

# **Briefing on Sustainability**

Daikin and SDGs

Daikin Industries, Ltd.

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## **Speakers**

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## **Content of Past Briefing on Sustainability**

## [First] Daikin CSR Activities

- 1 Efforts to Reduce the Environmental Impact of Air Conditioning (Promotion of inverters and R32)
- ② Providing Value for Human Health and Comfort and Developing Human Resources (Support for the development of engineers, etc.)

## [Second] Daikin from the ESG perspective

- 1 E: Contribution to Mitigation of Global Warming-Environmental Vision 2050
- ② S: Improvement of Human Resource Value-Global Human Resource Development
- ③ G: Our Governance

## **Today's Topics**

## [Third] Daikin and SDGs

"Sustainable Development Goals Daikin is Contributing to through Its Business"

- ① Promotion of Environmentally Conscious Products Utilizing Core Technologies
- 2 Provision of Energy Service Solutions
- ③ Responding to Air Needs

# International Frameworks for Taking on Society's Challenges on a Global Scale

## **Society's Challenges**

with the highest risk

Intensifying climate change

Increase and concentration of demand for electricity and other energy forms

Intensifying atmospheric pollution

Insufficient
human
resources
supporting
sustainable
development

Deforestation and forest degradation

## **International Frameworks**

UN Global Compact



UN
Framework
Convention on
Climate change
(Paris Agreement)

UN
Kigali Amendment
to the Montreal Protocol

## Response to the Global Framework



# Formulization of long-term environmental vision

Support for the Paris Agreement with a target of reducing greenhouse gas emissions to net zero by 2050

# Contribution to UN Sustainable Development Goals (SDGs)



2008 2018 2019 2050

# Participation in the UN Global Compact



# **Announcement of Endorsement of the TCFD Recommendations**

Analyze risks and opportunities that climate change poses to our businesses with the aim of reflecting them in management strategies and further enhancement of information disclosure



# Daikin's Aims for Value Creation and Contributes to Sustainable Development Goals

# Provide new value that makes people and space healthier and more comfortable while at the same time reducing environmental impact.

# Value Creation for the Earth

Reduce environmental impact through all business activities and contribute to alleviating climate change



Sustainable Development Goals (SDGs) targets











# Value Creation for Cities

Contributing to solving energyrelated issues arising from urbanization and contribute to the creation of sustainable cities



Sustainable Development Goals (SDGs) targets











# Value Creation for People

Pursue new possibilities for air and contribute to healthy, comfortable lifestyles



Sustainable Development Goals (SDGs) targets









# (Reference) Sustainable Development Goals Daikin is Contributing to through Its Business



## Ensure healthy lives and promote well-being for all at all ages

Prevention of heatstroke and infectious diseases, measures against air pollution, increase in productivity, etc.



# Ensure access to affordable, reliable, sustainable and modern energy for all

Increase in energy efficiency, use and spread of renewable energy, etc.



#### Contribute to sustainable cities and communities



ZEB (net-zero energy buildings) initiatives, promotion of energy management and demand response, etc.



## Ensure responsible production and consumption

Initiatives for energy efficiency during production, recycling, resource efficiency, etc.

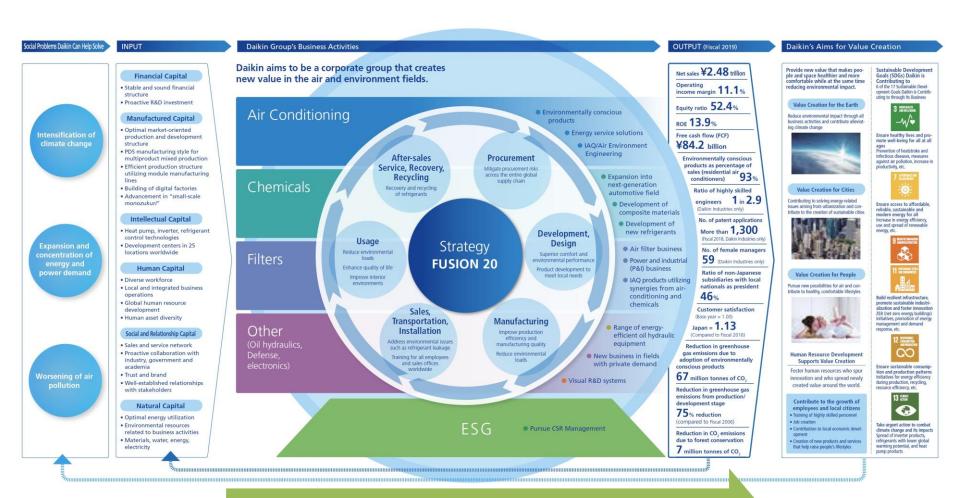


## Take urgent action to combat climate change and its impacts

Spread of inverter products, refrigerants with lower global warming potential, and heat pump products, etc.

#### **Process of Value Creation**

Through efforts to find solutions to social problems through our business, Daikin provides new value, and aims for sustainable growth.



