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Social and Environment benefits offered by Energy Efficient Air Conditioners

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Today´s Contents

- **Climate Impact of Air-Conditioners**
  - *GHG emissions can be reduced by transition to **Inverter technology** and adopting **Lower GWP refrigerants***

- **Social and Environmental Benefit by Energy Efficient Air Conditioners**
  - *Building new generation capacity (power plants) can be avoided by Inverter technology*
  - *Consumers can get economical and environmental benefit by **transition to Energy Efficient Air-Conditioners***

- **Challenges and Opportunities for Latin America and Caribbean region**
  - *Energy Efficiency Standard and Labeling (S&L), adopting **Seasonal Matrix** will help reducing drastically **GHG emission** as well as **energy consumption**.*

Who's Daikin

Key words that Express Daikin:

Founded in Osaka, Japan 1924
Over 90 Years of History

Comprehensive AC Manufacturer
handling both AC equipment and refrigerants

More than 100
global production bases for localized production

Operating in more than 150 countries

More than 80,000 employees
80% outside Japan

76% of our sales are from outside Japan

Overall Sales of more than 2 Trillion Yen

People-Centered Management

Daikin's AC Product Lineup

AC solutions are realized for all types of needs including those for energy-savings, the environment, comfort, peace-of-mind, safety, and health.

Residential AC

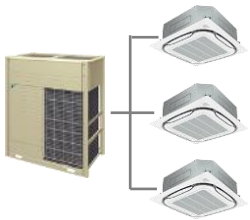
Room Air Conditioners

Housing/Multi-Split Air Conditioners

Unitary Air Conditioners

Control/Maintenance Systems

VRV Systems



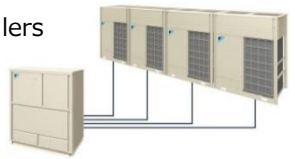
Ventilators

ACs for Facilities and Factories

Applied ACs

Centrifugal Chillers

Chillers



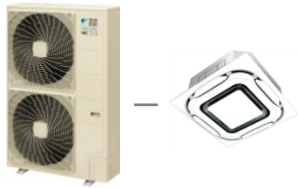
Air Handling Units

Fan Coil Units

Air Purifiers

Heating/ Water Heaters

ACs for Small Shops and Offices



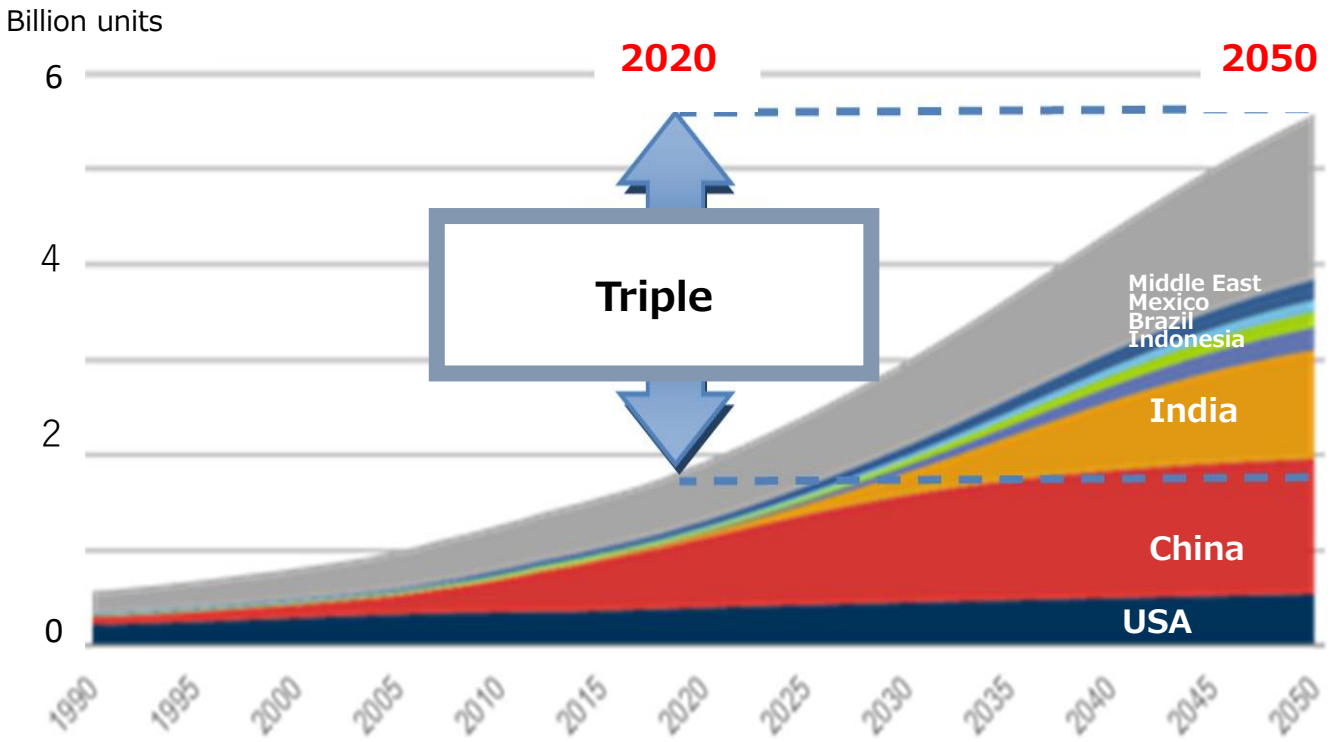
Rooftops

Residential → **Commercial** → **Industrial**

Background

Worldwide AC stocks in the market are increasing

(IEA report “The future of cooling”)



- Energy demand will more than triple between 2020 and 2050. Growth is driven by residential sector.
- Electricity demand, especially at peak, is increasing.

