



Daikin Industries, Ltd.

Daikin's Challenge to Achieving Carbon Neutrality

December 15, 2021

Event Summary

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[Venue]	Webcast	
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[Participants]		
[Number of Speakers]	3	
	Katsuyuki Sawai	Senior Executive Officer, Responsible for CSR, Global Environment Affairs, Public Relations
	Satoru Fujimoto	General Manager, CSR and Global Environment Center
	Miki Yamanaka	Department Manager, CSR and Global Environment Center
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*Analysts that SCRIPTS Asia was able to identify from the audio who spoke during Q&A.

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Presentation

Sakamoto: We would now like to begin the fifth sustainability briefing of Daikin Industries, Ltd. entitled Daikin's Challenge for Achieving Carbon Neutrality.

Thank you all very much for taking time out of your busy schedules to join us today.

The explanatory material is available on our website under Investor Relations, as announced in the email distributed today. The material will be projected on the screen, but if you need, please have it ready at hand.

I would like to introduce today's speakers. Katsuyuki Sawai, Senior Executive Officer, Responsible for CSR, Global Environment Affairs, Public Relations; Satoru Fujimoto, General Manager, CSR and Global Environment Center; and Miki Yamanaka, Department Manager, CSR and Global Environment Center.

I'm Sakamoto from the Corporate Communications Dept, IR Group, and I will be moderating today's session. Thank you.

Today, Mr. Sawai will first make a speech, and then Mr. Fujimoto will explain our company's approach to carbon neutrality. After that, Ms. Yamanaka, who is in charge of lobbying and advocacy activities, will talk about our past efforts to formulate rules.

We will have a 45-minute presentation, followed by a question-and-answer session. The end time is scheduled to be 12:00 PM.

Mr. Sawai, please.

Sawai: Good morning, everyone. This is Sawai from Daikin Industries. I would like to thank our investors and analysts for their continued interest in our ESG and sustainability initiatives. I was in charge of investor relations until April of last year, so I had a lot of dialogue with you. After that, I have been in charge of CSR and the global environment. I would like to continue to engage in dialogue with you, especially in the area of ESG and sustainability.

As you have already heard, the economy, industry, and social structure are undergoing major changes, and it is very important for the government and companies to work together to solve social issues. ESG, SDGs, and so on are in the newspapers every day. In particular, various measures are being taken not only in Japan but also around the world to reduce CO₂ emissions and decarbonize. In the midst of this situation, attention is focused on what we, as private companies, should do as our responsibility.

At COP26 held last month, as you all know, it was agreed that the world will work towards the 1.5-degree target. In addition to the national governments' efforts, corporations' own efforts to decarbonize are also paid attention to. I think it is important for us to make a clear action plan and show concrete activities to everyone.

Daikin's efforts in this area to date have been as you have already seen. In 2018, the Environmental Vision 2050 was formulated based on the forecast and identification of long-term risks and opportunities for Daikin in the 3-year plan of the second half of the Fusion 20. We have set a goal of becoming carbon neutral.

In the strategic management plan Fusion 25, which was launched this year, we set the challenge of becoming carbon neutral as 1 of the 3 themes of our growth strategy in order to contribute to a sustainable society and

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achieve growth for the Group. In order to achieve carbon neutrality, we have set specific themes that Daikin will work on over the next 5 years.

In the future, it will be important for us to achieve both the goal of carbon neutrality and business growth at the same time. We believe that energy-saving and environmental technologies for this purpose are our strengths. It is essential to create the soil to utilize this strength.

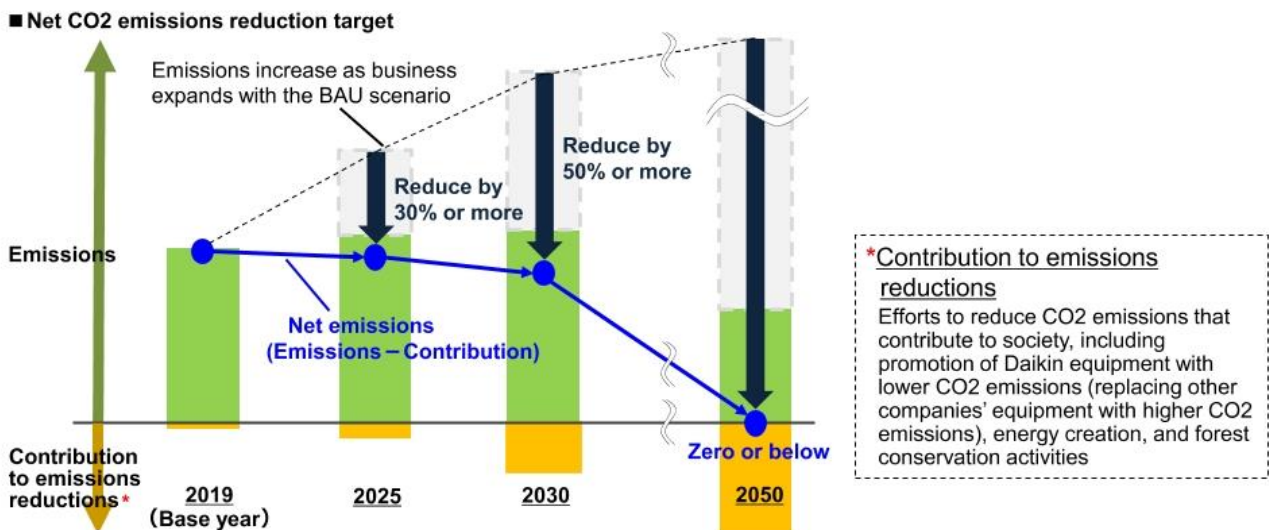
Today, we would like to provide you with an opportunity to deepen your understanding of our vision of the future, our approach to setting goals, and our efforts to formulate rules, which and our business strategies work in tandem, and to exchange opinions with you. Thanks.

Sakamoto: Now, Mr. Fujimoto, please.

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



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Fujimoto: My name is Fujimoto. Good morning. I would like to explain the concept of carbon neutrality, which is the key to sustainability.

First of all, as Mr. Sawai mentioned, we set the goal of Environmental Vision 2050 3 years ago. This is a long-term vision, so a medium- to short-term action plan was required. This time, we have clarified our goals for the next 5 years based on our strategic management plan Fusion 25.

As you can see in the graph, we are aiming for a 30% reduction by 2025, and a 50% reduction by 2030, compared to the BAU scenario, and will bring emissions to 0 in the future.

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As I will say later, there are 2 types of climate change: adaptation and mitigation, and air conditioning is a very necessary adaptation technology in the midst of global warming. Therefore, our business expansion is essential to contribute to the society.

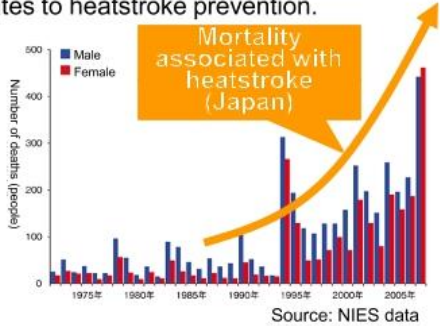
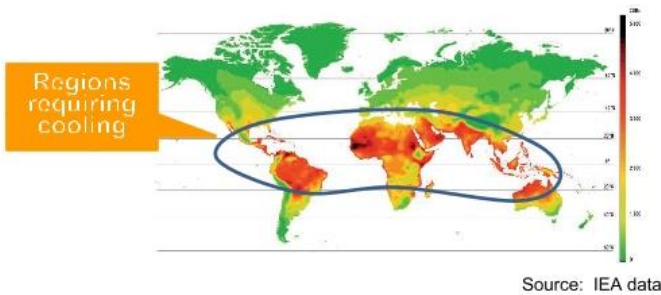
Air conditioning issues for carbon neutrality

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.

Air conditioning has contributed to the development of developing countries. In order to work in the tropics, air conditioning is necessary. As you can see in this map, the red areas in the world will have many days above 40 degrees in the future. In those areas, air conditioning will be essential to protect lives. In addition, as developing countries continue to grow their economies, more and more air conditioners will be installed.

According to the IEA forecast, the number of air conditioning in stock is expected to more than triple by 2050. For us, spreading the use of air conditioners is our contribution to society, so we think it is inevitable that BAU will increase. The major issue is how close we can get to carbon neutrality.

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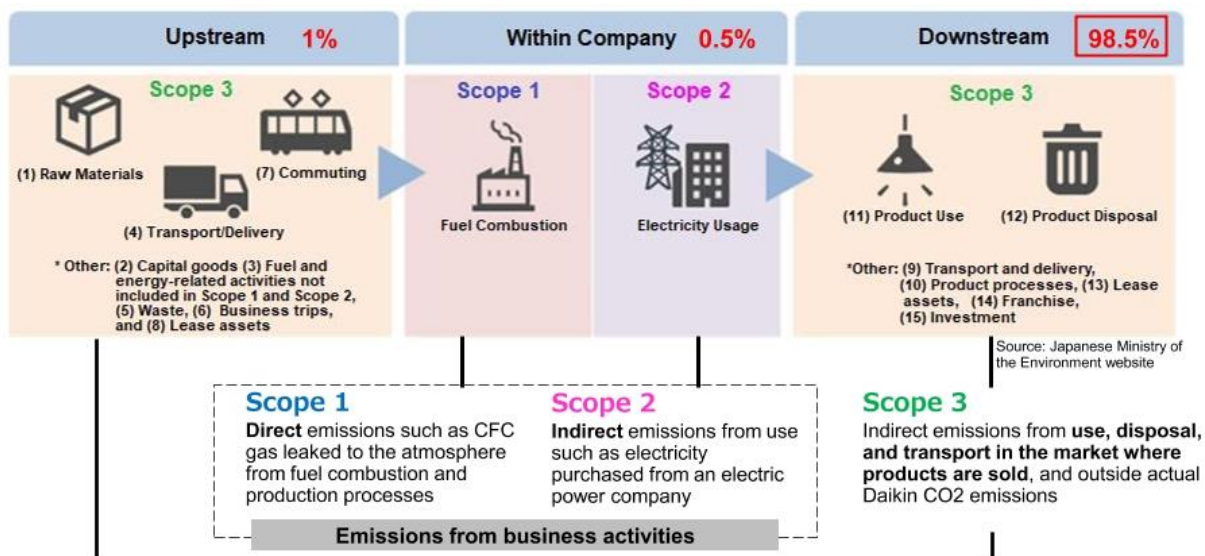
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Current situation for CO2 emissions at Daikin

- ✓ 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)



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This is the current situation of Daikin's CO₂ emissions. As for the CO₂ source categories, upstream refers to the CO₂ emitted from the procurement of parts and raw materials. The "within Company" refers to the CO₂ emitted by the Company's own factories and business activities. Downstream is the CO₂ that comes out after the sale. As you can see, downstream CO₂ generation is by far the largest, at 98.5%.

Therefore, from the perspective of carbon neutrality, the downstream measures will be the main theme.