Environmental Vision 2050 (established in 2018)

# Sustainable Development Goals Daikin is Contributing to through Its Business

## 1 Promotion of Environmentally Conscious Products Utilizing Core Technologies













# **Environmentally Conscious Products Utilizing Our Core Technologies**

Long-term vision for "Achievement of reducing greenhouse gas emissions to net zero"

## Reduction of environmental impact during use

# Environmentally conscious products

- Energy-saving products such as <u>Inverters</u>, etc.
- Refrigerants with lower global warming potential such as R32
- Non-fossil-fuel, water and space heaters using <u>heat pumps</u>

#### **Environmental solutions**

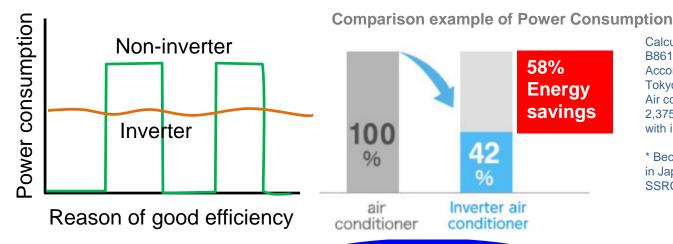
- Energy Management
- Use of renewable energy
- Cooperation with energy-saving buildings (ZEB and ZEH)

# Promotion of Widespread Adoption through Rule Formulation

- Open licensing of patent
- Support for the development of regulatory standards
- Service engineer education and training

# Core Technologies: Energy Savings by Inverter Air Conditioners

## More 50% reduction in power consumption by inverter use



Calculation of Annual Power Consumption in JIS B8616:2015

According to the conditions set forth in [District: Tokyo, Building Use: Stores]

Air conditioner (\*) without inverter 5,702kWh 2,375kWh air conditioner (SSRC140BA) equipped with inverters

\* Because non-inverter air conditioners are not sold in Japan, calculation was made equivalent to the SSRC140BA air conditioner without an inverter

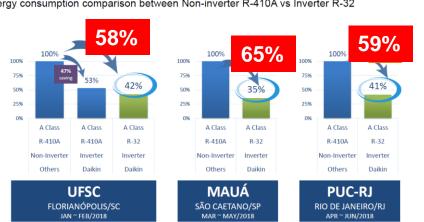
## **Actual survey results** in Brazil

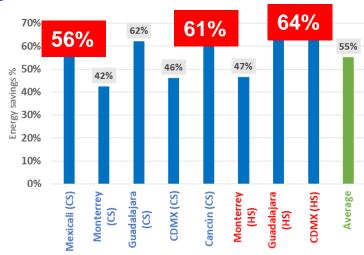
Rate of energy savings by inverters

## **Actual survey results** in Mexico

#### Final results from field tests

Energy consumption comparison between Non-inverter R-410A vs Inverter R-32





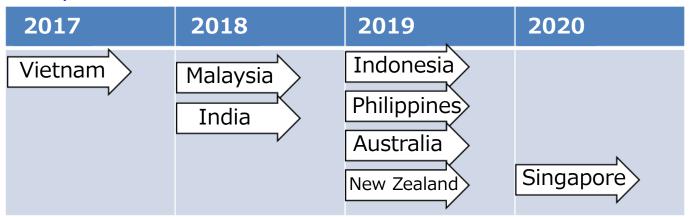
(Source: Report on Promotion of Environmentally Conscious Air Conditioners in Mexico, JICA)

## Status of Energy Conservation Regulations in Each Country

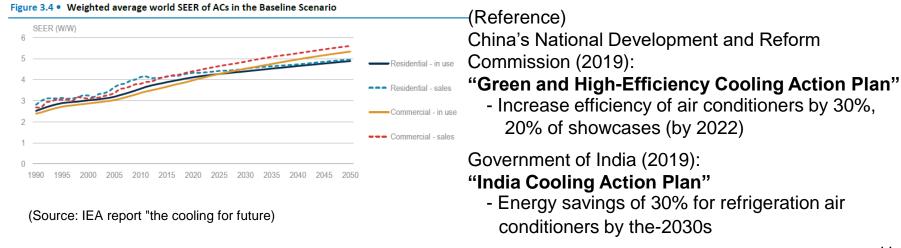
 Energy Conservation: Higher Regulation Values in Energy Conservation Regulations by Inverter Use

Conversion to energy conservation regulations that account for inverters (EER→CSPF/SEER)

Implemented in Japan, China, and Europe



#### Minimum energy performance standard (MEPS) rises at 1.7% per annum (IEAs)

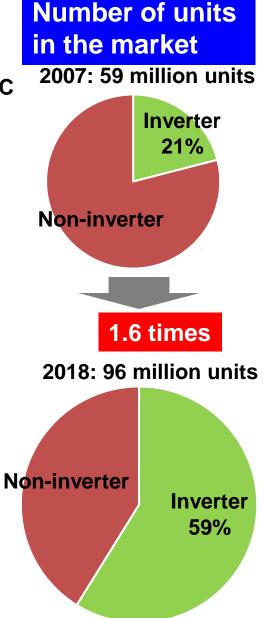


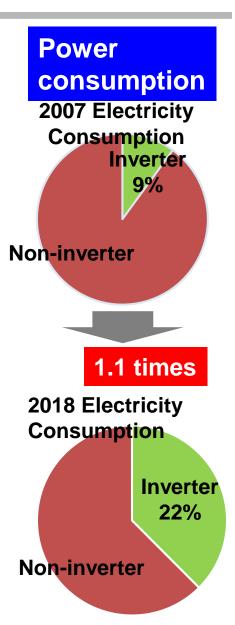
# **Current Market Status: Progress of Inverter Diffusion** and Environmental Contribution