Issues that we have to solve: Electricity demand increment

Increase Air Conditioner demand

↓

Increase electricity demand

↓

Newly-built power plants
With increase CO_2 emission

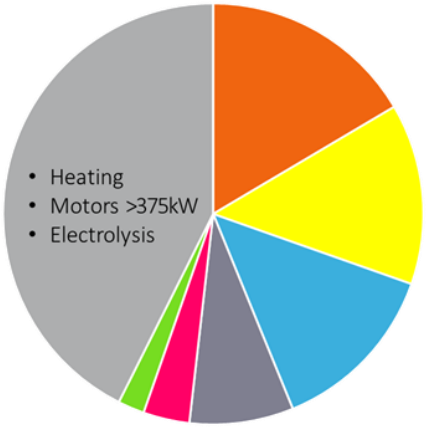
↓

Accelerate global warming

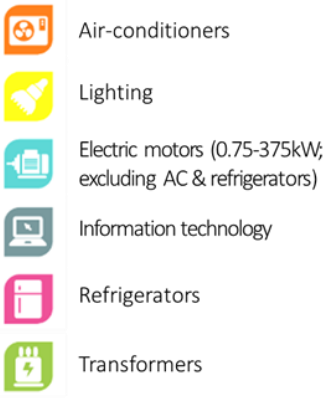
Need to build new generation capacity, with additional public finance burden

What technology can help avoidance of this problem?

Global Electricity Consumption in 2030 – Business as Usual



Total: 31,000 TWh



Σ 56% of global electricity use

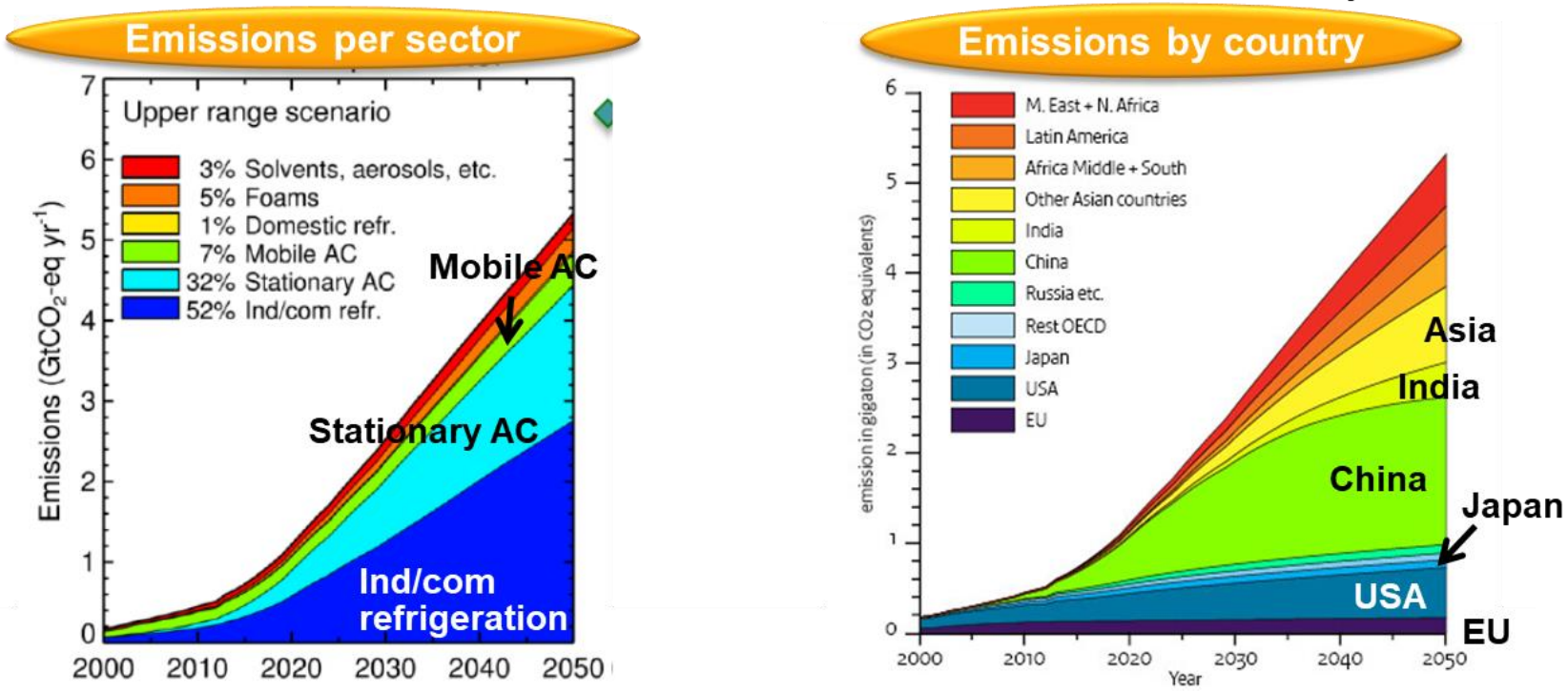
Chart source from:

U4E United for Efficiency

Issues that we have to solve: global warming by refrigerant

HFC emissions will increase and cause large global warming impact

(Velders *et al*)