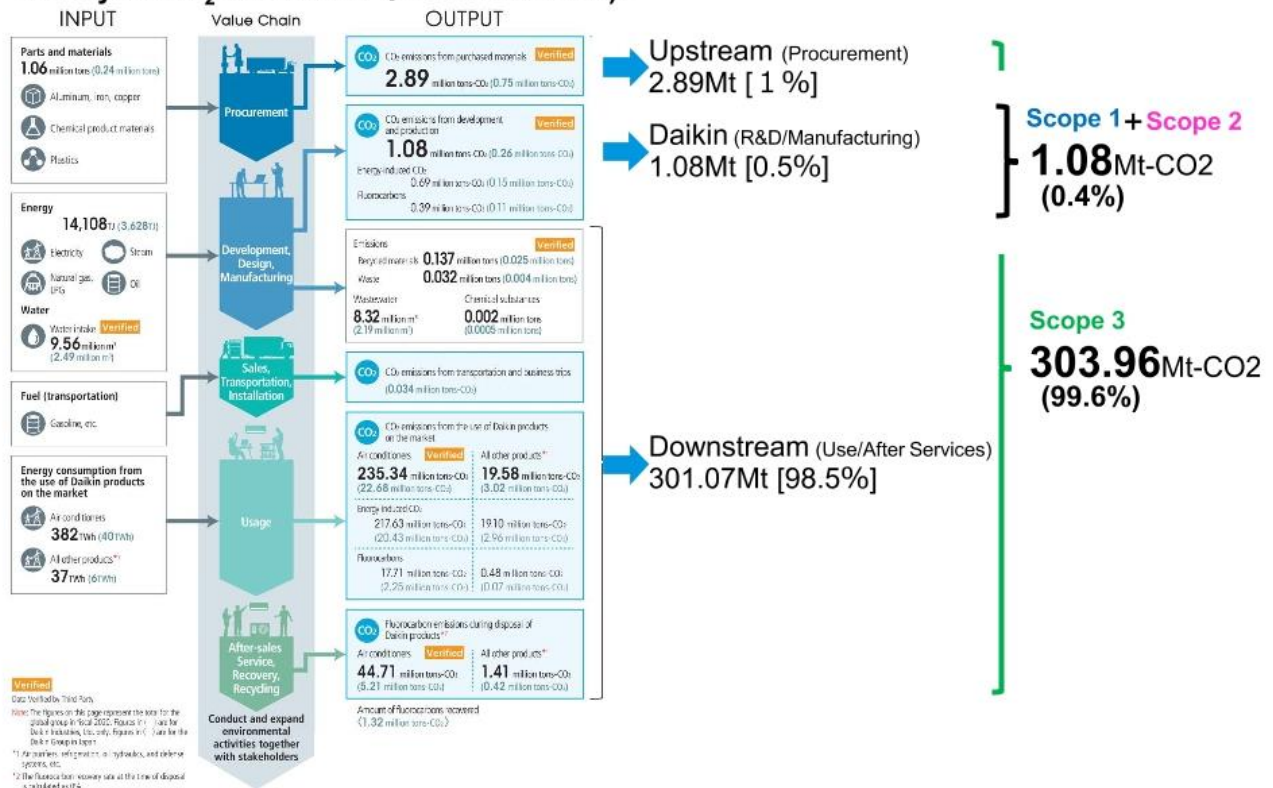
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CO2 emissions result

<Lifecycle CO₂ Emissions (FY2020 Results)>



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This page describes what contents are included in each of categories of upstream, within the Company, and downstream.

There are many ways in which air conditioners are used, so this is just a hypothetical value, but we believe that the total amount exceeds 300 million tons.

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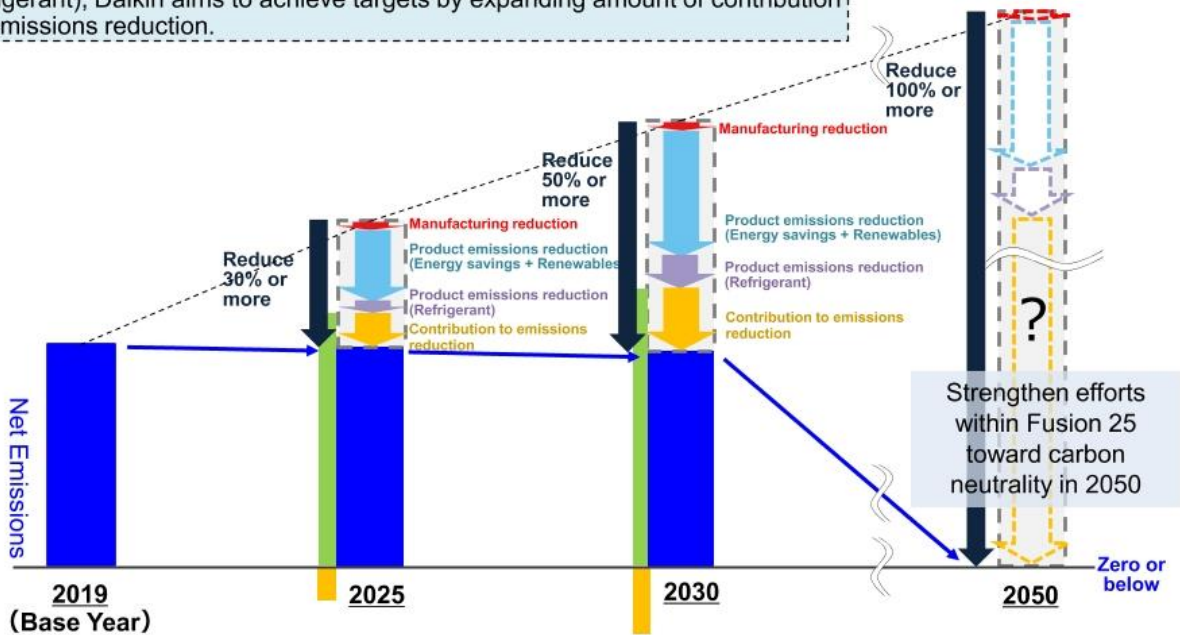
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How to reduce net emissions

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.



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So, the question is, how do we reduce CO₂ or GHG emissions when they are increasing so much?

First of all, as the use of renewable energy and energy conservation in buildings progresses worldwide, the required capacity of air conditioners will also decrease. Based on this background, we have been taking measures in our products, such as energy saving and lowering the GWP of refrigerants. We would like to further promote these measures and, as I will explain later, expand the amount of reduction contribution to achieve the target.

As you can see in the figure, the light blue arrow indicates the expected amount of product emissions reduction, including energy savings and reduction of the CO₂ emission coefficient of electricity, while the purple one indicates refrigerant and the orange indicates the amount of contribution to emission reduction.

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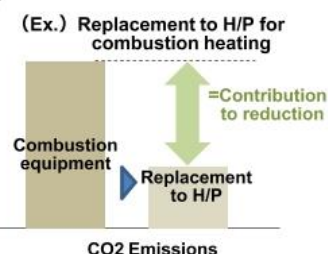
Daikin's approach for contribution to emissions reduction

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**

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I would like to explain our approach for contribution to emission reduction.

In addition to reductions within our value chain, we would like to focus on reductions outside our value chain. This is also related to the formation of rules, which Ms. Yamanaka will explain later, so I would like you to understand.

The first approach is the promotion of our equipment with lower emissions. 1 of this is the conversion of combustion heating to heat pump. Especially in Europe and the US, a lot of combustion heating are used, and we are going to convert that to heat pumps. In Europe, heat pumps are a technology that uses renewable energy, and it is claimed that this will offset emissions. We will also follow this approach.

We would like to examine the extent to which the conversion to inverter air conditioning equipment can really be included in the amount of contribution. In areas where the use of inverters in air conditioning equipment is almost non-existent or low, we have been promoting the use of inverters by forming rules and doing various other things. So, we think that it should be allowed to be included to some extent.

The second is the promotion of R32 air conditioning equipment. This has a considerable GHG reduction effect. Naturally, we will make reductions at our company, but we will also contribute greatly to the conversion of other companies to the R32, through free release of intellectual property, technical support, and so on, so I think we can count on some of that. At present, the R32 penetration rate is more than half globally. We believe that we are contributing to a considerable amount of refrigerant control.

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The third is refrigerant recovery. Recovery is not yet promoted in Japan, but little progress has been made worldwide either. We believe that refrigerant is a very valuable asset and that if it is released, it will have a huge environmental impact, so we want to recover it. We would like to count that amount as our contribution.

The fourth and subsequent approaches are forest conservation, new environmental businesses, and the technology themes to recover, store, process, and use CO₂. These are still small initiatives, and there are no clear prospects for the future yet, but we will proactively promote them in the future.

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

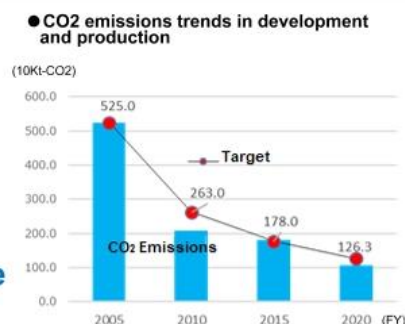
- ✓ Inverter ratio RA 75% in 2019 → 98%+ in 2025
 - Inverter ratio for other devices improved 5-15% (*VRV is already 100%)
 - By product volume ratio for Goodman 10% in 2019 → 30% in 2025
 - Inverter units are about 50% more energy efficient than non-inverter units.

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)



Finally, I would like to introduce what initiatives we will be taking in Fusion 25 based on these basic approaches.

As I mentioned earlier, there are a lot of downstream CO₂ emissions, but we believe that manufacturing, which we can control on our own responsibility, has a very high priority, so we are thinking of putting it first.

The graph on the upper right shows the change in emissions to date. The broken line is the target value, which was set at 1/2, 1/3, and 1/4 every 5 years, using 2005 as the base value. Initially, we thought that such a thing was impossible, but as you can see from the results in the bar graph, we have achieved the rather challenging target value over the past 15 years. As carbon neutrality is expected to become even more important in the future, we are now considering the possibility of giving priority to certain factories to become zero emission factories.

The second is to reduce power consumption and save energy. We are already accelerating the use of inverters throughout the world, and we are thinking of accelerating it further. It says that the target is 98%, but we would like to proceed with efforts to achieve 100%. We have been promoting the use of inverters around the

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world since about 2007, and now probably 40% to 50% of our machines are inverters. I believe that it is becoming a de facto standard.

The third is to expand the business of heat pump space and water heating. As I mentioned earlier, the amount of CO₂ emitted by combustion heating is very high worldwide, so we are going to convert this to heat pump and operate them using renewable energy. In Europe, we will establish a new development center in Ghent, and in North America, we would like to expand sales of FIT, a strategic product.

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

Next, there is a lot of debate about refrigerants, but we believe that we need to create a circulating system in the context of the circular economy. By doing so, we are working to reduce the amount of emissions and minimize the impact of global warming.

The first step is to promote R32 on a global scale, but at the same time, we will create the refrigerant eco-cycle and reduce the amount of emissions as much as possible. The creation of a system focusing on Japan, Europe, and North America will be done on a case-by-case basis, as the circumstances and situations differ from country to country. However, the policy is basically the same.

Naturally, we are also developing new refrigerants, such as lower GWP refrigerants and refrigerants for EV air conditioning. We will continue to develop new systems and equipment using our low-GWP refrigerants, and we will continue to advance our refrigerant initiatives by integrating these efforts.

While our global market share is less than 10%, but we cannot contribute to the world as a whole if we take measures only for that market, so we will promote initiatives that will contribute to the remaining 90%.

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Therefore, it is very important to formulate rules and how to work with other than our company, which will be introduced by Ms. Yamanaka next.

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)



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Last but not least, as part of our efforts for the future, we are taking on the challenge of new environment-related businesses, and we are trying to tackle a variety of themes.

You can see the photo of a smart city project in Singapore. In addition to that, we would like to consider what else we can do, such as expanding the micro-hydro power generation that we are currently working on in terms of energy creation.

We are also working with Doshisha University on CO₂ decomposition, recovery, and reuse, and we would like to promote these activities in collaboration with the University of Tokyo.

