Feature

Challenge to Achieve Carbon Neutrality

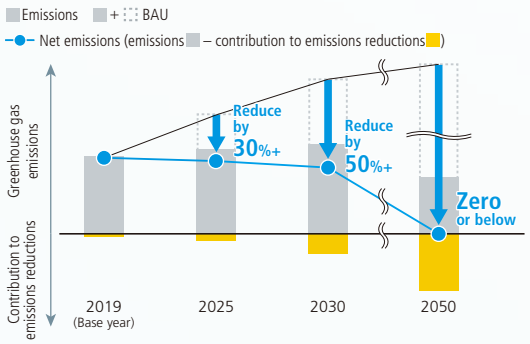
Why is it important?

Carbon Neutrality will Mitigate the Worldwide Impacts of Global Warming Amid the Sustained Growth in Demand for Air Conditioning

Air conditioners have become vital to people's lives around the world, and yet they emit large amounts of CO_2 through energy consumption during use and from the impacts of their refrigerants. As the only manufacturer in the world to produce both air conditioners and refrigerants, Daikin recognizes it has a major social responsibility to the natural environment.

Daikin formulated Environmental Vision 2050 in an effort to achieve net zero greenhouse gas (carbon neutrality) emissions by 2050. Under the Fusion 25 Strategic Management Plan, which targets fiscal 2025, Daikin has positioned "Challenge to achieve carbon neutrality" as one of its growth strategies. The target for this strategy aims to lower net greenhouse gas emissions by 30% or more in 2025 and by 50% or more in 2030 compared to BAU, with 2019 as the base year. Using innovative initiatives reflected in management strategy, we will develop a roadmap to net zero greenhouse gases and aim to balance business growth with contributions to the environment (see pp.11–12).

Targets for Achieving Net Zero Greenhouse Gas Emissions



Daikin's Approach

Reducing Greenhouse Gas Emissions to Net Zero Across the Entire Value Chain

Daikin's plan calls for helping achieve a carbon neutral society including across its entire value chain, spanning from not only product development and production, but also during product use. Demand for air conditioning is expected to continue growing around the world in the future, which requires us to find ways to reduce electricity consumption during the use of air conditioners. In emerging countries, where air conditioners are still spreading and there are no appropriate energy efficiency standards in place, many air conditioners that consume large amounts of electricity during operation are sold, becoming a factor for energy issues. Daikin is working alongside governments, international organizations, industry groups, and research institutes, among others, to create systems and frameworks based on the unique situation and issues of each country.

Daikin's Performance

Helping Mitigate Global Warming Under Strategic Management Plans

Under Fusion 25, we are focusing not only on reduction of CO_2 emissions during manufacturing, but also redoubling efforts for the spread of inverter air conditioners, heat-pump space and water heaters, and reducing the impacts of refrigerants. By the end of 2025, we intend to crystallize measures to achieve net zero greenhouse gas emissions.

Daikin's Approach to Achieving Carbon Neutrality

R&D and production	Sales, usage, end-of-life disposal/recycling		
Reduce greenhouse gas emissions during development and production Challenge to new businesses Develop new technologies	Reduce electricity consumption during use  Promote the spread of inverter products	Convert from combustion heating using fossil fuels  Spread and expand heat-pumps	Reduce impacts of refrigerants  Switch to refrigerants with lower global warming potential and build recovery/reclamation scheme

Reducing Greenhouse Gas Emissions During Development and Production

Minimizing CO_2 Emissions from Our Business Operations

Daikin has established a certification system for environmentally advanced factories based on its own standards in an effort to reduce environmental impacts from manufacturing in a coordinated effort with its production bases around the world. For example, we have established a system for visualizing electricity consumption using the IoT platform of plants. This has resulted in efficient improvements based on the quicker implementation of the cycle involving current situation understanding, data analysis, improvement, and confirmation of effects. As a result, despite the increase in production volume following the growth in demand for air conditioning, in fiscal 2021, we reduced greenhouse gas emissions during development and production by 36% compared to fiscal 2015.

Reducing Electricity Consumption During Usage

Using Energy Efficiency Technologies to Control CO_2 Emissions During Air Conditioning Usage

Air conditioners with inverters consume 50% less electricity than ones without inverters. For this reason, Daikin has for years focused on the spread of inverter air conditioners.

Inverter air conditioners represent an effective way of lowering energy consumption, particularly in emerging countries, where energy problems are becoming more serious as economies grow. Price, however, has posed a challenge to spreading these models in people's homes. Therefore, Daikin decided to partner with a major Chinese air conditioner manufacturer in 2008. Joint product development has enabled lower cost and higher production efficiency production of inverter air conditioners, helping to boost the share of inverter air conditioners sold in the marketplace.

In ASEAN, countries have introduced industry standards (CSPF*1) for evaluating energy efficiency performance following Daikin's grassroots advocacy efforts. We will continue with these activities aimed at the introduction of a harmonized system covering the entire region.