- China/Asia/India will cause large emissions without control

Dakin Group Environmental Initiatives

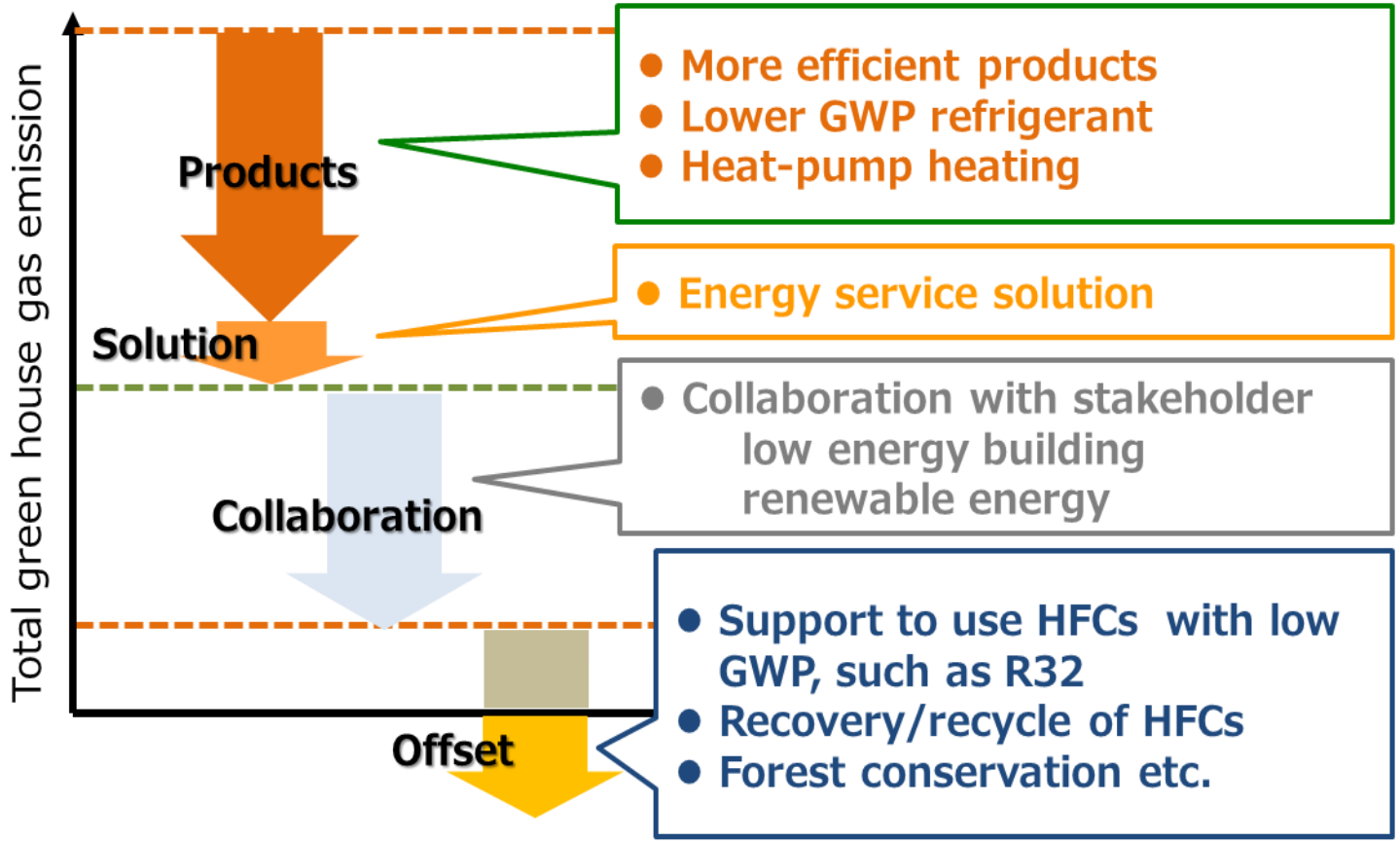
Daikin's policy on Climate Change

"Environmental Vision 2050"

- Provide safe and healthy air satisfying the air-related needs, such as safeguard against heatstroke, better work, better sleep in the world.
- Reduce GHG emissions from our products through the entire life cycle in cooperation with stake-holders by using IoT, AI, and open innovation.

How can Daikin achieve net GHG zero goal?

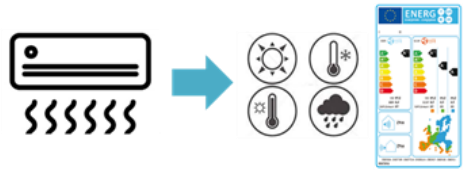
Daikin will achieve net GHG zero through products, solution, collaboration and offset



Underlying Energy Saving Roadmap

2000 — Today — Vision 2050

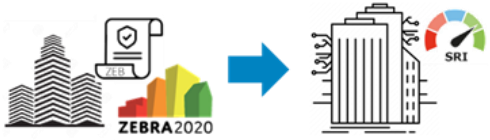
Equipment



- Individual product assessment
- Energy efficiency measured at rated points

Diffusion and Expansion of Inverter
- Reduction of cost

Building



- Consider environmental impact of completes solution, with real operating conditions
- Connectivity and interoperability between building systems

nZEB realization technology
- Systematization
- Using natural energy
- Optimization of design and operation

Community

- Integrated communication platforms
- Asset management to guarantee a seamless and efficient operation

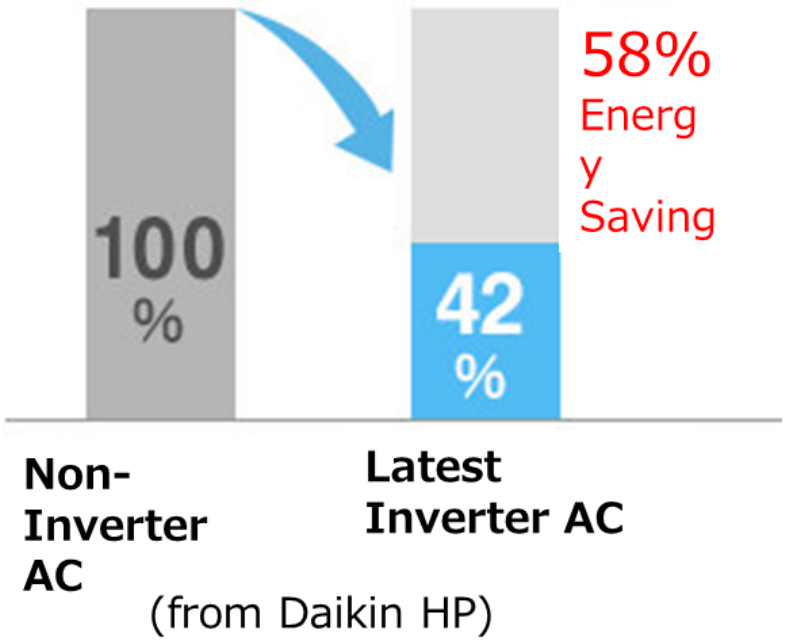
Demand control of electricity in demand site
- Control of AC systems to offer flexibility to grid operators or electricity market players
- Power demand prediction system

Dissemination of Inverter technology

Daikin has been promoting inverter AC since 2007

- About 60% of residential AC sold in 2018 were inverter type
- Latest inverter AC can reduce electricity by about 60%