This concludes my explanation. Thank you very much.

Sakamoto: Next, Ms. Yamanaka will make a presentation.

Yamanaka: Good morning. I am Yamanaka of the CSR and Global Environment Center of Daikin Industries. I would like to talk about Daikin Industries' rulemaking initiatives.

My mission is to spread our environmental technologies throughout the world, and to do so, rulemaking will be the main activity.

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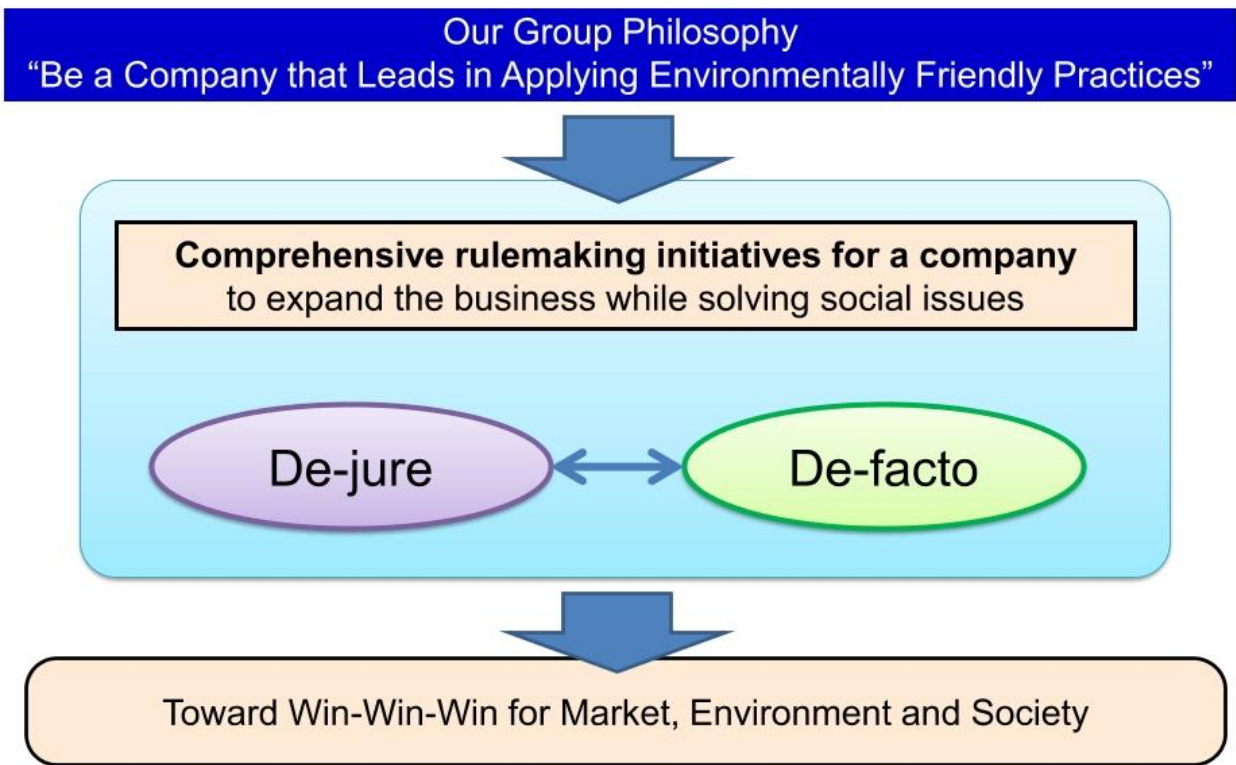
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We believe that spreading our environmental technologies will help us become a sustainable company. We are working on rulemaking for this purpose as an essential activity for a sustainable company.

Let me tell you more about it.

Becoming a sustainable company



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Our group philosophy is to be a company that leads in applying environmentally friendly practices. This means that we are trying to expand our business while solving environmental problems, or social issues. We see rulemaking as 1 way to achieve this.

Here, I would like to share with you what rulemaking companies can do. We believe that de jure and de facto are essential elements of approaches for rulemaking. De jure is commonly referred to as planning or standard. Not only that, we believe that de facto is also very important.

Here, de facto means implementation in society through standardized and planned technologies. I believe that only when all these things are in place will rulemaking be complete, and the market, the environment, and society will have a win-win-win relationship.

In English, the term "rulemaking" only means the formulation of laws and regulations, but I hope you will understand that we consider rulemaking in a broader framework.

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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 environmental 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

As a company, I would like to introduce some of the assumptions that must be made when proceeding with this activity.

The first is whether the subject matter will lead to solutions to current important social issues. What I am talking about is whether our rulemaking activities are worthwhile. Social issues can never be solved by corporate egoism. In rulemaking, the ego of a single company will never drive things. We believe that there must be an underlying cause. The same is true for the issue of climate change. Curbing global warming is a common global issue. In order to achieve this, we need to work towards a solution.

Another important factor in rulemaking is that the time is ripe for such a theme and the world is becoming aware of the problem. Even if we think that something is important, if the general public does not feel that it is important, it will be difficult to make progress in rulemaking or to have people understand what we are saying. Therefore, I think that we should start with the activities to build up the momentum, and after the momentum has been built up, the activities for rulemaking will begin.

The other factor is whether the Company that forms rules, i.e., our company, can lead the world in a single field in terms of products or business. Since rulemaking drives the world, you need to have a certain level of competence in that field to be able to lead the world. I think 1 measure is whether you have the ability to contribute to the world through your business activities and, based on your experience and achievements, be able to lead important businesses and product groups in rulemaking.

Lastly, and I think this is the most important, is the Company's commitment and human resources. We believe that our business and products have a very large environmental impact. With a firm belief that we are doing

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the right thing by contributing to the environment, we will create the technology to achieve this goal. I think it will be very important to have people who have the desire to spread the technology to the world playing an active role in the front line.

I believe that these 3 assumptions are very important in promoting rulemaking.

We don't think we have done it all yet. We are still in the process of learning, and although there are still things we can do and our abilities have not yet caught up, we are working hard every day.

I would like to explain why we decided to consider rulemaking based on our past experiences.

The first is the learning experience in Europe. Here, we learned about defensive rulemaking and offensive rulemaking. I would like to look at the specifics.

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.



It all started with the issue of refrigerant used in air conditioners. As Mr. Fujimoto mentioned earlier, refrigerants have become a very big problem for global warming, and there has been a very critical situation in Europe.

The refrigerant gas use HFC, which is now a restricted or controlled substance under the Kyoto Protocol, and Europe is a very advanced region in terms of environmental issues. I'm sure you are all aware of this by now. As described in this page, it was in 2004. It was a long time ago, but around that time, the EU Environment Committee suddenly tried to adopt a bill to ban HFCs.

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If the bill passes and HFCs are banned, we will have no refrigerants left to use. This had such a huge impact that we would have had to close our business in Europe. In order to solve this problem somehow, we started lobbying to block the HFC ban bill.

In 2004, the EU Parliament began deliberating on a bill to regulate CFC gas and HFCs. On the right side of the slide, you can see the legislative procedure of the EU Parliament. On the first reading, it was decided that not to impose any restrictions on the use of HFCs, as the optimal CFC gas. So, we were somewhat relieved.

However, in 2005, the following year, at the second reading, the Environment Committee adopted an amendment to almost completely ban the use of HFCs from 2010, as shown in yellow on the slide. This was something I had never heard of before, and I was very surprised.

If this were to pass to the EU plenary session, the law would be enacted, but at the time, we did not have any alternative technology. Even now, there is no alternative technology, and if the bill were passed, the business of air conditioning manufacturers would have become unviable. There was a sense of crisis that if we didn't really stop the bill, the Company would collapse.

Therefore, we repeatedly explained the role and importance of HFCs in air conditioners to the EU Parliament, with the cooperation of the Japanese Business Council in Europe (JBCE), as well as the sales and production teams of Daikin Europe and various academics. As a result, the bill to ban HFCs was repealed at the second reading of the plenary session.

We had only 2 weeks. Although it was a very short period of time, we were able to gain understanding by intensively visiting various places, talking to many members of the Parliament, presenting various information and data, and discussing our economic problems.

Through this experience, we learned that laws and regulations can be revised in the right direction with our thoughts and efforts.

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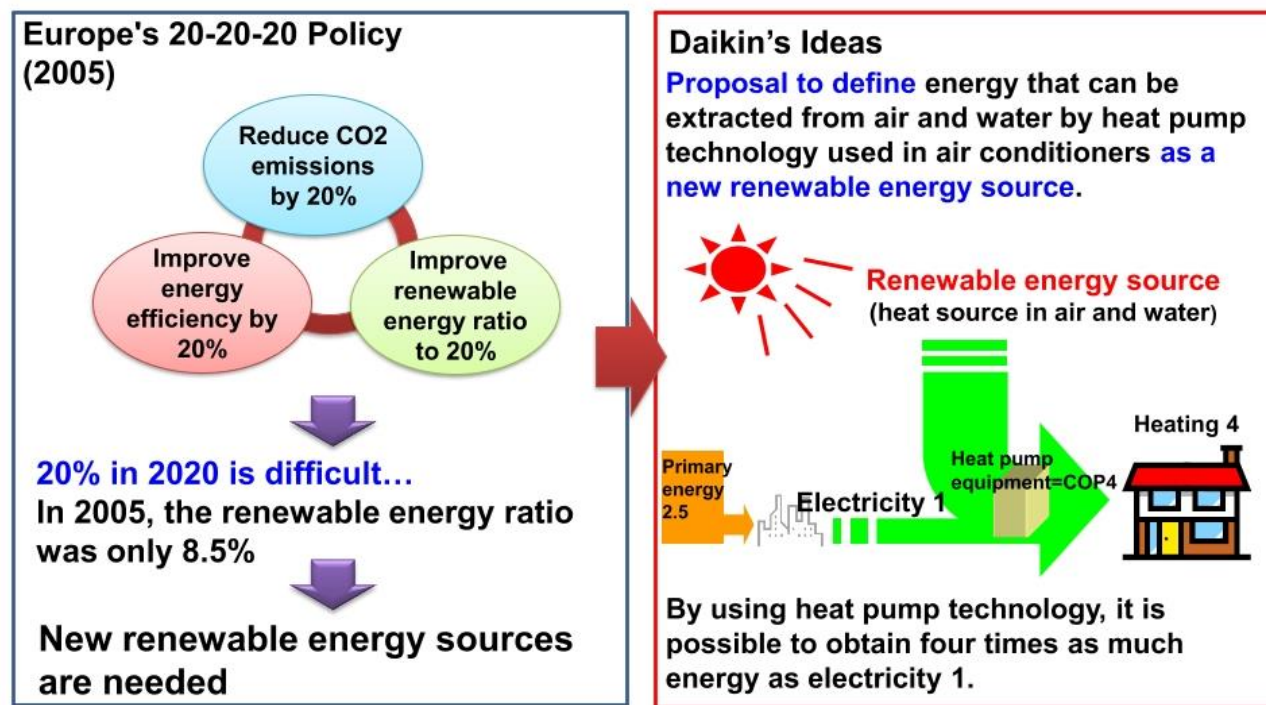
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Offensive rulemaking – Heat pumps (RES Directive)

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



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Therefore, we decided to go 1 step further and, based on our experience gained through the repeal of the HFC ban bill, we decided to try offensive rulemaking. In this context, we proposed rulemaking to use heat pumps for RES Directive.

At that time, in 2005, Europe had a 20-20-20 policy to reduce CO₂ emissions by 20%, increase the percentage of renewable energy to 20%, and increase the energy efficiency of equipment by 20% by 2020. It is more advanced now, but that was the trend at the time.