Increasing use of inverters worldwide

Penetration rate of residential inverter AC

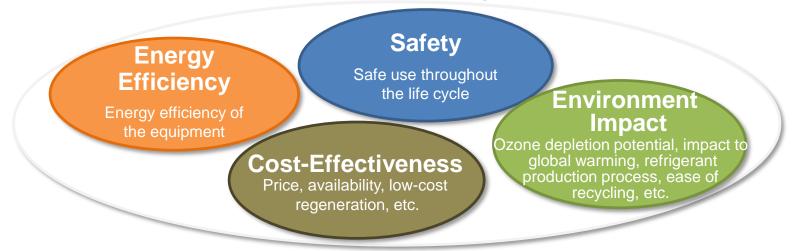
	2007	20	18
Region	INV Ratio	INV Ratio	Number of units (10,000 units)
Japan	100%	100%	965
China	7%	75%	4,215
Europe	25%	79%	617
Asia	12%	39%	1,612
North America	~5%	17%	824
Other	~5%	19%	1,354
Total	21%	59%	9,587



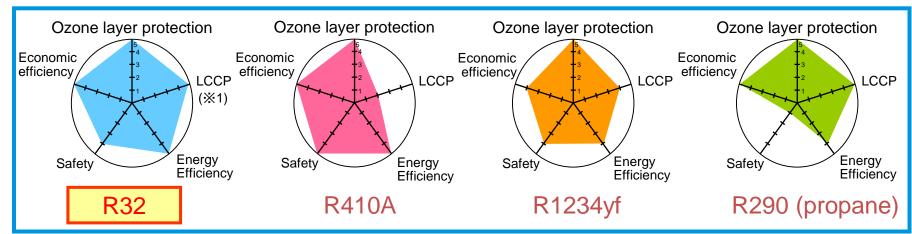


# **Core Technologies: Reasons for Determining Refrigerant with Lower Global Warming Potential R32 as Optimal Refrigerant**

- Refrigerant selection requires comprehensive evaluation
  - · Comprehensive evaluation items for refrigerant selection



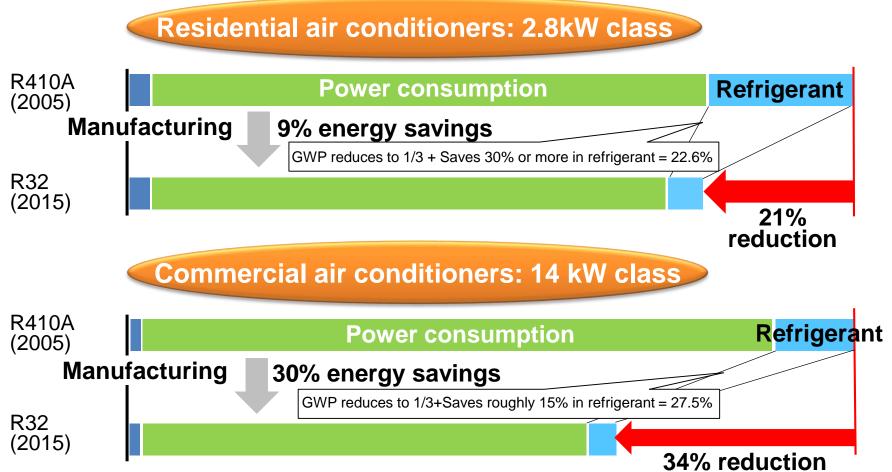
Assessment at time of R32 selection (for direct expansion air conditioner)



(\*1) LCCP.... Impact to global warming throughout the life cycle of air conditioner (impact of air conditioner use + impact of refrigerant emissions)

# Effectiveness of R32 for Reducing Impact to Global Warming during Air Conditioner Life Cycle

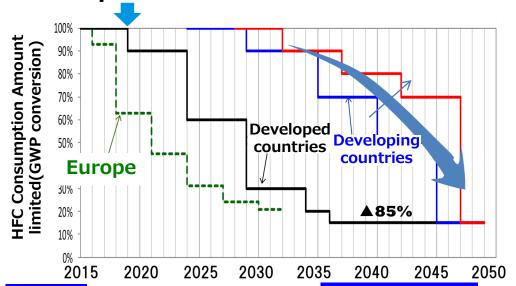
- Daikin reduces CO<sub>2</sub> emissions by 20% to 35%.
- Use of R32 reduces the impact of refrigerant on global warming (to one-third of conventional refrigerants), improves equipment efficiency, and reduces refrigerant volume.



## Status of Refrigerant Regulations in Each Country

Refrigerant: HFC phase down under the Kigali Amendment was started in

developed countries in 2019.



#### Europe

- Refrigerant prices soared with the reduction in supply due to stricter quotas in 2018. Although illegal refrigerant imports are increasing, refrigerant prices are level at high prices. Further reduction in quotas is expected in 2021 and 2024. This has made the need for regeneration apparent.
- The trend toward lower GWP is due to higher prices.
   Small-sized air conditioners are rapidly converting to R32.
   For refrigeration and freezing equipment, CO<sub>2</sub> is used for medium to large sized equipment while small sized products use propane.

#### **Japan**

- It will be difficult to achieve the Kigali Amendment in 2029, the pressure to lower GWP in VRF and refrigeration equipment will increase.
- In order to overcome the 2029 issue, the government is promoting development of "green refrigerant" as a post-R32 refrigerant. From 2030 onwards, it will be difficult to achieve current goals without a new refrigerant.
- Daikin Industries is advocating the achievement of the Kigali Amendment by promoting recovery.

#### **United States**

- GWP regulations are expected to begin in California in 2023.
- In addition to the R32, the mildly flammable refrigerant R454B and the non-flammable refrigerant R466A, which has CF3I as a component, have been proposed.
- Daikin Industries announced that it would choose R32 (September 2019).