Power consumption (example)



(from Daikin HP)

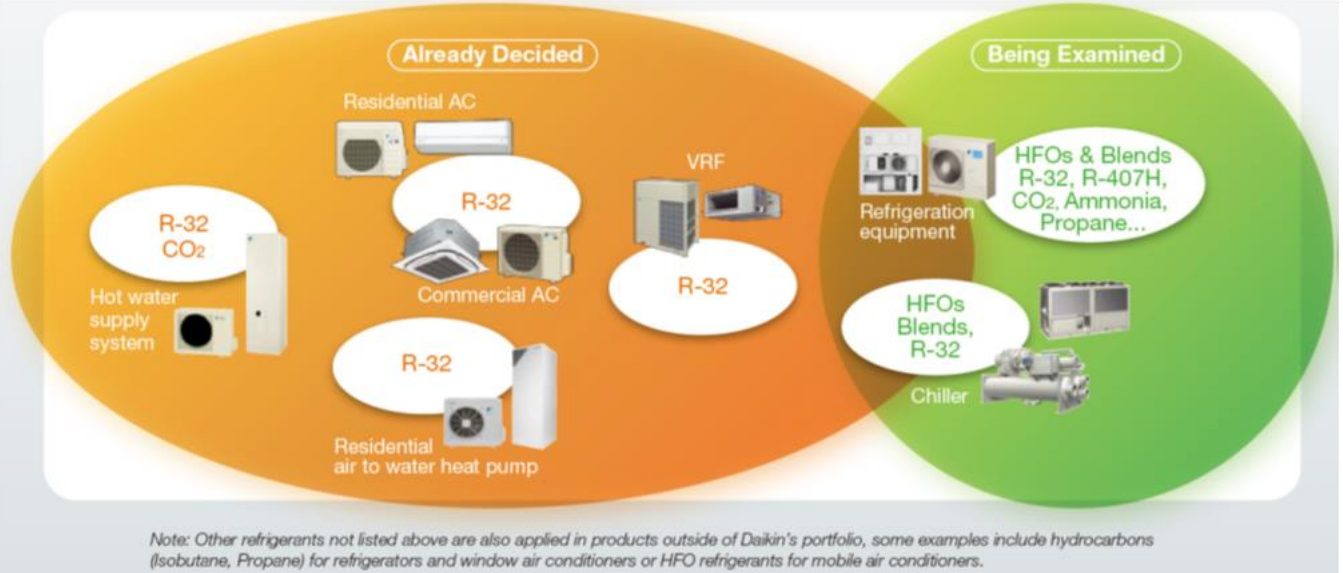
Penetration of inverter type AC
(from JRAIA website)

Region	Inverter type ratio of annual sales (2018)
Japan	100%
China	75%
Europe	79%
Asia	39%

Dissemination of Lower GWP refrigerant solution

Diversity of refrigerant Choice, and Sooner the better for the future Environment

- There is no one-size-fits all solution.
- Need to find appropriate solution for each application
- GWP is not only factor to make a decision. Need to take holistic approach to make the decision.
- Once an appropriate refrigerant is found, Daikin takes at most effort to swiftly introduce it to the market to reduce future environmental damage.



Note: Other refrigerants not listed above are also applied in products outside of Daikin's portfolio, some examples include hydrocarbons (Isobutane, Propane) for refrigerators and window air conditioners or HFO refrigerants for mobile air conditioners.

