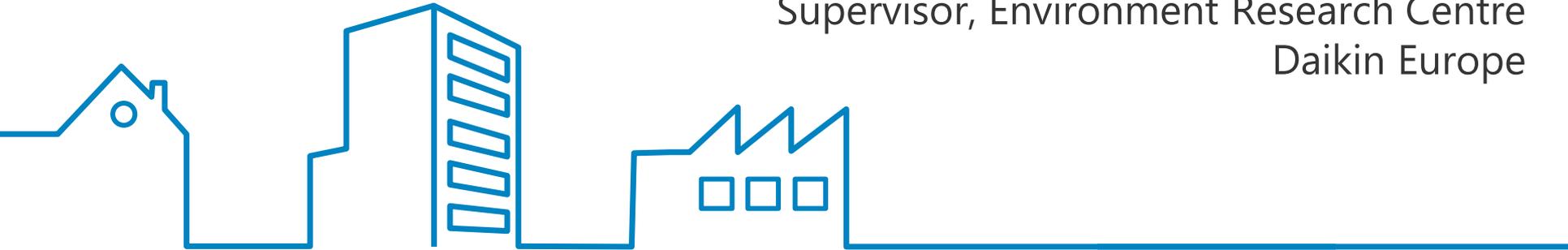


Contribution with heat pump technology in the decarbonisation and energy security for Europe

Saki Nakaoka

Supervisor, Environment Research Centre

Daikin Europe



Self-introduction



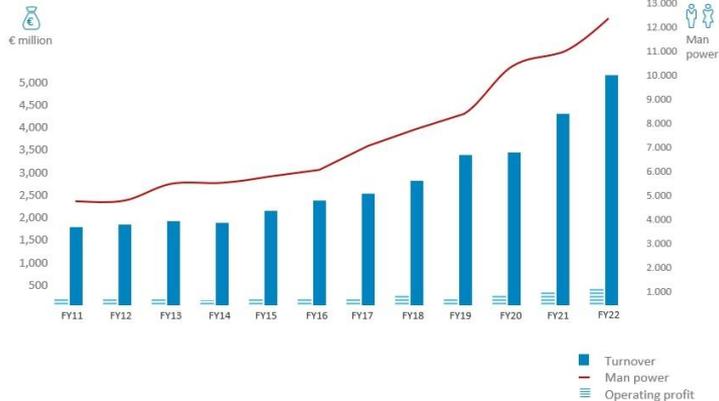
Saki Nakaoka
Supervisor
Environment Research Centre
Daikin Europe N.V.

2016 Daikin Industries, Ltd. (Japan)
2019 Daikin Europe N.V. (HQ in Belgium)

Policy research around environment and climate

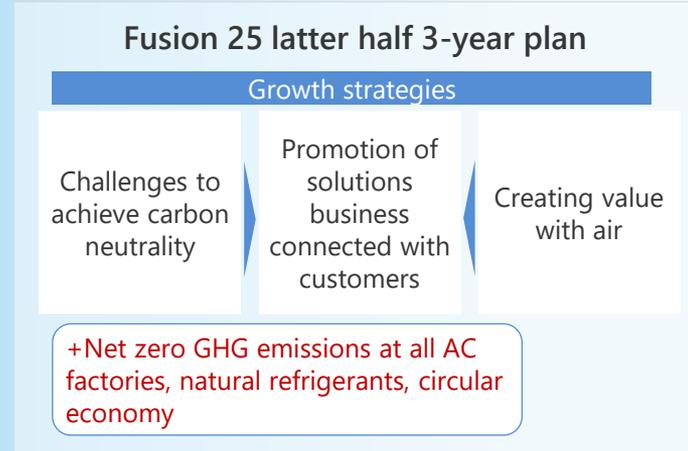
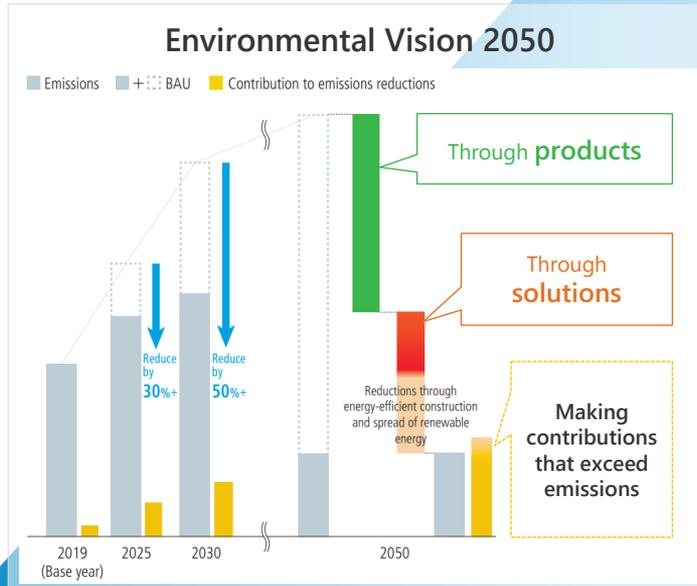
About Daikin Europe