# **Developing countries and the United Nations**

- Conversion to R32 is proceeding in residential use. To confront the issues of protecting the ozone layer and R22 abolishment, the number of countries using UN funds to convert to R32 is increasing.
- The Montreal Conference is shifting from discussions on new refrigerants to discussions on improvements in servicing and installation technologies to conserve energy and prevent leakage during use.

# **Current Market Status: Contributing to the Environment by Promoting R32 and Other Refrigerants with Lower Global Warming Potential**

Refrigerant: R32 is becoming more prevalent in various countries.

(Source: Daikin Industries Independent Survey from 2019/1 to 2019/6)

Region	Market	Residential market R32 ratio (%)		
Japan	Japan	100%		
China	China	45%		
Asia	Thailand	90%		
	Vietnam	64%		
Europe	Italy	76%		
	France	30%		
	Turkey	46%		
Other	India	21%		
	Australia	56%		
World total		32-35%		

#### Sales of residential air conditioners using R32

- Global unit sales in 2018
   Approx. 26 million units (JARN)
   Equivalent to 27% share in a single fiscal year
- Worldwide cumulative unit sales
   84 million units (Daikin Survey)
   Equivalent to 140 million tons of CO<sub>2</sub>
- Our cumulative unit sales (over 70 countries)
   21 million units
   Equivalent to 35 million tons of CO<sub>2</sub>

Daikin's policy in fields other than air conditioners

- CO<sub>2</sub>, propane, and R407H are used mainly in Europe for refrigeration.
- Chillers use medium-pressure refrigerant (R1234ze, R513A) and low-pressure refrigerant (R1233zd) according to equipment specifications and regions. R32 is used for small air-cooled scroll-type compressors.

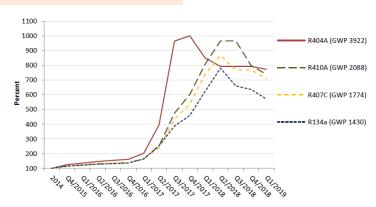
## **Current Market Status: Refrigerant Situation in Europe**

F gas regulations 2006: Preventing leaks and emissions

> 2014: Limitation of consumption (quota system) (EU) No517/2014 **GWP** regulations (750 or less for air conditioners)

Refrigerant prices are soaring and recycled refrigerants are rapidly expanding (2017 data)

#### Refrigerant price

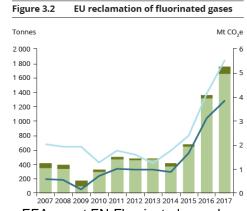


(Source: Okorecherche report 2019/3)

## **Examples of Daikin's** countermeasures

In addition to promoting R32 equipment, sales of multisplit system for commercial using recycled refrigerants.

#### **Amount recycled**



(Source: EEA report EN-Fluorinated greenhouse gases 2018)

#### Overall scheme



[1] Charge 100% recycled refrigerant at factory Start in FY2019

VRV LOOP



[4] Refrigerant recovery at disposal

Start in FY2019

[2] Additional refrigerant charging and test operation service

Launched in FY2018





[3] Maintenance and repair

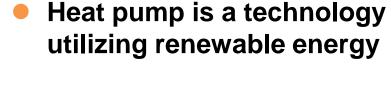
Start in FY2019

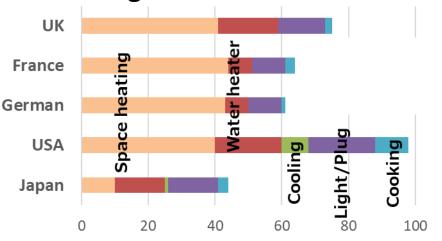


CONFIDENCE

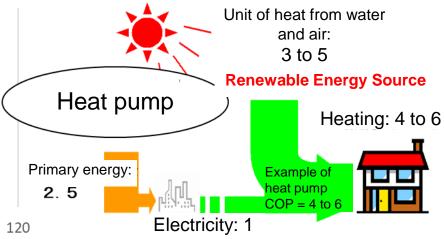
# **Core Technologies of Daikin Industries: Potential of Heat Pump Type Heating and Water Heaters**

For household energy in Europe approximately 80% is used for heating and water heaters





Energy consumption at home [GJ/(home/year)] (Source: Residential Environment Program Laboratory 2013)



EU parliament acknowledged "aerothermal energy" and "hydrothermal energy" as renewable energy sources in addition to geothermal energy. (2008/12/17)

 Amid global decarbonization, electrification, and elimination of fossil fuels, the need for heat pumps will increase further

(Reference)
Annual CO<sub>2</sub> Generation of Heating Equipment in Europe Estimated by Daikin Industries

Oil burning boilers 5,138Kg

Gas boiler 3,189Kg

Heat pump 1,450 Kg

SPF=4
For power consumption
European average

## Regulations Related to Heat Pumps in Each Country

Heat pump: With the trends for decarbonization, electrification, non-fossil fuels, acceleration of the heat pump market is essential.

## **European policy**

#### A Clean Planet for All

The EU Committee announced a long-term vision in November 2018 for elimination of for European greenhouse gases by 2050 and achieving zero net emissions.

#### **Decarbonization Pathways**

European economy

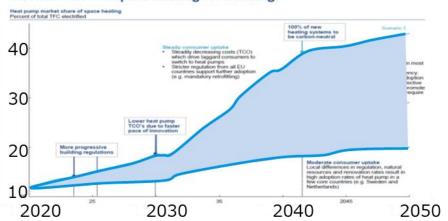
In response to the above vision, Eurelectric announced a proposal for decarbonization.