CLIMATE IMPACT OF AIR-CONDITIONERS

Refrigerants transition to reduce Climate and Environment Impacts

HCFC R22

Ozone **D**epleting **S**ubstance

1980s

HFC R410A

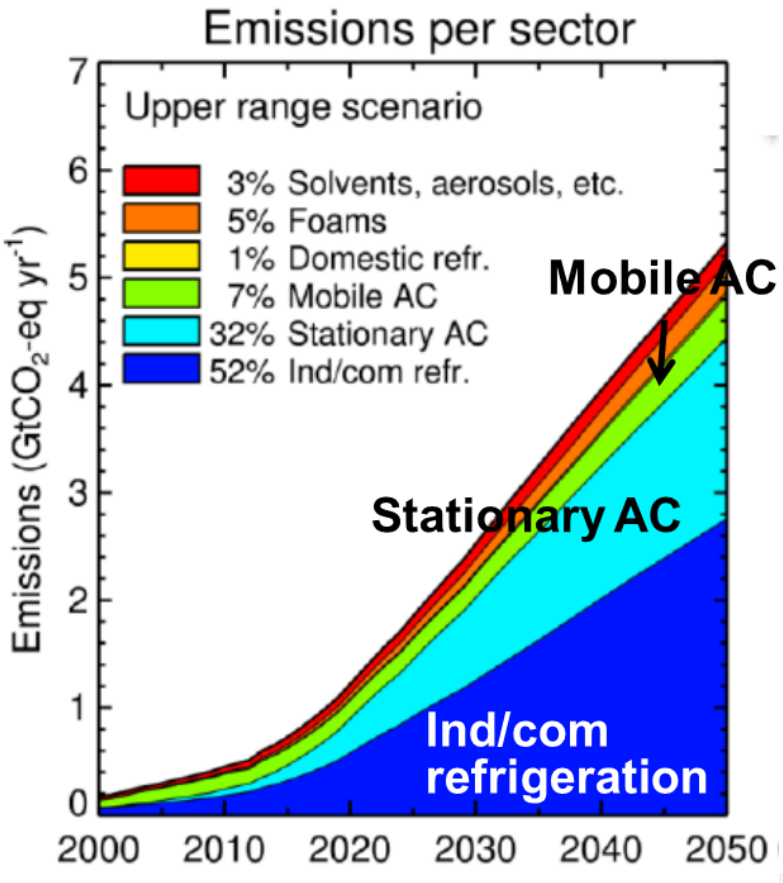
ODS alternative but **High GWP**

2000s

HFC R32

Lower GWP

2010s

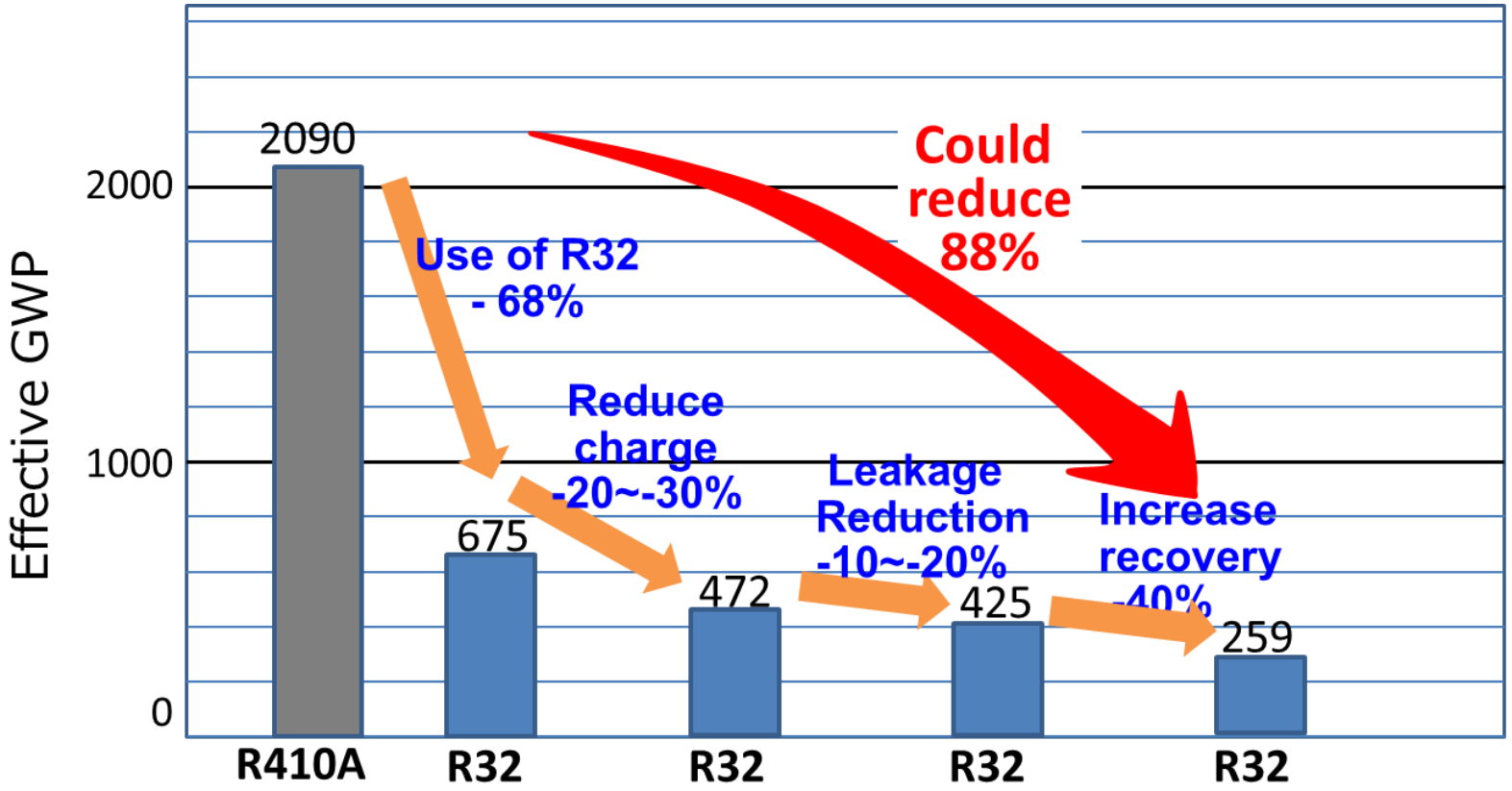


Key elements is… **Sooner, the Better Approach**

As soon as the most balanced and feasible solution for an application is found, Manufactures should commercialize and disseminate the technology.

GHG emission reduction through lower GWP refrigerant

Comprehensive measures can help to be achieved low-GWP target of Kigali Amendment as an international agreement.



Highlight on Latin America and Caribbean region

SOCIAL IMPACT OF AIR-CONDITIONERS

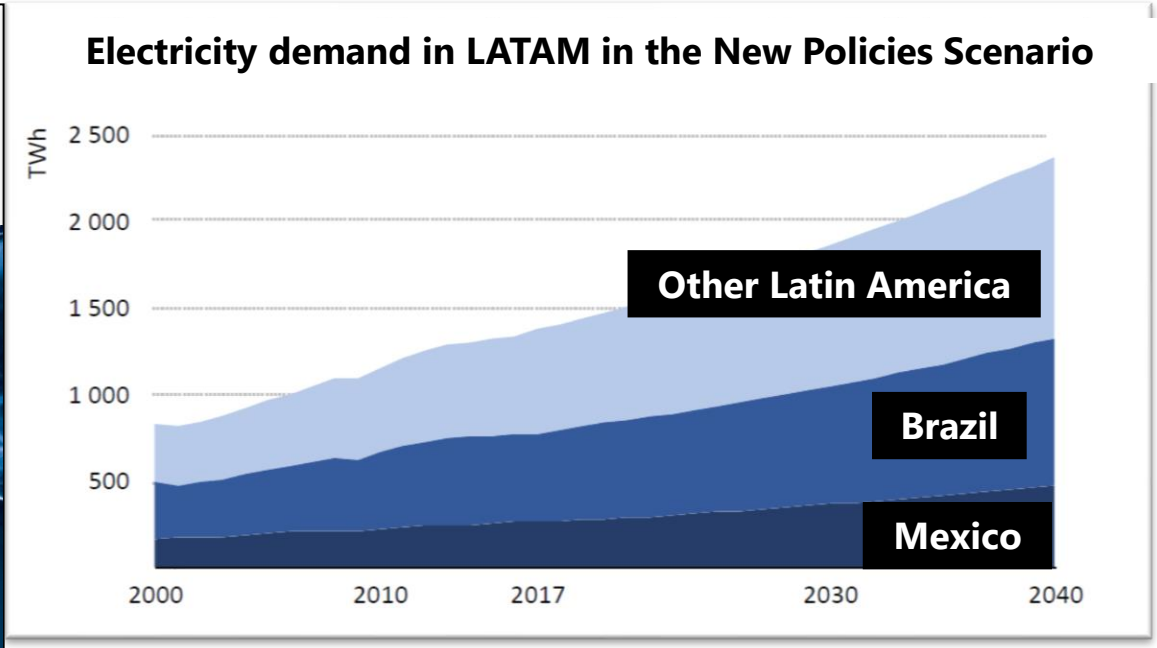
Air conditioning set to be a main driver of global electricity demand, report says