Operation started: 1973
 Head office: Ostend, Belgium
 Chairman: Masatsugu Minaka
 President: Toshitaka Tsubouchi
 Employees: +13,000
 14 major factories across EMEA
 *As of March 2023



Daikin Group's "Environmental Vision 2050" and "Fusion"

The Environmental Vision 2050 is closely linked to the strategic management plan Fusion. In the second half of the three-year FUSION 25 plan, new perspectives were added to key existing themes.



Our Group
Philosophy

Strategic Management Plan Fusion

Environmental Vision 2050

2025

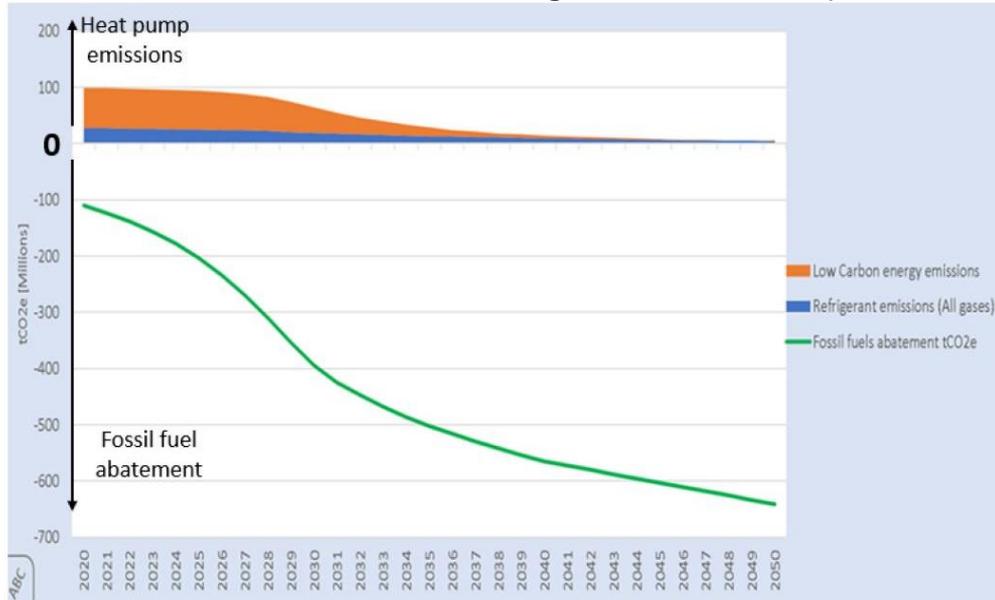
2050

The importance of heat pump technology in the European decarbonisation and energy security and policy measures supporting the development of the heat pump market