#### Incentives for heat pumps in each country

- France: 30% reduction in equipment costs
- UK: 0.0742GBP/kWh of electric power consumed
- Italy: tax exemptions, installation cost subsidy, and running cost subsidy

#### **Expansion of the heat pump market**

Changes in heat pump economics are driving adoption of electrification in space heating for buildings



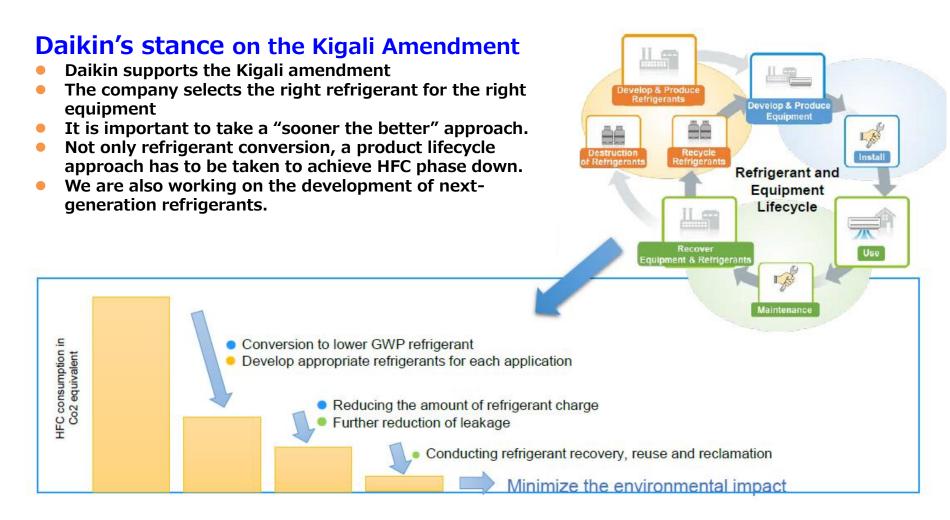
(Source: Decarbonization pathway)

## U.S. California's zero carbon roadmap

Reduce greenhouse gas emissions from the building sector by 100% in 2045 Replace 100% of water heaters and heating systems with high-efficiency heat pumps in 2030.

## Reference: Refrigerant Policies of Daikin Industries

# Daikin Industries' Refrigerant Life Cycle Management and Path to Kigali Amendment



## Reference: Refrigerant Policies of Daikin Industries

In order to promote the conversion of refrigerants worldwide,
 Daikin offers companies worldwide free access to its 93 patents on the manufacture of R32 air conditioners.

## **September 2011 Open Licensing to Emerging Countries**

➤ This was done to accelerate efforts toward phasing out of refrigerants that deplete the ozone layer.

## **September 2015 Open Licensing to Developed Countries**

➤ Even in developed countries, there is an urgent need to convert to low GWP refrigerants that have a lower impact on global warming.

## **July 2019 Worldwide Pledge for R32 Equipment**

- ➤ Daikin declared the release of all R32 air conditioner manufacturing patents filed since 2011.
- To promote conversion to R32 in the United States, Daikin declared that it would adopt R32 in its main products sold in the United States. (2019/9/26)

# ② Provision of Energy Service Solutions







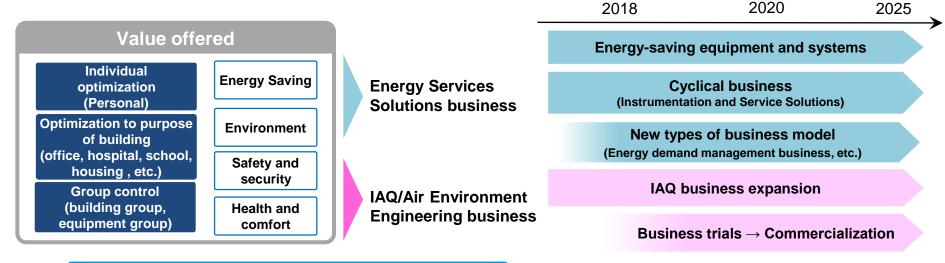






#### **Fusion 20 Latter-Half Plan**

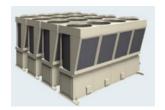
- In addition to sales of energy-saving equipment systems coordinating ventilation and airconditioning, we also provide energy-saving services for the entire building and services for customers throughout the value chain from design to servicing and maintenance.
- We are also taking on the challenge of creating businesses with recurring revenue streams and new business models that lead to equipment replacement.



#### **Development of energy-saving equipment and systems**

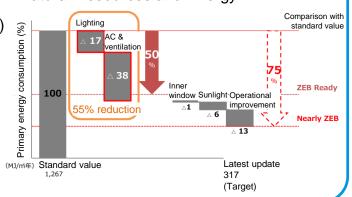
2017 Chairman Prize of Energy Conservation Center, Japan (ECCJ)

2018 Chairman Prize of Energy Conservation Center, Japan (ECCJ)



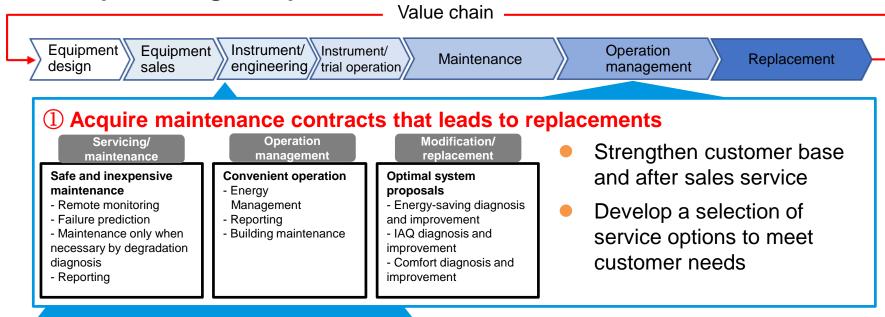


2018 Director General Prize of Agency of Natural Resources and Energy



## **Establish Cyclical Business**

Connecting with customers and equipment, acquiring maintenance contracts that include equipment from other companies, and providing a selection of service options to gain replacement demand.