- Worldwide energy demand from air conditioners is set to triple by 2050, according to the IEA's "The Future of Cooling" report
- The impact of using air conditioners and [illegible] accounting for around one-fifth of the ele[illegible]

Anmar Frangoul

Published 7:56 AM ET Tue, 15 May 2018 | Updated 9:26 [illegible]

CNBC



World Energy Outlook 2018; IEA

Key elements are…

ACCESS TO COOLING

Wider access to cooling is necessary, bringing benefits to human development, health, well-being and economic productivity.

ACCESS TO ELECTRICITY

Expand access to cooling will have a significant impact on countries' overall energy demand. It is also critical to expand and maintain a renewable energy.

Standard & Labeling issues in Brazil

Standard & Labeling system must guide consumers to choose efficient products accessibly, however….

End user cannot understand the difference between non-inverter and inverter.

Most of the Splits registered at INMETRO are A Class with Procel. ENCE shows classification (from A to D) and energy consumption.

But the methodology is the same, so, it doesn't show the difference between both technologies.

NON-INV		INVERTER
16,9 kWh/month	VS	16,6 kWh/month

WHICH ONE SAVES MORE ENERGY?

AC demonstration project in Brazil (JICA)

PROJECT SCOPE

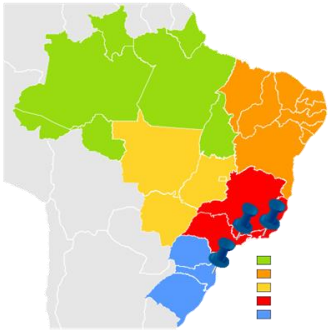
- Analysis of policy impact based on actual measurements of Energy consumption results.
- Study and knowledge transfer of Japanese air conditioners market and Japanese energy efficiency policy
- Building program of refrigerant service training

PROJECT PLAYERS

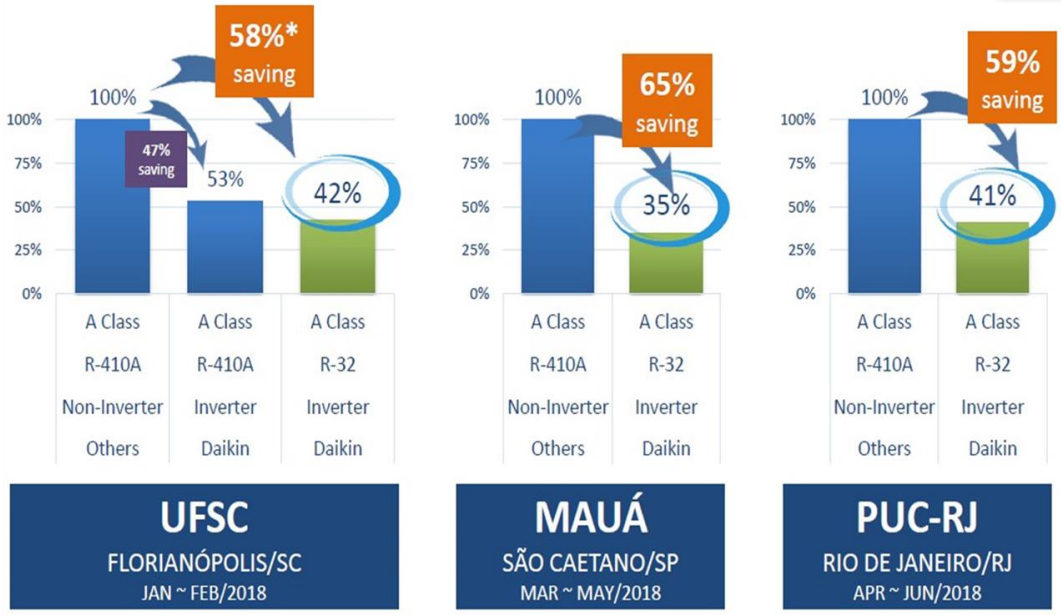
- UFSC: Federal University from Santa Catarina;
- IMT: Mauá Technology Institute;
- PUC-RJ: Pontifícia Catholical University Rio de Janeiro

TARGET

1. São Paulo
2. Florianópolis
3. Rio de Janeiro



PROJECT RESULTS



What JICA Project conduct to deliver the transitions

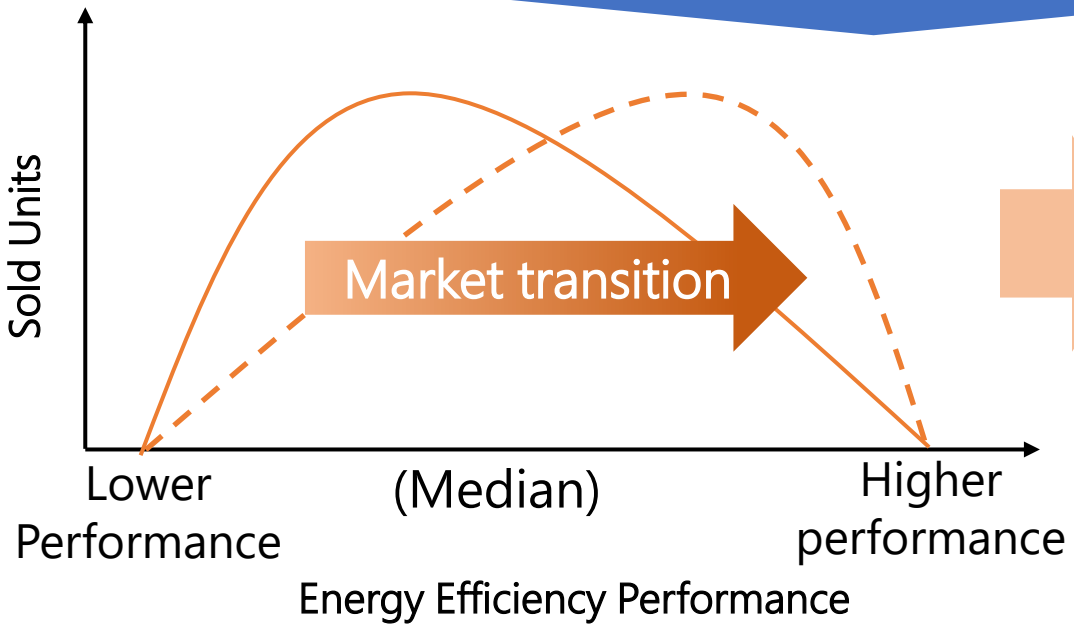
1. **Support to implement Seasonal Efficiency Standard of ISO 16358**
2. **Recommend to set an appropriate table for all types of AC (Inverter AC and Non Inverter AC)**