In India, Daikin encouraged the introduction of evaluation standards and labeling system. In 2010, the share of inverter air conditioners in the marketplace was nearly zero, but in fiscal 2020, this share had risen to 55% and it is expected to grow to 80% in 2024.*2

In Brazil, the government revised the country's energy efficiency standards for air conditioners in 2020. Daikin participated in this process by providing specialized information and technical support with the cooperation of the Japan International Cooperation Agency (JICA) and universities, among others. Daikin is contributing to building a foundation for consumers to select energy efficient air conditioners.

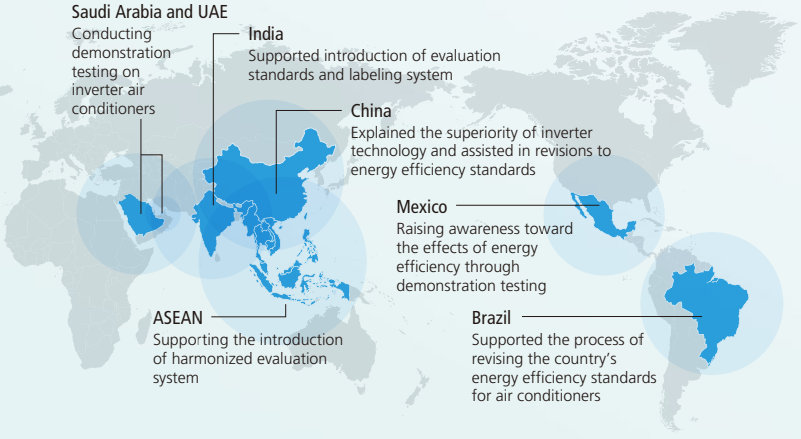
In Saudi Arabia and the UAE, we have conducted demonstration testing on inverter air conditioners. To expand our activities in the Middle East and to Africa, we held discussions with government officials on the need for policy for promoting the spread of energy efficient air conditioners.

Looking ahead, we will continue to propose inverter air conditioners with a focus on regions where market penetration is still low.

*1 CSPF: Cooling Seasonal Performance Factor

*2 Source: *BSRIA World Air Conditioning Overview 2022*

Countries and Regions Where Daikin has Partnered with Others to Spread Energy Efficient Air Conditioners (Since 2010)



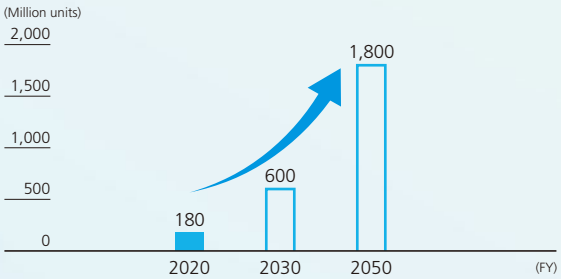
Transitioning Away from Combustion Heating Using Fossil Fuels

Supplying Heat-Pump Heating to Europe and the World

Daikin is working to spread heat-pump heating. Looking at the size of the worldwide space heating market by heat source, heat-pumps account for 0.8 trillion yen*3 compared to 3.3 trillion yen for combustion type heating which burns fossil fuels using gas boilers. This means that inexpensive and quicker to heat combustion type heating remains prevalent worldwide despite its larger CO_2 emissions.

However, in Europe, where heating is widely used, decarbonization is accelerating due to the European Green Deal Policies enacted in 2019. A number of subsidy programs and tax refunds have been announced, leading to the rapid growth of the heat-pump market there. Furthermore, according to the International Energy Agency (IEA),*4 the transition to heat-pumps will be key to social system transformation in terms of not only decarbonization but also securing stable sources of energy, because in recent years the prices of fossil fuels are soaring while supply has been constrained due to instability.

Forecast for the Spread of Heat-Pumps in Buildings based on the Net Zero Scenario for 2050



Source: Prepared by Daikin based on the IEA's *Net Zero by 2050: A Roadmap for the Global Energy Sector.*

Daikin launched *Daikin Altherma*, a heat-pump space and water heater, in Europe in 2006. Since then, we have steadily expanded the product lineup based on the climate and needs of every European country. For example, *Daikin Altherma 3H HT* launched in fiscal 2020 for cold regions can supply hot water without use of electric heaters even in outdoor temperatures as cold as negative 15 degrees Celsius. It is the only product in the industry that can replace combustion heating with heat pump without modifying an existing home. In fiscal 2021, we launched a smaller capacity model.

Sales of *Altherma* have grew 4.5 times since fiscal 2014 thanks to our fine-tuned services including installation and maintenance.

Daikin will continue with its proposal activities in regions around the world that still mainly use combustion heating. As part of this, Daikin is stepping up its efforts in North America where there is growing momentum for a shift in environmental policy.

*3 Calculated by Daikin based on data from BRG for North America, Europe, and China, and from FUJI KEIZAI CO., LTD. (2020) for Japan.