It was very difficult at that time to achieve a renewable energy ratio of 20%. At that time, the percentage of renewable energy was only 8.5%, and the EU was struggling to figure out how to increase it in the future. As such, we have proposed a new source of renewable energy.

Daikin's idea is shown on the right of the slide. We proposed to define the energy that can be extracted from air and water by the heat pump technology used in air conditioners as a new renewable energy.

If the energy required for an air conditioner, i.e., electricity, is 1, the energy that can be extracted from air and water using the heat pump technology is about 3. If you add it up, you get about 4 as much energy for heating. We were able to show the European Parliament that this is a very significant technology that not only saves energy efficiency, but also reduces energy use by using renewable energy. By using heat pump technology, 4 times as much energy can be obtained as electricity. This is a Daikin idea, and we have started to share it widely with you.

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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



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We proposed heat pumps as a new energy source and technology, and the motivation of the European Parliament to promote this technology and increase the ratio of renewable energy in Europe at that time matched with our motivation to promote heat pump technology. We were able to achieve a win-win situation.

As for Daikin's approach, we approached the EU Parliament and the EU Commission and made a concrete proposal to revise the Directive to promote the use of renewable energy. The challenge was that it was impossible for the Company to approach the issue alone, so we received support from various industry groups, academics, and others.

In order to gain understanding of members of the Parliament, we had to appeal to them with not only policy issues, but also economic issues and the fact that since we do business in Europe, if our technology spreads, it will have a positive impact on our business and the European economy. We were able to gain understanding by talking such things in plain language rather than in difficult technical terms.

The RES Directive has 3 sectors: fuel, power, and heating and cooling. Finally, air heat and water heat were added as renewable energy sources in the heating and cooling sector.

This was 1 of the events that led us to start our heat pump business in Europe.

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Offensive rulemaking – Inverters (ErP Directive)

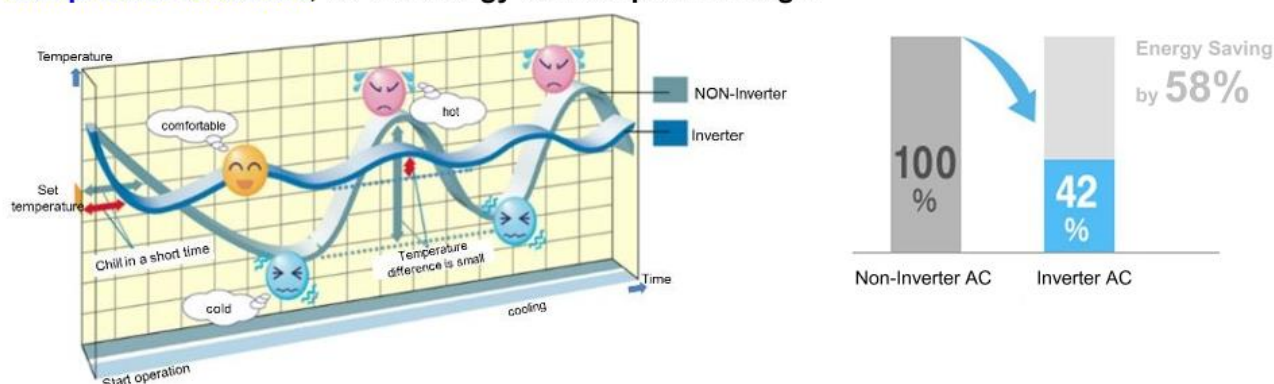
The inverter, which is one of Daikin's strengths, is a technology that controls voltage, current, and frequency to continuously control heating and cooling operations.

<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.



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There is 1 more thing that we have been working on in Europe for rulemaking. As we move forward with renewable energies, energy saving has become very important, as the power supply is often unstable. Therefore, we have worked to spread our inverter technology.

1 of our activities was related to the ErP Directive. The ErP Directive is an EU directive that mandates environmentally friendly design and requires the use of such technologies for air conditioners. Here, we have succeeded in spreading the use of inverter technology.

Inverter technology is a technology that controls the voltage, current, and frequency to continuously control the heating and cooling operations.

In the case of non-inverter technology, when the air conditioner is turned on, if the room temperature drops to a certain level in the middle of summer, the air conditioner will stop operating at that point. When the temperature rises quickly again and you think it is getting too hot, the power is switched on again, the machine starts working, and the temperature is lowered again. In the case of technology that does not use inverters, the system is turned on and off repeatedly in this way, but in the case of an air conditioner equipped with inverter technology, the power switch is not turned on and off each time. The temperature in the room is kept constant by controlling the speed of the compressor without turning the power switch on and off each time.

If you don't use an inverter, it uses a lot of power when you turn it on and off, but with an inverter, you can save a lot of energy by reducing power consumption. It has been proven that if an air conditioner without an inverter uses 100% of the electricity, an air conditioner equipped with an inverter can save 58% of the energy.

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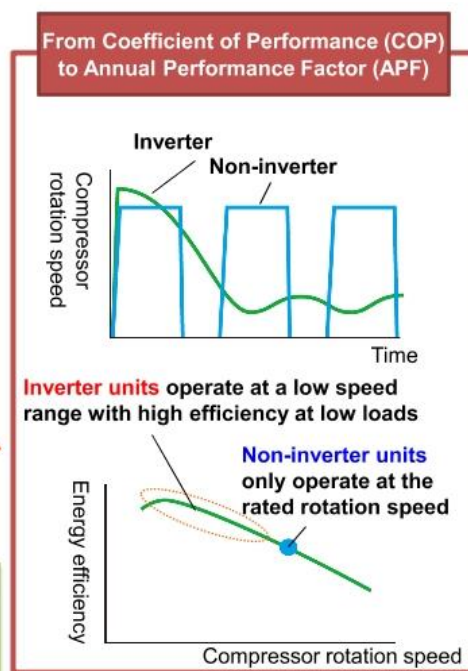
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Offensive rulemaking – Inverters (ErP Directive)

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



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We thought it was a very good technology and that would be understood in Europe, so we were involved in the ErP Directive from the very beginning of the discussion, and we tried to bring the good points of the inverter and what kind of technology it is to the Parliament in a fair way.

In fact, we conducted a demonstration test to see how the system would perform with a non-inverter and how it would perform with an inverter, and after showing exactly how much power would be consumed, we came to a decision as to which would be better.

We have provided unbiased data on technology, and the discussion has been accepted.

This led to the adoption of inverters as a very important technology for environmentally friendly design in the ErP Directive, and the technology spread rapidly in Europe.

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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

■ Example of energy efficiency label for air conditioners



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

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Taking advantage of our experience in Europe, we now applied it to our activities not only in Europe, but also in China. Here, I would like to introduce what we have done in China in terms of rulemaking.

We didn't just suddenly go to China and say, "Let's do it," but there was a shift in China's policy. As you know, China formulates a medium-term plan every 5 years. Up until now, to a certain extent, the plan has been based on economic supremacy, but from around 2006, China began to fully address environmental issues.

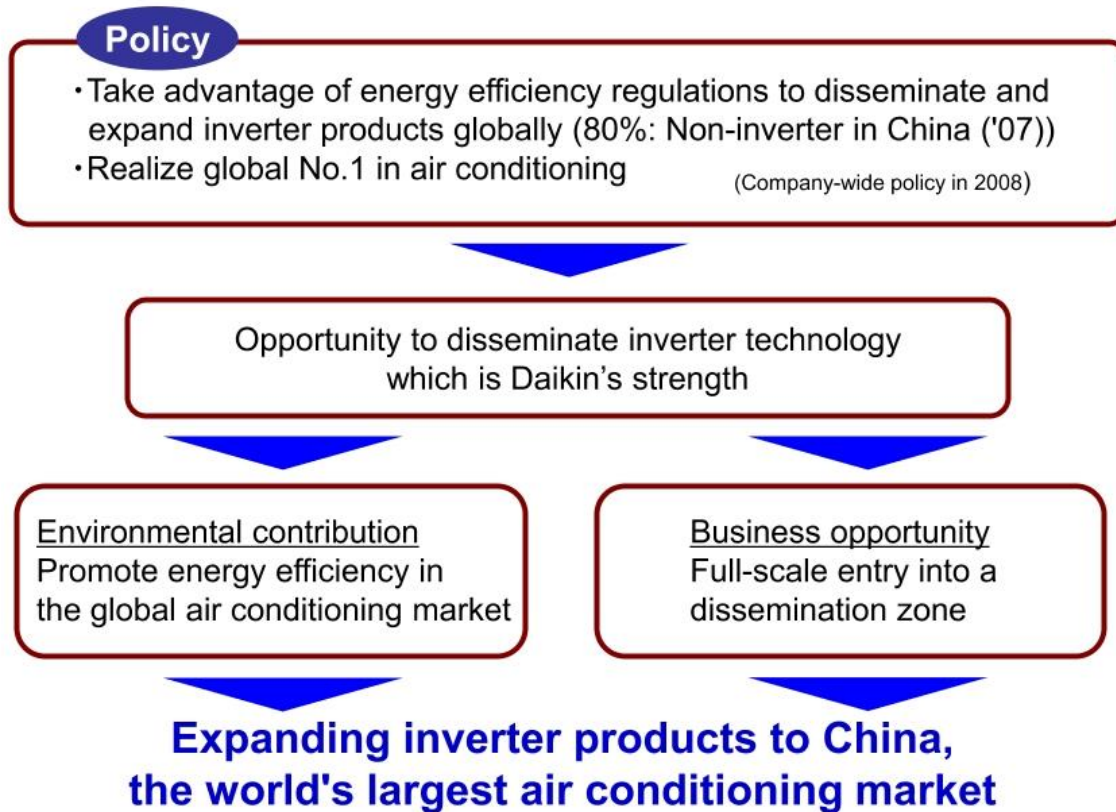
The Chinese government's environmental policy has changed drastically, and we decided to take advantage of this opportunity and start promoting inverter technology in China.

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Turning the trend toward energy efficiency into a business opportunity



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As you can see on the slide, in order to take advantage of the energy conservation regulations, we have set a major policy to spread and expand inverter products all over the world. In China, the non-inverter market was 80% at that time, we set a policy to realize global number 1 in air conditioning.

And in order to promote the use of inverters, which is our specialty, we have been working from 2 perspectives. We have decided to approach the Chinese market with 2 goals in mind: to contribute to the environment and to create business opportunities.

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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 Performance evaluation project of RAC (Project to promote international standardization of Annual Performance Factor)	Support and survey project on building infrastructure to promote energy efficiency Support and survey project on international standardization of RAC and refrigeration	
Operator	IS-INOTEK (with JRAIA's full cooperation)	- 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	(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		(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.

In order to do so, through the Institute of Energy Research, Kyoto University, and Ritsumeikan University, we explained to the members of the National Development and Reform Commission, which has since changed its name, what inverters are and started to promote their use.

It's about building momentum. As I mentioned at the beginning, without momentum, it is difficult to make progress, so we have started activities to increase the momentum.

After that, we joined the World Business Council and created a subcommittee for inverters and heat pumps, where we could discuss both heat pumps and inverters. After that, we participated in an international standardization support projects supported by the Ministry of Economy, Trade and Industry (METI), and we started to create standards and plans for inverters in China. Not only us, but also many member companies such as Panasonic, Mitsubishi Electric, and Sharp have collaborated with us to make this project possible.

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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**



"Decided to form an alliance to speed up the process."

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In addition to planning and developing standards, which are the foundation for the spread of technology, Daikin has adopted a strategy that goes 1 step further.