Merged Table for All types of AC		
Star Rating	*Min CSPF*	*Max C.*
A	*x.xx*	
B	*x.xx*	*x.xx*
C	*x.xx*	*x.xx*
D	*x.xx*	*x.xx*
E	-	*x.xx*

Currently 90% products rated "A"

20% each

Policy Action can Create Social and Economical Benefit



- ✓ ***Reduces the need to build new generation capacity.***
- ✓ ***Lead to a reduction in cooling-related CO2 emissions.***

AC demonstration project in Mexico (JICA)

OBJECTIVE

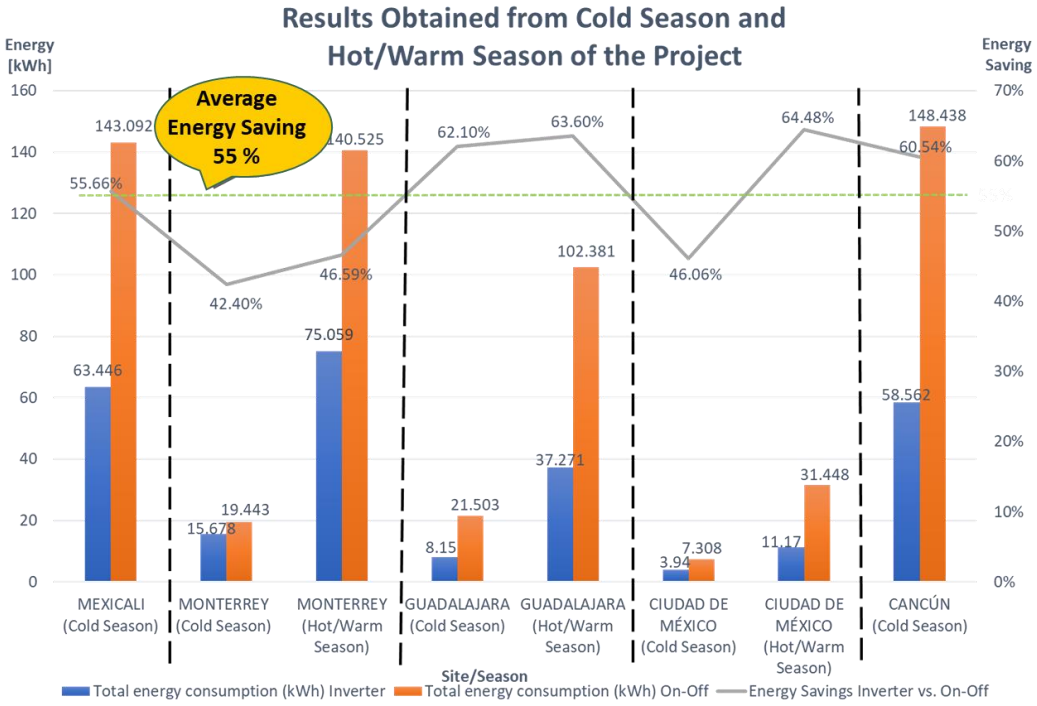
Comparison of electricity consumption between R-32 Inverter and R-410A ON-OFF mini-split AC, climate and economic impacts in five cities: Cancun, CDMX, Guadalajara, Monterrey and Mexicali

1. Energy savings
2. TEWI analysis
3. Economic analysis

PROJECT PLAYERS

1. Mexicali: **SAT** (Tax Administration Service)
2. Monterrey: **SCT** (Secretariat of Communications and Transport)
3. Guadalajara: **INIFAP** (Institute of Forestry and Agricultural)
4. Mexico City: **CENACE** (National Centre of Energy Control)
5. Cancún: **DICONSA** (Provisions to Rural Areas Programme)