*4 IEA press release: *A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas*

Mitigating the Impacts of Refrigerants

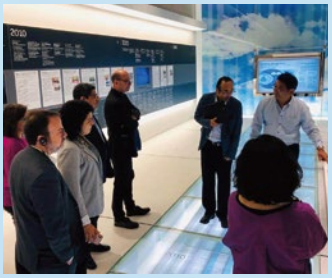
Switching to Lower GWP Refrigerants and Building a Refrigerant Eco-Cycle

The CO_2 emissions from air conditioners are affected by not only electricity consumption but also the fluorocarbons used as refrigerants. Daikin has been working tirelessly to mitigate the impacts of these refrigerants.

One area of these efforts is switching to refrigerants with lower global warming potential. The selection of next-generation refrigerants requires a comprehensive evaluation of environmental impact, safety, and cost-effectiveness as well as finding the right refrigerant for each application based on model

Working with Stakeholders to Promote the Spread of Environmental Technologies

Spreading environmental technologies such as inverters, heat-pumps and refrigerants with a lower global warming potential requires market creation by marketing the actual environmental impact performance and the fostering of correct understanding in society. The establishment of rules for properly evaluating and utilizing these new technologies is vital. However, there is only so much a single company can accomplish in this regard. Daikin has participated in the creation of systems and programs around the world through collaboration and partnerships with governments, international organizations, industry groups, research institutes, and NGOs/NPOs. We will continue working with industry, government, and academia to hold discussions on market creation and rulemaking for a carbon neutral era.



Brazilian government delegation visiting a research center

of air conditioner, water heater, or refrigeration unit. Daikin has identified that R-32, which has approximately one-third the global warming potential of conventional refrigerants, is the right choice for both residential and commercial air conditioners today based on independent evaluations and reviews taking into account international discussions. For this reason, we have been promoting the spread of R-32 around the world.

Transitioning to new refrigerants from conventional ones requires the understanding from the market and technologies. This is why Daikin has performed demonstration testing on R-32 air conditioners and provided technical guidance for the proper handling of R-32 in emerging countries such as India, Thailand, and Malaysia. We have also helped improve the market environment around the world by raising awareness and fostering technicians in the field. Moreover, in 2011, we began offering free access to multiple patents related to the manufacture and sales of air conditioners using R-32, and in July 2021, we added an additional 123 patents to this list. The ability for manufacturers around the world to manufacture R-32 air conditioners will help to curb global warming going forward.

As of June 2021, when including other manufacturers, more than 160 million R-32 air conditioners have been sold and the contribution to CO_2 emissions reductions is estimated to be 260 million tons-CO_2. We will continue working to spread R-32 while also developing new refrigerants with lower global warming potential. In July 2021, we made an equity investment in OCSiAl of Luxembourg to speed up the development of energy efficient refrigerants used in electric vehicles.

Another initiative is the development of an appropriate recovery and reclamation system for used refrigerants. At the time of air conditioner and heat pump disposal, most refrigerants are destroyed to prevent their release into the air. Establishment of a circular economy requires the further utilization of recovered and reclaimed refrigerants. In fiscal 2019, Daikin began selling air conditioners in Europe that use reclaimed refrigerants, with sales exceeding 40,000 units as of March 2022. We are now actively working to establish and utilize a refrigerant reclamation scheme together with Group companies as well as refrigerant recovery providers and construction companies, in order to help build a recovery and reclamation cycle for refrigerants.

Daikin is attempting to develop this system worldwide. For example, in Japan, we established an implementation structure involving both the air conditioning divisions and the chemicals divisions which manage refrigerants. Going forward, we will work alongside governments and other companies to commercialize the recovery and reclamation of refrigerants that have undergone destruction in an effort to boost the recovery rate of refrigerants which remains at low levels.

Cumulative Total of R-32 Air Conditioners Sold by Daikin
(As of December 2021)

Over 35 million air conditioners sold in more than 120 countries worldwide
(Approx. 14 million in Japan and 21 million overseas)

Next Challenge

Growing Company Leading Environmental Initiatives

Focused on the reduction of CO_2 emissions worldwide, Daikin is tackling the challenges of new business and new technology creation from a long-term view while also increasing the contributions from its existing businesses.

One example is our involvement in Singapore's smart city project of 2020. The project is looking to build a district-level centralized cooling system that is optimized to control every neighborhood in the city state. Daikin is also promoting the energy creation business with micro-hydroelectricity, with the goal of making the many untapped hydroelectric resources around the world a baseload power source. Furthermore, we are working on co-creation with Doshisha University to explore CO_2 ambient temperature decomposition, direct recovery, and reuse technologies that directly reduces CO_2.

Controlling the emissions of CO_2 and fluorocarbons deeply correlated with climate change is a mainstay theme of Daikin's core business. Carbon neutrality both poses a risk and represents an opportunity for Daikin. We will contribute to solutions to environmental and energy issues by connecting innovative technologies to markets while we grow as a company.

Expectations of Daikin's Ability to Resolve Climate Change Issues

Yukari Takamura
Professor
The University of Tokyo Institute for Future Initiatives

Daikin's businesses and technologies are garnering attention worldwide as potential solutions to the challenge of carbon neutrality. I expect that Daikin will grow its businesses linked to such solutions to climate change issues. Particularly, I would like to see Daikin play an even larger role in Asia which accounts for a large share of the world's CO_2 emissions.