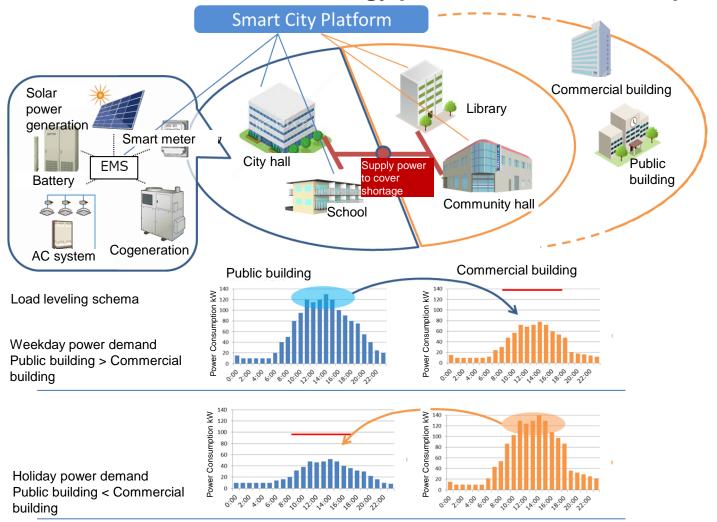
## Case Study for Cyclical Businesses: Air as a Service (Japan)

- Daikin Air Techno Co., Ltd. provides a comprehensive service for the design, installation, management, and maintenance of air conditioning, plumbing, sanitation and other facilities.
- In addition to predictive maintenance services by remote monitoring, the company has also been commissioned to provide management services, such as the periodic inspections required under the Fluorocarbons Emission Reduction Act, periodic filter cleaning, and long-term air conditioning repair plans.



# Case Study for Demand Response 1: Load Leveling of Local Governments (Japan)

- A demonstration was performed for a model that equalizes the overall load by consolidating multiple properties and implementing demand control of air conditioners.
- A contribution was made to local energy production and consumption.



## Case Study for Demand Response 2: NEDO UK (Manchester)

To advance the low-carbonization through electrification of energy for water heaters and heating systems in the residential sector, Daikin is promoting widespread utilization of heat pump technologies. At the same, to mitigate the accompanying increase in power load, we are implementing a demonstration of demand response with energy demand management performed by bulk transaction and operation (aggregation) of electricity demand.

(Source: NEDO Smart Community Case Study)

Sale Mary). Changer	SIX TOWN HOUSING		UC	Index	Target (guidelin
United	BOLTON BURY DOCHDALE  BURY DOCHDALE  BURY DOCHDALE  OLDHAM  WIGAN  TAMESIDE  COUNCIL	Analysis server	1	DR quantity	200k
Oxiden Consideration				Response time	12 mir
W				Duration	30 mir
				DR quantity	(100k
	Northwards Housing North Harcelain Count Home		2	Response time	(12 mir
		=		Duration	(60 mir
	Heat Pump Aggregation System			DR quantity	(200k
~~		Residential Heat Pump	3	Response time	(60 sec
Capacity Shortage  Hitachi  PAIKIN  Aggregate				Duration	(60 mir
				DR quantity	(200k
		4	Response time	10 mi	
			Duration	(60 min	
Request Power	lega-Watt Request  Heat Pomp Aggregator  Small Nega-Watts Widely		5	DR quantity	(200k
Utility or ISO	Widely			Response time	12 mir
Unstable	Planning		6	Duration	(120 m
Execution	Modification			Shift time	(60 min. or
<b>←</b>	Report	<u> </u>	7	Shift quantity	(350 Wh/ho
DR Commi	unication using "OpenADR2.0b"			Cost difference	Negative v
L	Energy Consu as DR e	mption Data vidence			

UC	Index	Target (guideline)	Evalua tion	Remarks		
1	DR quantity	200kW	0	Achieved more than 200 kW DR at 144 homes. Response time was 6 min. or		
	Response time	12 min.	0	less at all the homes and duration of 30 min. or more was achieved.		
	Duration	30 min.	0			
2	DR quantity	(100kW)	Δ	The guidelines of response time and duration were achieved at all the homes.		
	Response time	(12 min.)	0	DR quantity of 100 kW was achieved at 26 homes, but time distribution was		
	Duration	(60 min.)	0	uneven. The control system needs to be improved.		
3	DR quantity	(200kW)	0	DR of over 200 kW was achieved at 144 homes. Duration of 60 min, was		
	Response time	(60 sec.)	Δ	achieved at 92% of the homes, a level fit for practical use. Response time of 60		
	Duration	(60 min.)	0	sec. demanded by DNO was achieved at only 7 homes.		
4	DR quantity	(200kW)	0	DR of over 200 kW was achieved at 144 homes. The actual transaction		
	Response time	10 min.	0	requirement is 3 MW or more, so the target is likely to be achieved if the		
	Duration	(60 min.)	0	number of homes increases.		
5 · 6	DR quantity	(200kW)	0	DR of over 200 kW was achieved at 65 homes. Response time of 12 min. was		
	Response time	12 min.	0	achieved at all the homes. Duration of 120 min. was achieved at only 24% of		
	Duration	(120 min.)	Δ	the homes.		
7	Shift time	(60 min. or more)	0	Reduction of HP operation time and a shift quantity of 350 Wh/house or more		
	Shift quantity	(350 Wh/home)	0	were achieved. Cost difference was negative in all time zones, which means		
	Cost difference	Negative value	0	cost reduction was achieved along with peak shifting.		