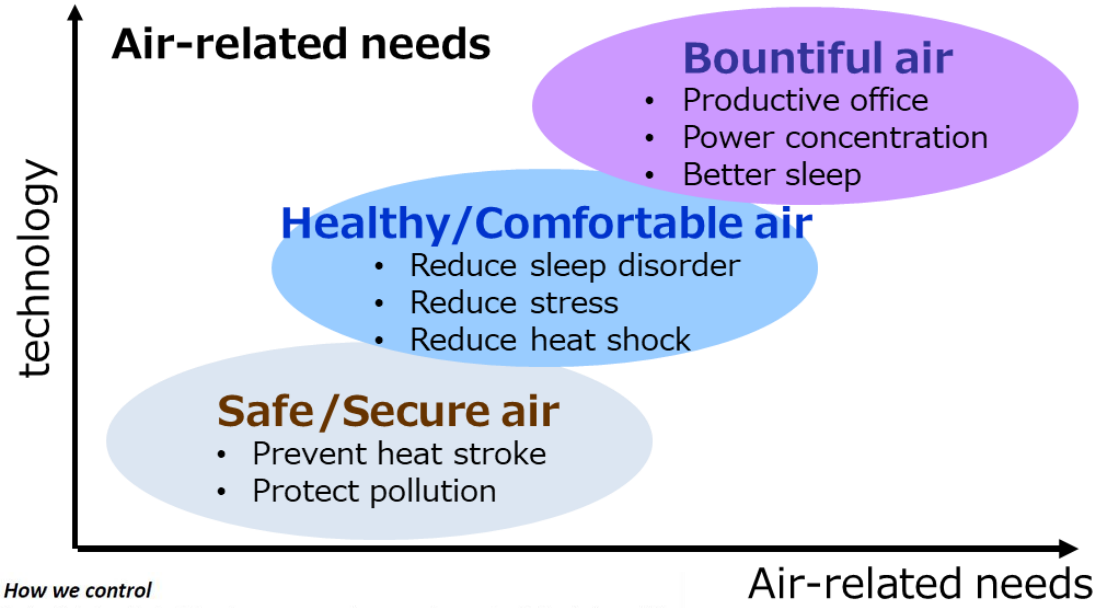
PROJECT RESULTS



IAQ Solution: Safe and Healthy Air vs COVID-19 Pandemic

Will provide safe and healthy air satisfying the air-related needs

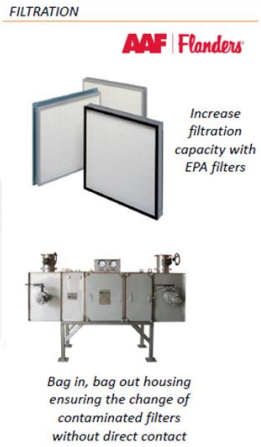
- We spend about 90% of life time indoors
- Daikin can control IAQ and provide sage and healthy air



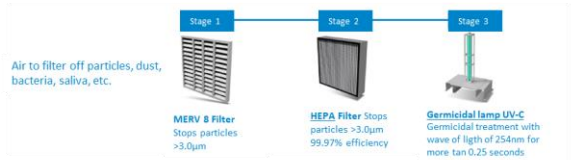
- **IAQ Technology (Humidity/Co2 Control)**
- **Air Analysis**
- **Filtration**

How we control

Product/Solution selection is based on customer needs, current a/c system installed and other variables.



Filter efficiency

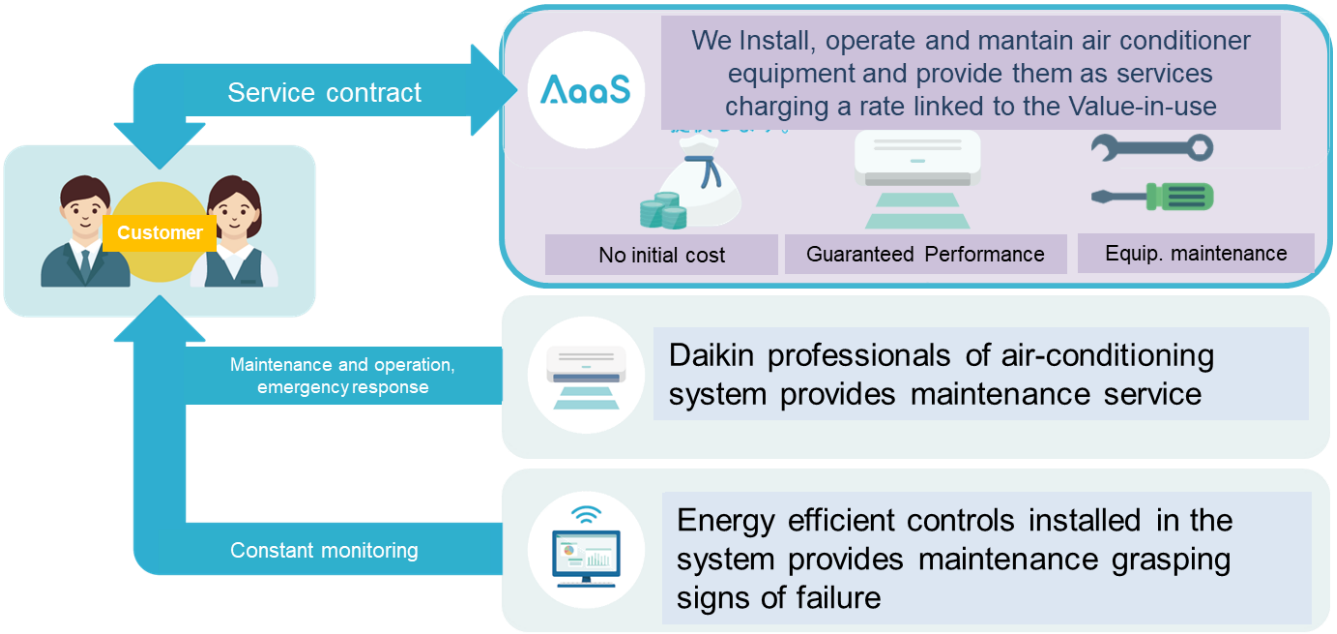


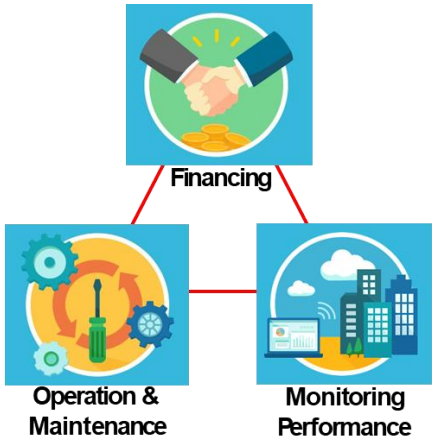
BBVA wework cinépolis

Servitization model: Air as a Service

“Air as a Service/Integrated Air Solutions (IAS)”

- ✓ One stop solution, includes installation, update, operating, maintenance, monitoring (7/24)
- ✓ Daikin owns the assets on behalf of the building owner.





Collaboration for business Development with:

U4E United for Efficiency

KIGALI COOLING EFFICIENCY PROGRAM

BASE Driving investment in sustainable energy

Thank you very much for your kind attention!

¡ Muchas gracias por su amable atención!

Muito obrigado pela sua atenção!

Shu Kawasaki
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