Decarbonization potential of heat pumps

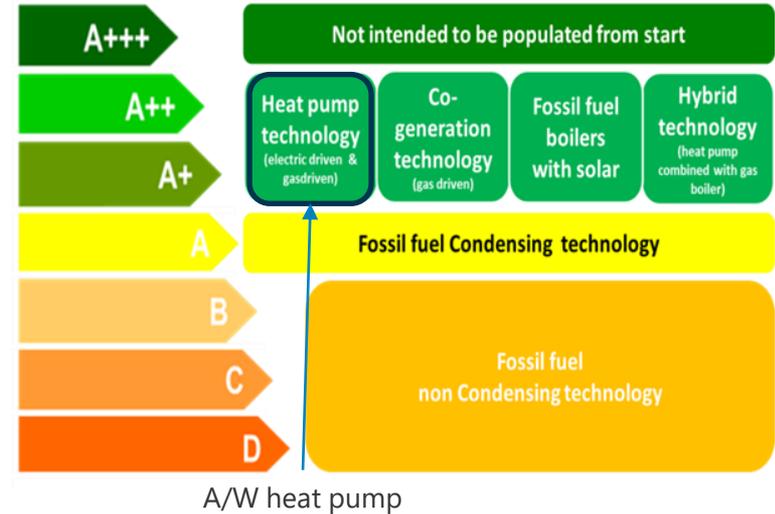
Replacing fossil fuel-based heating system with heat pumps will drastically reduce GHG emissions. The revised Energy labelling has made it possible to compare existing fossil fuel-based heating and new technologies such as Air to Water heat pumps in one label. This has created awareness for consumers and a push to select more energy efficient products.

Avoided GHG Emissions through use of Heat Pumps



Source: EPEE HFC Outlook EU

Energy labelling for space heaters (Lot 1)

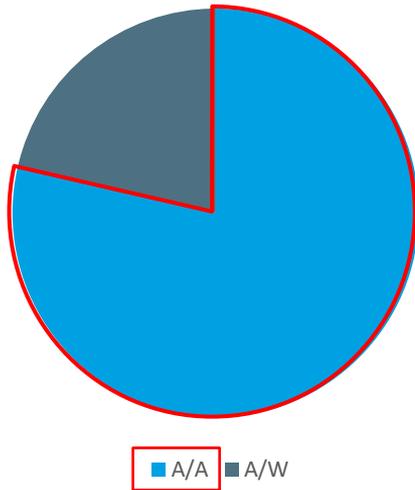


Energy labelling: European Regulation to provide a clear and simple indication of the energy efficiency and other key features of products.

Importance of 'A/A heat pumps'

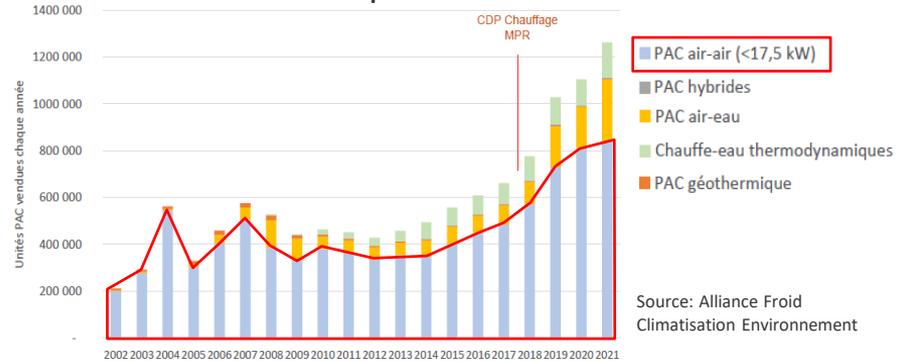
A/A heat pumps have a long history and are favoured for their flexibility and easiness of installation, price, and resistance to freezing in cold climates, making them a large market.

Percentage of A/A heat pump and A/W heat pump units in Europe 2022

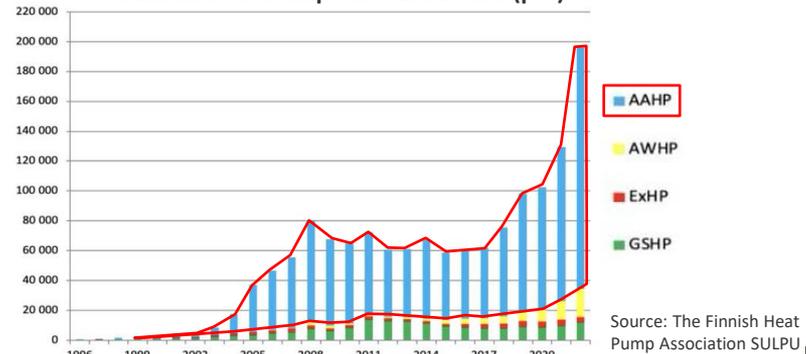


Source: Daikin Europe N.V. based on BRG, BSRIA and other sources.