This is a partnership with Gree Electric Appliances, the number 1 air conditioner manufacturer in China. In February 2009, we entered into a partnership with Gree in order to expand business opportunities, and jointly developed an energy-saving inverter room air conditioner.

In order to change the market where non-inverters are the mainstream, we thought that the best way to expand the inverter market would be to collaborate with Gree, China's number 1 manufacturer.

At the same time, Gree was also aware of the change in policy by the Chinese government at the time, and they recognized that they needed to steer their business in an environmentally conscious manner. Therefore, we decided to collaborate with Gree in this joint development project.

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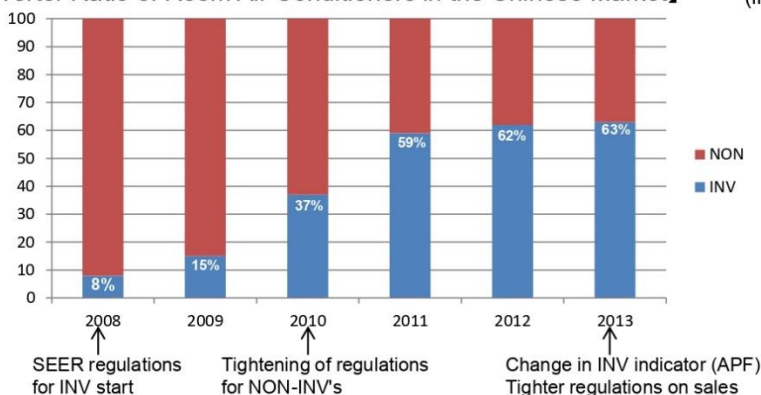
Advantages of the alliance and what we focused on

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 Ratio of Room Air Conditioners in the Chinese Market】



(inverter circuit)

(Control waveform according to the load)



(Compressor)

"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

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As for the benefits of the alliance and what we focused on, we adopted an open strategy.

Through the jointly developed electrical components and compressors, Daikin's core inverter technology has been provided to Gree. This is a very big decision. However, we thought it was important to expand the market for inverters and how much of a share we could gain in that market, so we made the wise decision to provide Gree with our inverter technology.

As a result, in 2008, the ratio of inverters was 7% to 8%, in 2013 it was 63%, in 2018 it was about 76%, and now the ratio of inverters is almost 80%.

It grew very rapidly. We believe that these 2 efforts, changing the standards and regulations, and encouraging business, have led to the rapid expansion of the inverter market.

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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)

In addition to China, we are working on projects in India, Brazil, the Middle East, and ASEAN countries.

In these countries, rather than going it alone, intergovernmental dialogue is a very important factor, so we have conducted demonstration experiments and seminars while utilizing the research projects of the Ministry of Economy, Trade and Industry and JICA projects. We provided information on inverter technology and also supported the revision of the labeling system. I would like to talk about the specific actions a little later.

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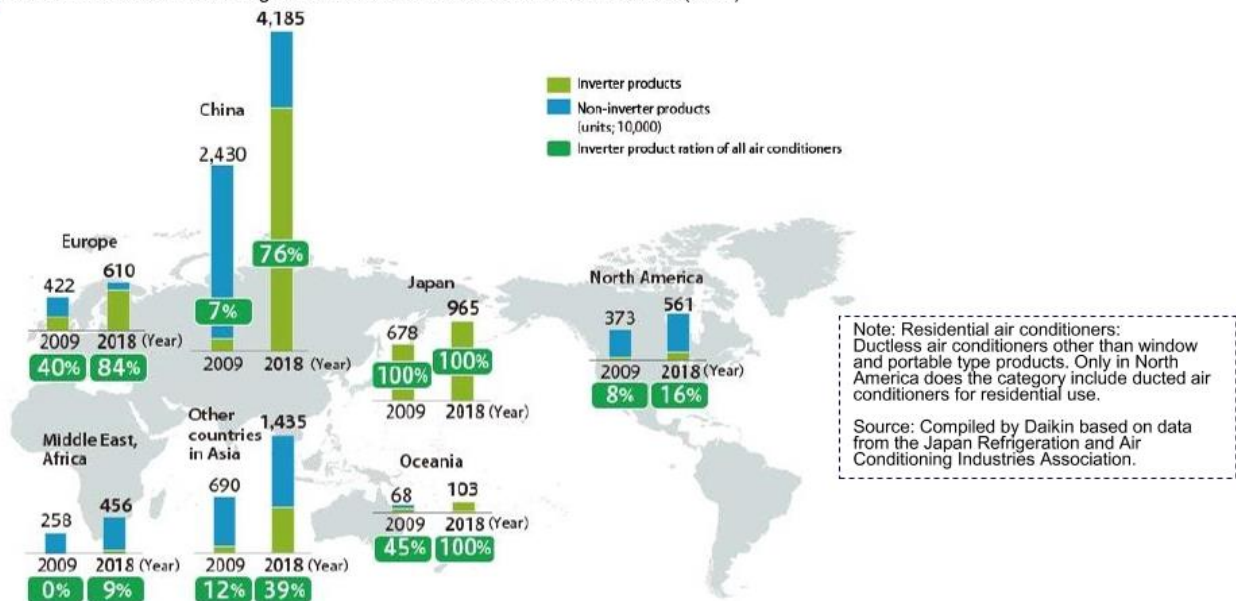
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[Reference] Inverter products as percentage of all residential air conditioners worldwide

- 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)



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Just for reference, here is the ratio of residential inverters in the world.

As you can see here, in the case of China, the rate has gone up from 7% to 76%.

On the other hand, inverters are not widely used in the United States at all. Although they have the technology, it has not been widely adopted in the market. I think this is the next item to be addressed.

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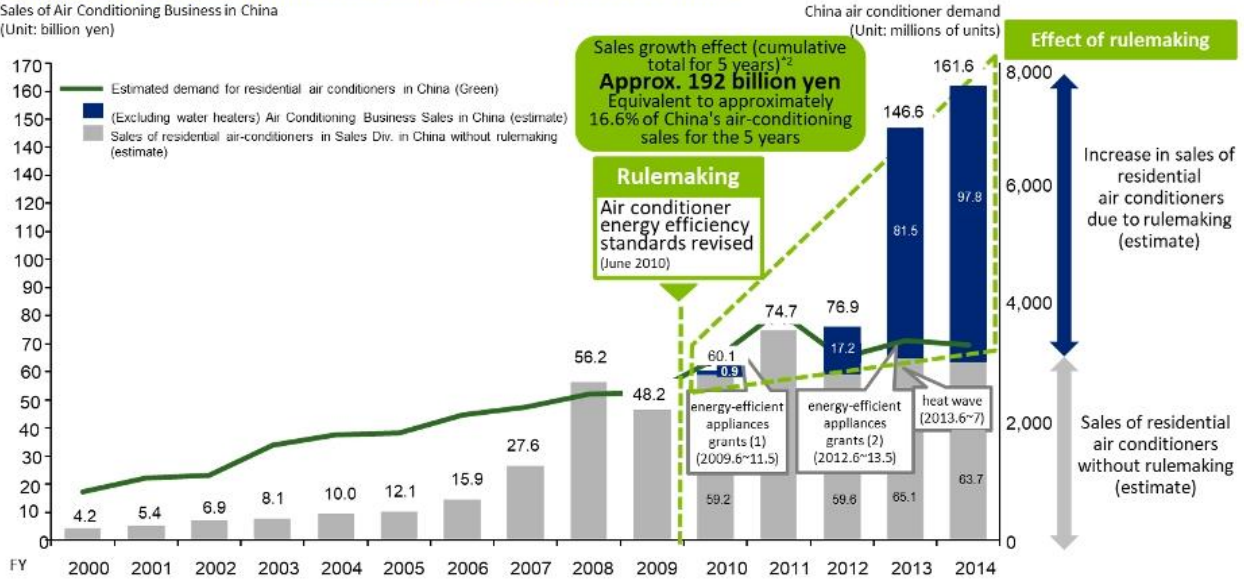
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[Reference] Business impact of rulemaking

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 Tohmatsu, based on Daikin HP and Japan Refrigeration and Air Conditioning Industry Association air conditioning business volume estimates

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Let's look at the business impact of the rulemaking in China. This is not our own data, but the economic and sales impact estimated by Deloitte Tohmatsu based on the data we have published.

From the point of view of the actual expansion of the inverter market, the sales effect is estimated to have been JPY192 billion cumulatively over the 5 years. Outside consultants have pointed out that 16.6% of the sales of our air-conditioning division in China may have been brought about by rulemaking.

As you can see, the impact of rulemaking on our business is significant.

Based on these success stories and experiences, we have now expanded our efforts to the world.

As Mr. Fujimoto mentioned in his presentation, we are working to promote the use of R32, a low-GWP refrigerant. This is a very global initiative.

The reason why we need to work on low-GWP refrigerants is, as you all know, the social demand to curb global warming.

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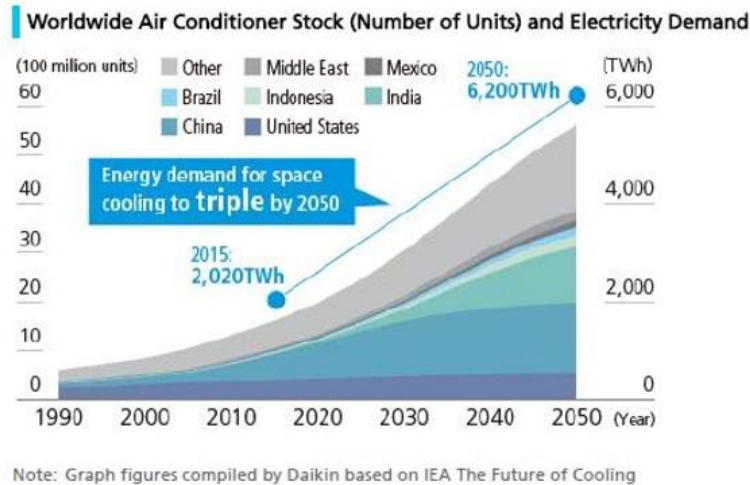
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CO2 Emissions from air conditioners

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.



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

CO₂ emissions from air conditioners are very large. Demand for cooling is expected to skyrocket by 2050, tripling the global electricity demand attributable to cooling. What Daikin needs to do is to reduce CO₂ emissions from air conditioners. This is something we definitely need to do. At the same time, the impact of refrigerants on global warming is expected to be very large, and we have been working on this issue since around 2010.

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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)	Developed country	○ (phased out by 1996)	○ (phased out by 2020)	Kigali Amendment Agreement on HFC Phase Down
	entry regulation Developing country	○ (phased out by 2010)	○ (phased out by 2030)	
Paris Agreement (Emission control)	Developed country	-	-	○ (partially)
	exit regulation 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).**

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The use of refrigerants is not only contributing to global warming, but can also destroy the ozone layer. At the time, the Montreal Protocol imposed restrictions on production and consumption of ozone-depleting substances such as CFCs and HCFCs, and both developed and developing countries set their own timetables for their total elimination.

On the other hand, HFCs, which we use now, do not deplete the ozone layer, but their high global warming potential makes them a controlled substance under the Paris Agreement.

This was at a time when the Paris Agreement was not progressing very well, and it was difficult to reach a consensus. The Montreal Protocol members suggested that HFCs should be regulated in the same way as CFCs and HCFCs in the Montreal Protocol, which had contributed greatly to the reduction of ozone-depleting substances.

The amendment to reduce HFCs in the Montreal Protocol, which is credited with the reduction of CFCs and HCFCs in 2016, was agreed upon by the world and approved as the Kigali Amendment.