## Case Study for Demand Response ③: <del>₹LiSCool</del>





(Lisbon)

- Business feasibility is being verified in cooperation with a virtual power plant (VPP) having a demand management function that automatically controls the upper limit of power consumption of air conditioners according to the amount of energy available from the VPP operator who manages multiple power generation facilities of renewable energy.
- The use of multi-split system for commercial are equipped with cold storage units to ensure comfort for the residents.

#### <Participating Companies and Organizations>

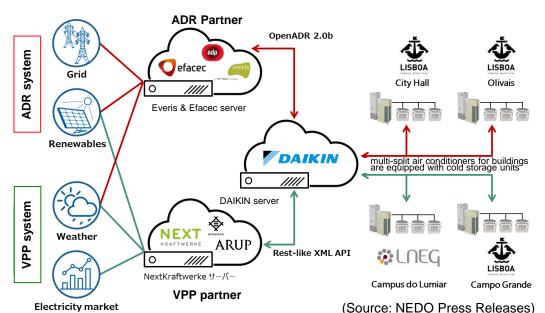




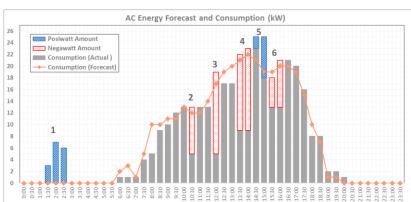




#### <Schematic of demonstration system>









# 3 Responding to Air Needs









#### **Fusion 20 Latter-Half Plan**

# As an IAQ/Air Environment Engineering business, we will work to build a business model while implementing trial themes.

# Respond to problems and needs concerning air quality

Provide new value

#### Ex.) Trial projects

- Integrated service of air quality diagnosis, installation, maintenance, and replacement for food manufacturing plants.
- Develop indexes for sensitivity values such as aroma and "delicious air".
  - Verify the relationship between bio-information and IAQ environment.
- Air environment to improve office productivity, etc.

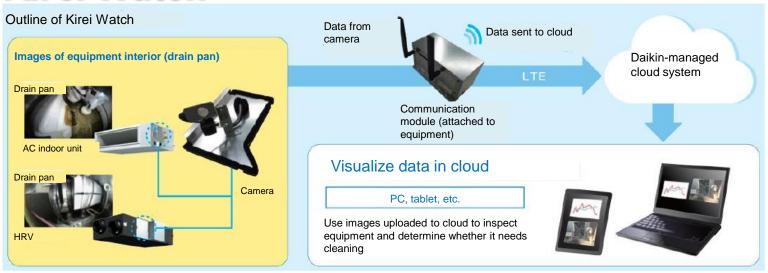
#### <Customer Value to Provide>



## **Business Proposals for Apparent Needs: Kirei Watch**

- Air conditioning drain pan inspections, humidifier inspections, and certain cleaning must be implemented in accordance with the revised Maintenance of Sanitation in Buildings act.
- The drain pans and humidifying element of the ceiling-embedded indoor unit and total heat exchanger are photographed with a camera. This inspection of the air conditioner helps save labor and also contributes to a reduction in risk of water leakage and formulation of a maintenance plan.

## Kirei Watch



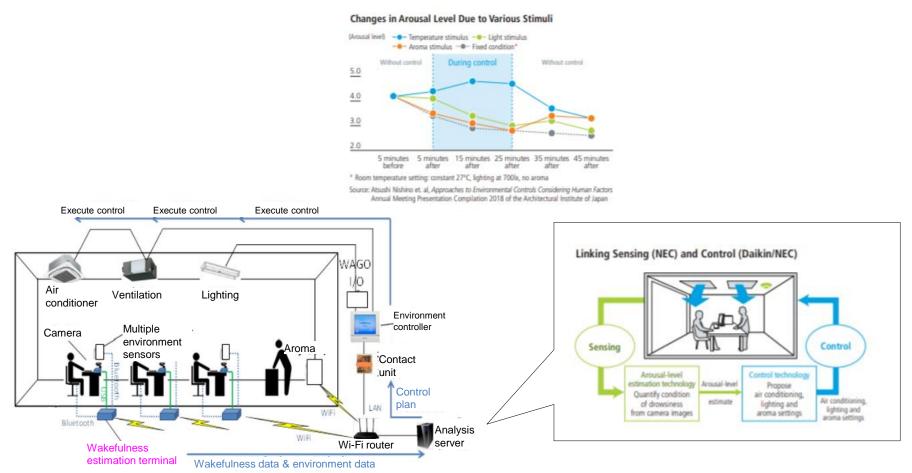




- Visualization and quantification of stains through image analysis
- Utilization in maintenance plans by examining changes over time

# Proposal of New Value: Improvement of Intellectual Productivity and Identifying the Role of Temperature Stimulation

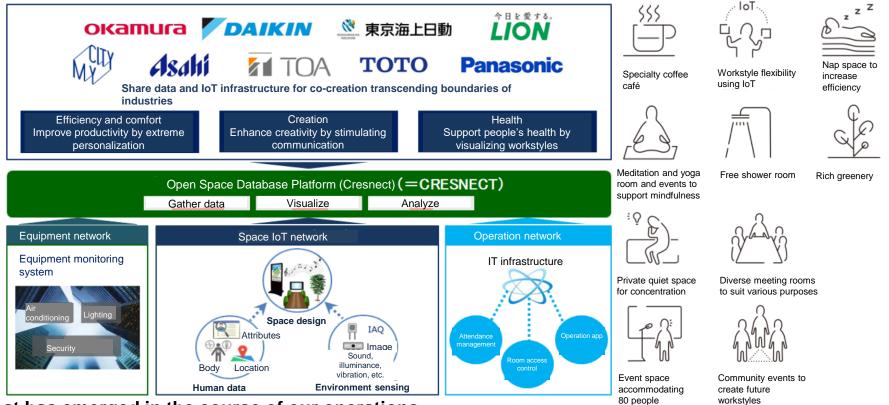
- Joint research with NEC is underway to realize IAQ /air environment that enhances intellectual productivity.
- For improvement of intellectual productivity in work spaces, providing optimum temperature stimulation by an air conditioner is more effective for brain activation than manipulation of normal fragrances and lighting.



# Proposal of New Value: CRESNECT / "point 0 marunouchi" Initiatives

Aiming to create office spaces for the future, Daikin is utilizing CRESNECT, a collaborative creation platform for spatial data, and performing a demonstration in the coworking space of "point 0 marunouchi."

Concept of "Point 0 Marunouchi"



#### What has emerged in the course of our operations

- Many visitors say that the air is delicious. Air quality value is improved to a level where people can perceive the difference.
- Space utilization is greatly improved with changing the layout.
- Provision of alcoholic beverages has a major effect on switching work awareness ON/OFF.
- Need for shower booths and sleeping rooms as private spaces in offices is obvious.
- Sound sources that hamper meetings and concentration have been discovered.

# References

## (Reference) Our Group Philosophy (established in 2002)

- 1. Create New Value by Anticipating the Future Needs of Customers
- 2. Contribute to Society with World-Leading Technologies
- 3. Realize Future Dreams by Maximizing Corporate Value
- 4. Think and Act Globally
- 5. Be a Flexible and Dynamic Group
  - 1) Flexible Group Harmony
  - Build Friendly yet Competitive Relations with Our Business Partners to Achieve Mutual Benefit



- 6. Be a Company that Leads in Applying Environmentally Friendly Practices
- 7. With Our Relationship with Society in Mind, Take Action and Earn Society's Trust
  - 1) Be Open, Fair, and Known to Society
  - 2) Make Contributions that Are Unique to Daikin to Local Communities
- 8. The Pride and Enthusiasm of Each Employee Are the Driving Forces of Our Group
  - 1) The Cumulative Growth of All Group Members Serves as the Foundation for the Group's Development
  - 2) Pride and Loyalty
  - 3) Passion and Perseverance
- Be Recognized Worldwide by Optimally Managing the Organization and its Human Resources, under Our Fast & Flat Management System
  - 1) Participate, Understand, and Act
  - 2) Offer Increased Opportunities to Those who Take on Challenges
  - 3) Demonstrate Our Strength as a Team Composed of Diverse Professionals
- 10. An Atmosphere of Freedom, Boldness, and "Best Practice, Our Way"

## (Reference) Daikin Environmental Vision 2050

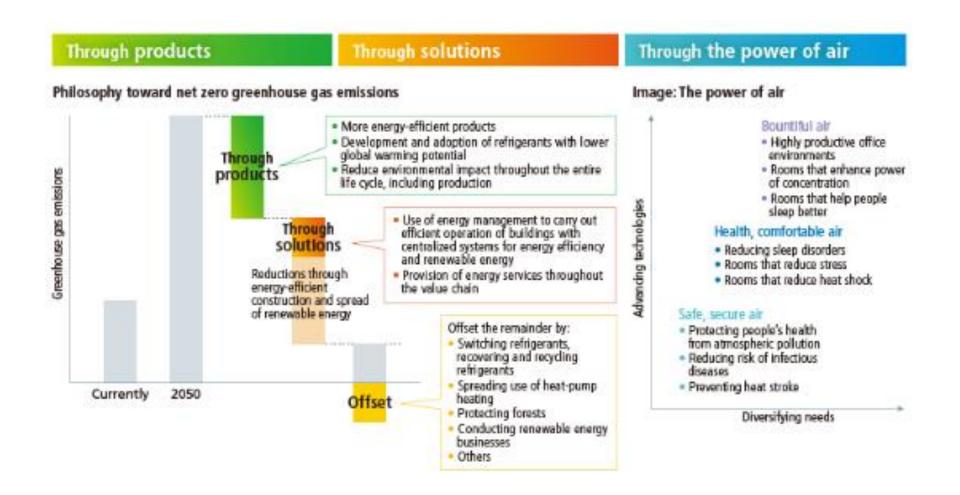


We will reduce the greenhouse gas emissions generated throughout the entire life cycle of our products.

Furthermore, we will create solutions that link society and customers as we work with stakeholders to reduce greenhouse gas emissions to net zero.

Using IoT and AI, and open solutions, we will meet the world's needs for air solutions by providing safe and healthy air environments while at the same time contributing to solving global environmental problems.

# (Reference) Medium- to Long-Term Strategies for Realizing Environmental Vision 2050



Currently, medium- and long-term strategies are being formulated with the goal of 2030.



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