As a result, HFCs have become a regulated substance under both the Paris Agreement and the Montreal Protocol.

The Paris Agreement is about reducing emissions, or exits, while the Montreal Protocol is about reducing entrances, so we are now faced with pressure to reduce emissions from both entrances and exits.

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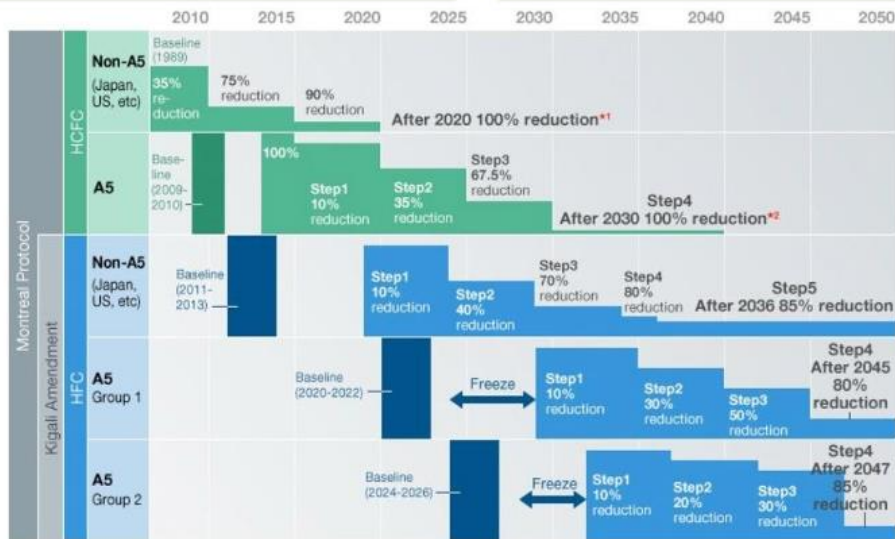
Montreal Protocol and Kigali Amendment

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.

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Daikin Website <https://www.daikin.com/csr/information/influence/protocol> 37

This is the schedule for the reduction of HFCs and HCFCs under the Montreal Protocol and the Kigali Amendment.

The green area above is the schedule for the reduction of HCFCs, substances that deplete the ozone layer. It is aimed that most of them will be gone by 2030. At the same time, HFCs will be reduced as shown in blue. In Japan, it has already started in 2020, but for developing countries, it will start in 2024. In the end, the schedule was established so that developed countries will have to reduce the GWP impact of HFCs by 2036, and developing countries will have to reduce their impact significantly by 2045, about 15 years later.

On the other hand, what needs to be seen is that developing countries are faced with the very difficult task of reducing HCFCs while at the same time reducing HFCs.

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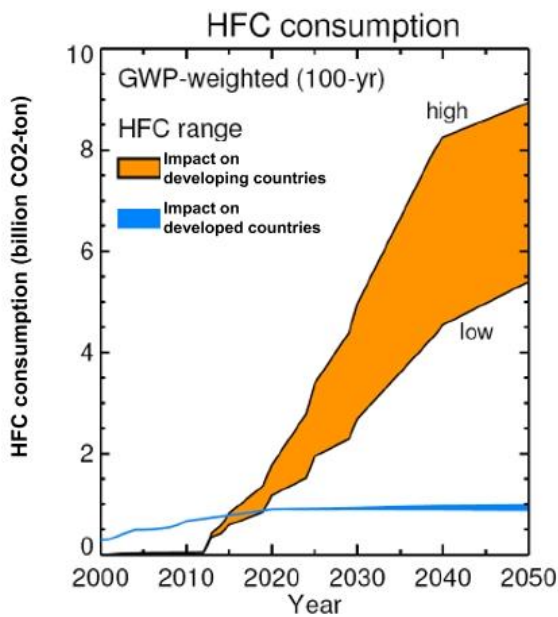
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Factors to consider when selecting the optimal refrigerant

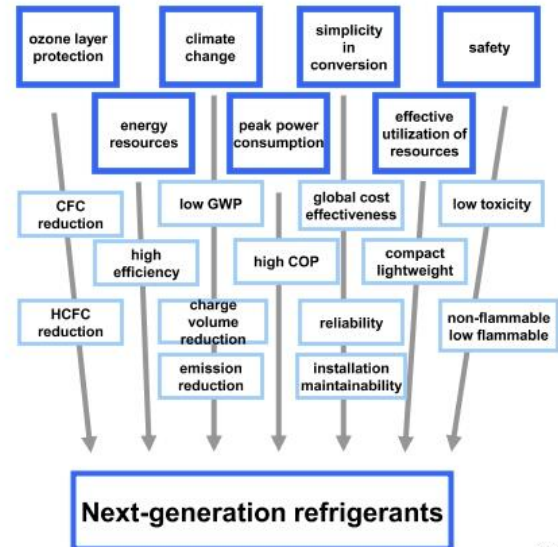
In emerging countries where HCFCs are phasing out and HFC consumption will increase significantly in the future, development and dissemination of lower GWP refrigerants are important.



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.



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Selecting a refrigerant is very difficult. Of course, we need to protect the ozone layer, but we also need to think about energy efficiency. The global warming potential must be low, and the maximum power consumption and so on must be minimized. We must also make effective use of resources, and we must look at safety. As for the ease of conversion, if the technology is extremely difficult, it cannot be converted, so it is necessary to use something relatively easy.

Thus, there are various screening points, and those that clear these points are positioned as next-generation refrigerants, and we began our search.

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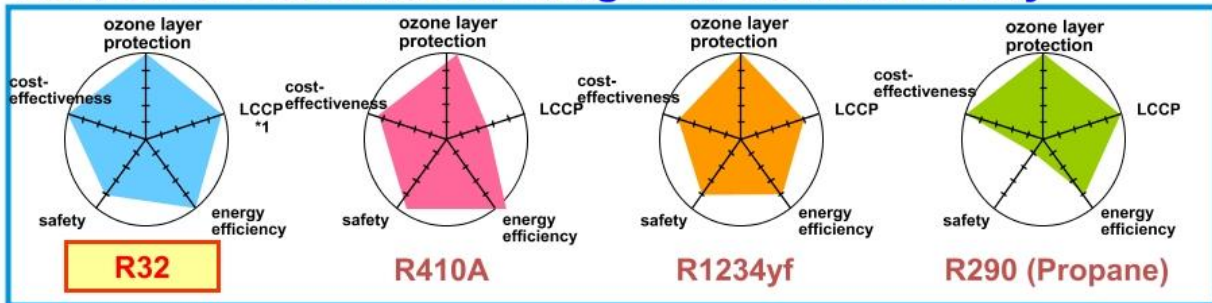
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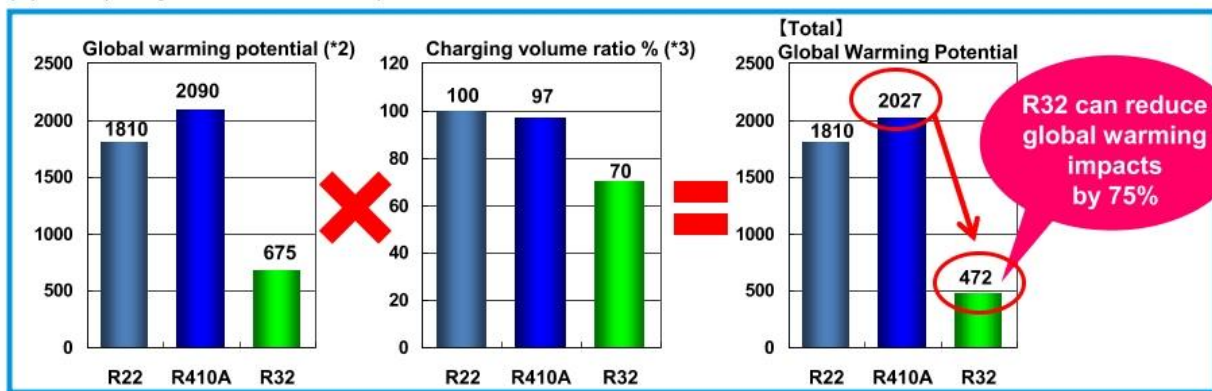


Sooner the Better – Daikin’s Policy

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

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Then we found a refrigerant called R32.

With the various criteria, R32 is the most well-balanced refrigerant, and we have come to the conclusion that this refrigerant is the best choice.

Of course, there is research that suggests that a better refrigerant may emerge if more time is spent, and we are pursuing that research. However, if we wait for that to happen and continue using a refrigerant with a high global warming potential, it will have a huge impact on future global warming.

Sooner the better. We believe that the key to curbing climate change and global warming is to start with what we can do as soon as possible, and that is why we have started promoting the use of R32 refrigerant.

R32 also has a global warming potential. Although the figures are 675, it will be possible to reduce the amount of refrigerant used, and compared to the R410A refrigerant used up to that point, the reduction could be as much as 75%. We thought that there was no reason not to use such a refrigerant, and so we began to go around the world to tell people about it.

However, this R32 isn't completely safe. It has some flammability, which we call Mildly Flammable. At this point, we began to work on the need to create an international standard for the use of slightly flammable refrigerants.

We believe that only by having such a standard will everyone be able to use our products with peace of mind, and so we have started working on this.

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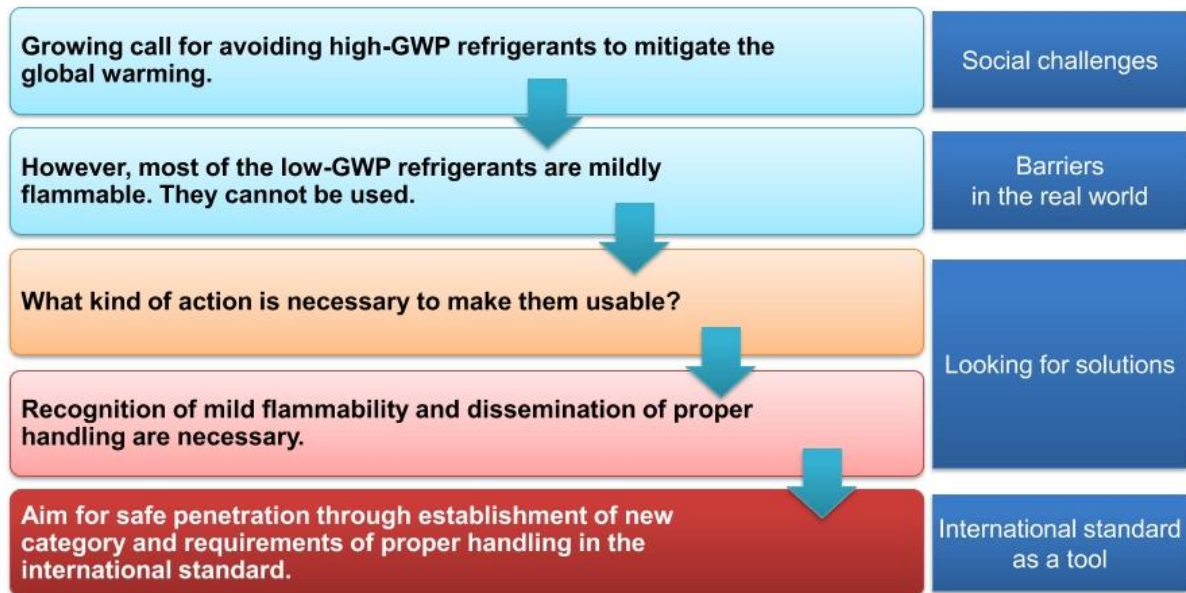
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Why was standardization necessary?

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**.



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I would like to explain the reason why standardization was necessary. As I mentioned earlier, the R32 is mildly flammable. Although it had been proven to be non-hazardous under proper handling, in 1998, there were only 2 classifications in the world: non-flammable or flammable.

Therefore, even though R32, which is mildly flammable, has very low flammability, it was put in the same category as hydrogen and propane, which are very explosive, and required the same handling. Therefore, it was very difficult to use them in ordinary air conditioners.

However, there is a growing need to reduce global warming as a social issue. When we think of refrigerants with low GWP, most of them have this mildly flammability. This led us to explore the idea of how to make low-GWP refrigerants usable, and to promote correct knowledge and handling methods.

What we had to do was to establish a new category in international standards. We came up with the idea of establishing and spreading the requirements for proper handling. The international standards were used as a tool to create the standards.

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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

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Specifically, these are the categories.

It says Flammable and Higher Flammability, but in the past, Flammable and Higher Flammability were almost always grouped together, and the category was essentially flammable or non-flammable. We have worked to create the category of 2L, a new category of lower flammability. There are 3 categories: 1, 2, and 3, and we created a category for 2L, lower flammability.

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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

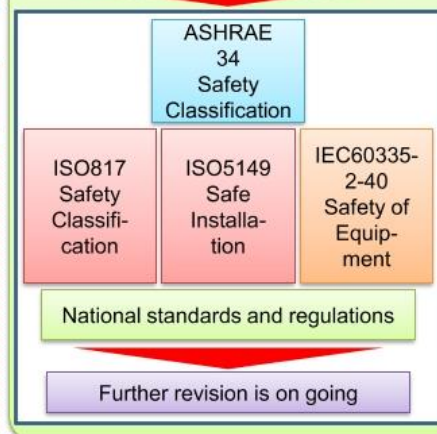
Director-General of the Industrial Technology and Environment

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



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I'll talk about how we went about it specifically. As shown in the figure on the right, a committee of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers), called 34, originally created a safety class standard for this classification. We joined ASHRAE 34 and worked hard to establish a class for mildly flammability.

In fact, we had started specific activities in 1997, but the momentum was not strong enough, so the activities were stagnant. However, after finally succeeding in establishing a new flammability category, A2L and 2L, in ASHRAE 34 in 2010, we were able to establish a new standard in ISO 817, which is an international standard.

Then, we have revised ISO5149 as a standard for safe usage, and have established a safe index for A2L.

IEC60335-2-40, an electrical safety standard, was also revised to specify not only the use of A2L refrigerant, but also how to use it in the equipment itself. All of these factors have contributed to the safe use and widespread use of A2L refrigerants and mildly flammable refrigerants.

This initiative has been carried out by our employees for a very long time. The activities of these employees were highly evaluated by the Ministry of Economy, Trade and Industry (METI), and last year we received the Minister of Economy, Trade and Industry's Award for Industrial Standardization for 2020. We are very grateful.

We will continue to make revisions to further establish safety and to further expand the use of A2L refrigerant.

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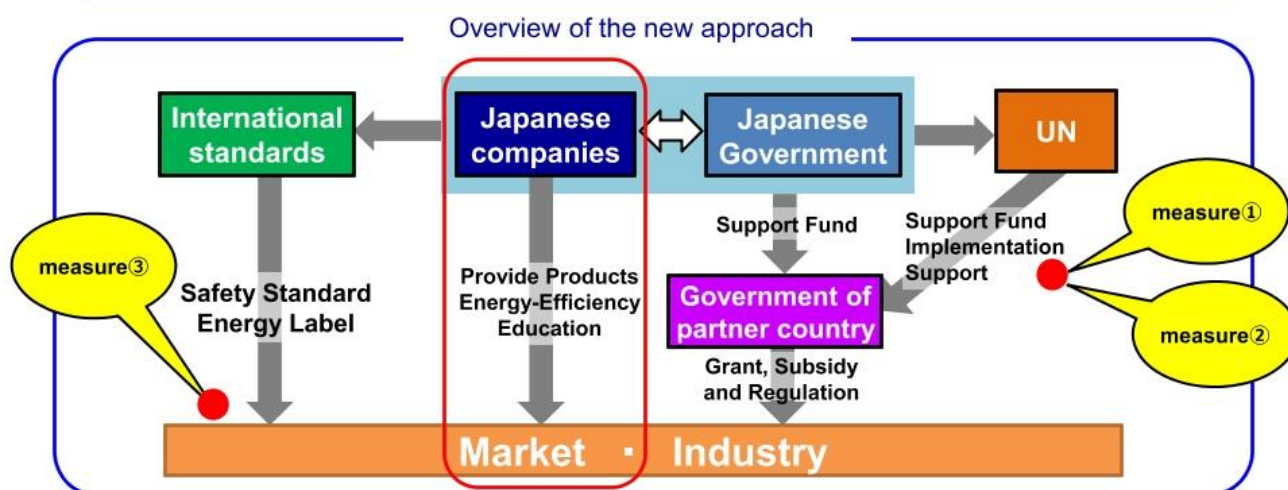
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Approaches to developing countries

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**



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While resolving these fundamental de jure issues, we are also starting to approach developing countries to promote the R32 worldwide.

Developed countries have enough technologies to use it and standards. However, for developing countries, it was technologically difficult, so we began to actively provide technical guidance and share our technology with them, while at the same time developing standards in each country.

Normally, when a Japanese company goes to a developing country, it would provide products, energy-saving education, and services to the market. But in this case, it would not be enough, so we worked with the Japanese government, and with the financial support, we lobbied the governments of the partner countries.

We have also consulted with the United Nations to receive financial support and implementation assistance, and we have been working with the institutions and markets of partner countries.

Specifically, we made proposals to the government. We told them that we had to promote the shift to refrigerants with higher environmental performance, and that the solutions we were proposing would not only contribute greatly to environmental protection, but would also be easy to convert.

Then, the government of the partner country said to us that if that were the case, Japanese companies would just win. They said the government has a mission to protect local businesses. We were asked what we are going to do about it.

So, as I mentioned earlier, we have been providing technical support to local industries. There, we have promoted the understanding that conversion is not so difficult. At the same time, in order to maintain a high

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level of safety and performance, the country's national standards will be established in a way that quotes international standards. This should improve the safety.

By promoting these 3 points at the same time, we were able to promote the conversion.

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

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Furthermore, developing countries were very interested in what we were going to do with so many patents of the R32. Therefore, our top management made a very big decision.

This R32 is necessary for the spread of environmental technology, and we should never block its progress by patenting it. So, the top management made a wise decision to release this. As a way to spread the environmental technology using R32 to the world, we have released 93 patents free of charge.

The free release was done in stages. First, in September 2011, we released our patents free of charge to emerging countries. As I mentioned earlier, emerging countries are facing a major challenge to reduce the use of ozone-depleting refrigerants and to move to low-GWP refrigerants, so we opened our patents to emerging countries to help them.

In 2015, it was released free of charge to developed countries. In response to global warming, the demand for low-GWP refrigerants has been increasing and so has the demand for R32, so we decided to take the plunge, and released R32 free of charge to developed countries.

In addition, since we have been obtaining more and more patents since then, we have released all of them completely free of charge in the form of a patent pledge in July 2019.

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We have not abandoned our patent rights, but we have made an announcement that you are free to use it. This was taken as a measure to help curb 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.



I would like to share a few examples of our initiatives for dissemination.

These are examples in India, Saudi Arabia, Thailand, and Mexico/Brazil. With the cooperation of the Ministry of Economy, Trade and Industry (METI) and JICA, we have been able to reach out to the markets of various countries through dialogue with the government. We provided training, conducted demonstration tests, made policy recommendations, and did various other things to encourage the spread of the technology to other countries.

In India, we have contributed to the dissemination of the R32. In addition, a labeling system has been established in favor of inverters.

The same is true in Saudi Arabia. Although it is a very difficult market, the understanding of the R32 has spread. We also established a labeling system that is advantageous for inverters.

In Thailand, the use of R32 air conditioners is almost 100%, and R32 air conditioners are becoming more and more popular in room air conditioners.

In Mexico/Brazil, the spread of the R32 has started through JICA projects. And in Brazil, a labeling system for inverters has been established.

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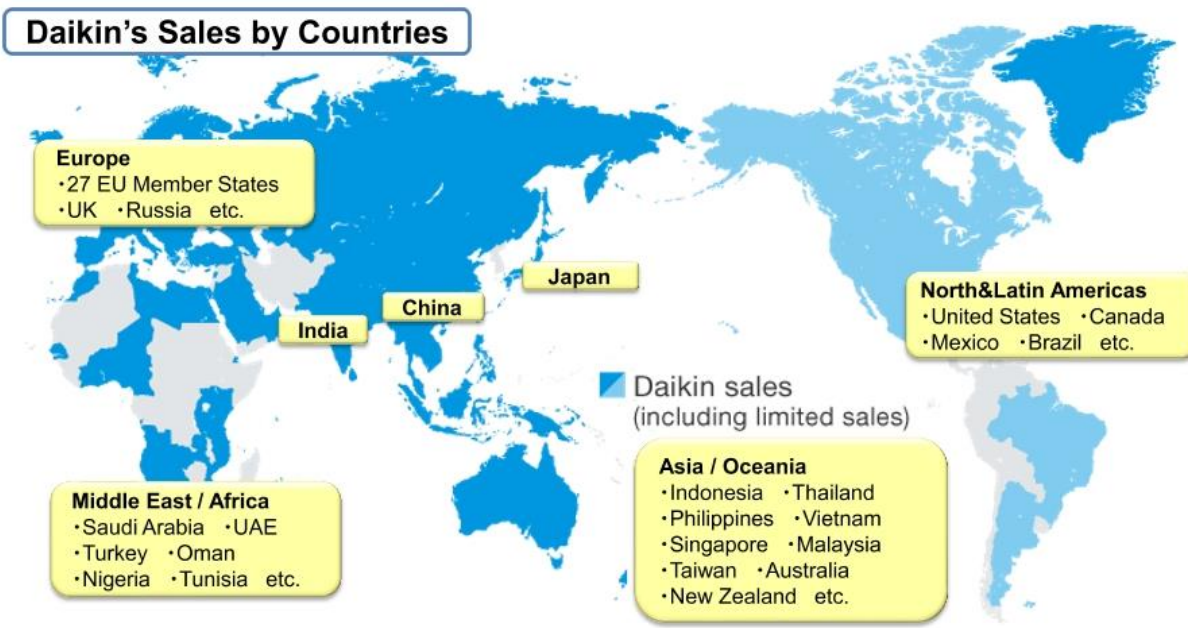
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In the ASEAN countries, we are working together with the Japan Refrigeration and Air Conditioning Industry Association to disseminate standards for evaluating energy-saving performance, and Daikin is also making a significant contribution to these efforts overall.

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 coversion (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.



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As a result of these comprehensive new systems, Daikin was the first company to launch room air conditioners equipped with R32, and they are now sold in more than 100 countries, including Japan. Since 2012, we alone have sold a cumulative total of 33 million R32-equipped room air conditioners. Including other companies, we estimate that the total number of units is around 160 million. As a result, the amount of CO₂ emissions reduction is estimated to be 260 million tons, though this is a rough calculation. We would like to contribute even more in the future, and since we are halfway through our journey, we would like to continue to promote these activities. Thank you for your continued support. Thank you very much.

Sakamoto: Thank you.

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Question & Answer

Sakamoto [M]: We will now take the time for your questions.

If you have any questions, please let us know using the raise your hand button at the bottom and center of the Zoom screen. We would appreciate it if you could provide us with your company name and your name before asking your question. Mr. Sano, please.

Sano [Q]: Thank you very much for your explanation. I would like to ask you just 1 question, Ms. Yamanaka.

You have more than 50 years of experience in operations in Europe, and in China, you have an experience of rulemaking in cooperation with Gree. In North America, in light of the low rate of conversion to inverter, it is a little difficult to see the human resources and strategy in terms of the intelligence that is a condition for rulemaking. Can you tell us a little more about the current situation in North America, including the rate of conversion to inverter, and your strategic perspective, including Fusion 25? Thank you.

Yamanaka [A]: In North America, as you mentioned, it is difficult to see the intelligence and strategic aspects, especially in terms of rulemaking. We felt this, too, and created a dedicated lobbying unit in Washington, D.C., around 2015. We have strengthened our human resources and started our efforts from there, although it is engaged in not only lobbying but also public relations activities.

Then, President Trump took office, and this caused a major setback in environmental policy. The US Department of the Environment's workforce was cut in half, and research that was being conducted for environmental policy was halted. This made rulemaking activities somewhat difficult at that time.

However, since the Biden administration took over, we have strengthened our activities. Now, as a policy of the Biden administration, the government has declared to achieve carbon neutrality by 2050. In response, heat pumps and electric vehicles were launched as 2 major measures, and we are now accelerating our activities to promote the use of heat pumps.

When promoting the use of heat pumps, it is absolutely better to use inverters rather than non-inverters, so we are working to promote the use of inverters as well.

However, we did not stop moving forward under the Trump administration. In the United States, there is a very environmentally advanced state, California. We had discussions with the state of California, which has been pushing forward environmental policies like Europe, and we contributed to the establishment of measures to install low-GWP refrigerants and so on.

We are planning to move forward with this project, so please look forward to it. Thank you.

Sano [Q]: Thank you very much. Incidentally, how much do you expect the rate of conversion to inverter in North America to increase from the current 16%? Could you please add something to this?

Yamanaka [A]: In the future, if heat pumps are promoted as a way to decarbonize, the ratio may increase dramatically.

Sano [M]: I understand. Thank you.

Sakamoto [M]: Thank you.

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Now, next, Mr. Hyogo from Mitsubishi UFJ Trust and Banking Corporation, please.

Hyogo [Q]: My name is Hyogo from Mitsubishi UFJ Trust and Banking Corporation.

You explained that the reduction target is based on the BAU ratio until 2030, but how do you see the consistency with net 0 in 2050 at this point? In order to achieve net 0 by 2050, what is expected to happen between 2030 and 2050? I would like to ask you to answer this question first. It could be about changing the world with refrigerants, or you could suggest something within the scope of what you can visualize now.

Fujimoto [A]: It is true that there are still many things that are difficult to foresee for 2050, but in terms of possibilities, as we have already mentioned, we believe that the widespread use of heat pumps will lead to offsets. In Japan, they are talking about taking it to the minus side, so we would like to pursue that possibility as well.

Another possibility is that in the tropics, mainly in developing countries in Asia, India, and Africa, there are places where solar power and air conditioners are compatible or, in other words, work very well together. If we combine such things with energy management, and make full use of an energy management system that manages in total using DX like a smart city. We think that we can expand the amount of reduction contribution and lower the amount of net emissions.

Hyogo [Q]: Thank you very much.

Secondly, I would like to know if there is anything that you have started discussing in response to COP26, such as the need to change the planning in your company, or the need to bring forward your efforts.

In addition, I am aware that there is a lot of effort being made in the area of general agreement and disagreement in the area of rulemaking and consensus building. I would like to ask you to share information on any issues that are currently being considered in this consensus building process.

Sawai [A]: I will answer the second point, COP26.

Internally, we will begin to consider the latter half of the Fusion 25 plan next year. We have just started discussing how we at Daikin view and position our efforts to achieve the 1.5-degree target in response to COP26, and the possibility that we will have to move up the current targets for 2025 and 2030.

As Mr. Fujimoto explained, we have a large amount of Scope 3 emissions, but since we are a manufacturer, we should at least consider reducing emissions to zero at our plants. We are now aware of this issue.

Hyogo [M]: Thank you very much

Sawai [M]: Ms. Yamanaka about rulemaking.

Yamanaka [M]: Do you ask how we build consensus?

Hyogo [Q]: There is a limit to what your company can do alone, and you mentioned that you are working with various manufacturers or involving the government, but I think that even this is not enough. So, I would like to ask you to share your understanding of these issues.

Yamanaka [A]: It is very difficult to build consensus on a global scale, as you pointed out. Of course, there is a limit to what individual companies can do, so 1 of the major points is how to reach an agreement in the entire industrial association. In addition, I believe that the government's support is also very important.

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In addition, we are thinking of collaborating with international organizations such as the IEA, the United Nations, the UNIC, UNDP, and the World Bank. In addition, we need to cooperate with NGOs, and NPOs in Japan, and discuss what is best and what we can do. We have to discuss with them on what they can help us on and what we can help them on, and reach a consensus.

Hyogo [M]: Thank you.

Lastly, I have a request. You explained that without air conditioning, the world would be in trouble. If this is not understood, air conditioners tend to be treated in the same way as plants that use fossil fuels, and people tend to argue that air conditioners are useless because they have a large CO₂ impact. Therefore, I hope you will make an appeal about the necessity of air conditioners. That's all from me. Thank you.

Sawai [M]: Thank you very much. Within the Company as well, we have been discussing the need to further emphasize the absolute importance of air conditioning based on various evidences.

I would like to make a request in reverse. Ms. Yamanaka also mentioned that rulemaking is difficult for Daikin alone. For example, Mr. Fujimoto explained the importance and necessity of refrigerant recovery and reclamation, but the Ministry of the Environment and the Ministry of Economy, Trade and Industry (METI) are not so positive about it. We are trying to discuss this through face-to-face talks.

After listening to today's explanation, and with your understanding, I would like to ask you, if you have an opportunity to talk with government officials, to express your opinion on the importance of these things in the future. Thank you.

Hyogo [M]: Thank you very much. I don't know how much I can contribute, but I would like to work with you all to leave a better society for the next generation by doing such activities. Thank you for your answer. That's all from me.

Sawai [M]: Thank you very much.

Sakamoto [M]: Thank you. Next, Mr. Isayama from Goldman Sachs Japan, please.

Isayama [Q]: I am Isayama from Goldman. Thank you very much for your explanation today. It was very interesting and I learned a lot.

I was particularly interested to hear about the rulemaking process. I would like to know what is the focus of the current rulemaking process on refrigerants in Europe and California. I think there was a time in California when you were in a panic because the GWP was going to be restricted to 400, or 600, below the R32. In the end, you were able to get back on safe ground. As I recall, you said that GWP 400 or less for mixed refrigerants would be okay, but is difficult to recover, or so. I was under the impression that in the US, you were going to have a 2-pronged approach in the end, so I was wondering if your company's rulemaking was successful.

Is the focus of refrigerants not only on GWP, but also on recovery? Or is the focus still on CO₂, and you are not talking so much about GWP? What is the current focus of refrigerant rulemaking in the developed regions of Europe and California? I would like to know if the next refrigerant after R32 will be available after 2030. Thank you.

Yamanaka [A]: Thank you for your question. As I'm sure you are well aware, there are 3 main issues regarding refrigerants in California. 1 is GWP. The GWP is still a point of contention. The reason for this is that if you take something with a high GWP, they say the emissions will increase in the future. In California, CARB, the California Air Resources Board, is concerned that future emissions are going to increase, so they want to reduce the current GWP. There is 1 point.

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The other is the use of recycled refrigerants. By using recycled refrigerants, the demand for the recovery of refrigerants that are currently released into the atmosphere will increase, and this will add value. We would like to promote the recycled refrigerants aiming for the recovery.

The third point is energy conservation and proper power control.

As for GWP, the regulation is 750. It has been decided that the use of refrigerants with a GWP value of 750 or higher will be prohibited. Of course, there are refrigerants with lower GWP. For example, R32 has a GWP of 675, but there is another mixed refrigerant with a GWP of 466. There is also a mixed refrigerant that is non-flammable. That is the GWP733.

If you limit the GWP too much now, you have to do away with all possible refrigerants. Since the best refrigerants are still unknown, too strict a limit could result in a major mistake. Therefore, the decision was made in California to keep the GWP limit at 750 and to keep all options on the table.

As for recycled refrigerants, it was California's original hope that all refrigerants would be recycled. In the US, the recovery of refrigerants has not progressed too far, so it was decided that it would be impossible to say such a thing now, so the first thing to be done was to ask companies to use 10% of the refrigerants contained in equipment sold in California as recycled refrigerants.

They knew that they couldn't manage to use refrigerant recovered and reclaimed in California for 10% of the equipment shipped to California, so they asked us to use recovered and reclaimed refrigerant from anywhere in the US at our company. That 10% of refrigerants sold in California does not necessarily have to be used in California. We have settled on a very reasonable form that requires that recycled refrigerant be used in the US at least.

It was also agreed that energy saving standards would not be set in this ruling, but that energy saving should not be lower than now. So, while California is still somewhat concerned about industry, we held a number of workshops and had serious discussions with many companies and industrial associations to find the best way to come to this conclusion.

Europe, on the other hand, is more radical. They are also thinking about suddenly lowering the GWP and tightening the HFC phase-down schedule. Furthermore, there is a movement to ban HFCs as chemical substances through chemical substance regulations.

However, this would limit the number of refrigerants that can be used for air conditioning, which will be necessary in the future, making it very difficult to use, and it would also cause safety problems. This is where the industry, industrial associations, and the market are now rebelling and discussing.

Isayama [Q]: Ms. Yamanaka, this is very helpful. Thank you.

I would like to add 1 more point. Looking at the previous slide, on page 9, I was wondering what the time frame would be. If we assume that R32 will be used until about 2030, will there be a breakthrough in refrigerants that will contribute to a huge reduction in emissions by 2050? Or, will the R32 continue to be used, and will you change emission by any different way of creating the product?

I thought that there would be a breakthrough in refrigerants, but what kind of thing would cause such a chart? I'm sorry if I'm repeating what Mr. Hyogo said earlier, but I would like to ask you again. Thank you.

Fujimoto [A]: Basically, I believe that energy conservation and renewable energy, plus building energy conservation, are significant.

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If the current trend of COP26 continues, I believe that the global shift to renewable energy will be much greater than expected. By 2050 or so, the conditions for renewable energy and building energy conservation will be in place in many countries. In addition, renewable energy, especially solar power, and air conditioning go hand in hand. It can generate electricity well in hot countries. If we can control and manage energy through DX, we will be able to reduce product emissions.

To put it bluntly, if 100% renewable energy is used, product emissions will be reduced to zero, and we will work towards that as much as possible. Since refrigerants will inevitably remain, we will continue to promote the use of R32 and the recovery and reuse of refrigerants, but we will also look at the next steps in the development of new refrigerants and the creation of a more powerful management system.

Isayama [M]: Sorry, I took much time. Thank you very much. I learned a lot.

Fujimoto [M]: Thank you.

Sakamoto [M]: Thank you. We have other questions, but the time has come to end the session, so we would like to conclude. Thank you for taking time out of your busy schedule to join us today. This concludes the briefing session.

Sawai [M]: Thank you very much.

Fujimoto [M]: Thank you.

Yamanaka [M]: Thank you.

[END]

Document Notes

1. *Speaker speech is classified based on whether it [Q] asks a question to Company, [A] provides an answer from the Company, or [M] neither asks nor answers a question.*
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