Annual Heat Pump sales in France

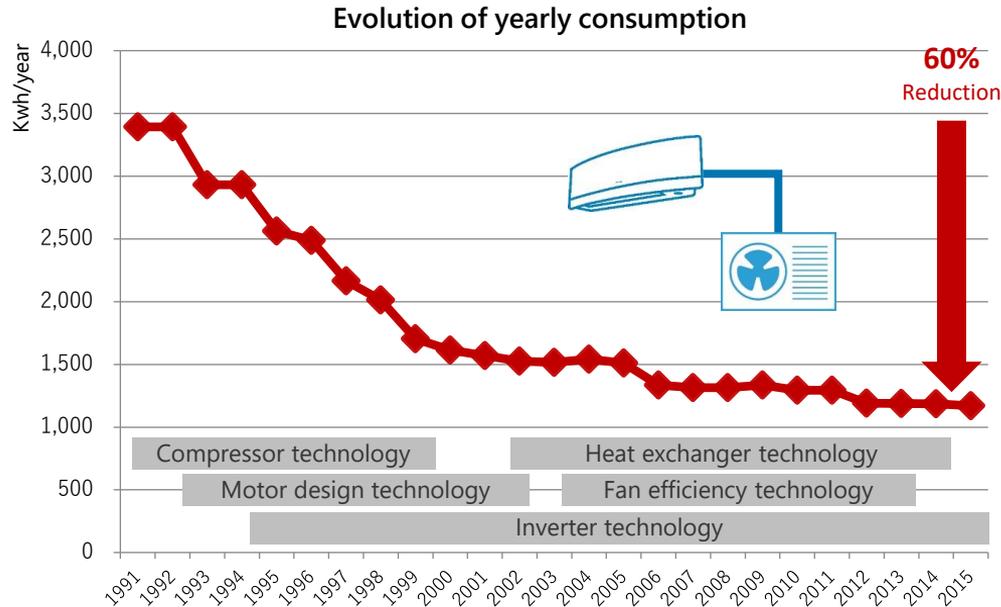


Annual Heat Pump sales in Finland (pcs)

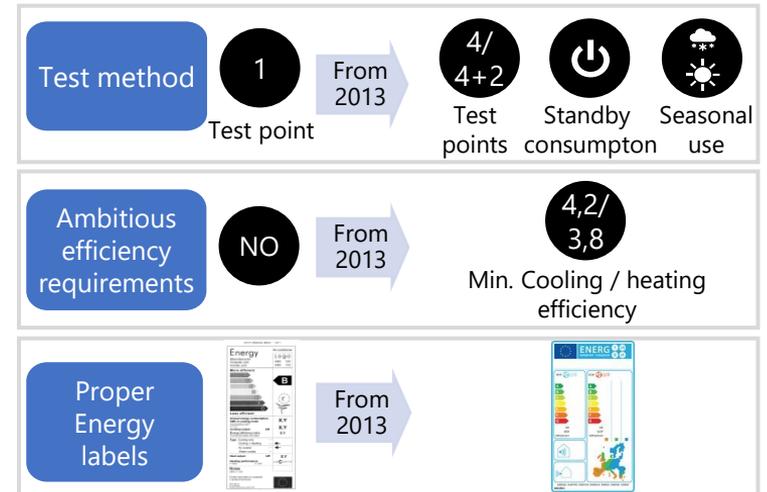


Efforts to increase the efficiency of A/A heat pumps

Daikin and the industry are enhancing the energy efficiency through inverter technology and improved components. Ecodesign has been revised to better reflect technological improvements by introducing seasonal performance rating.



Ecodesign/Energy Labelling Lot 10 (air-conditioners ≤12 kW)

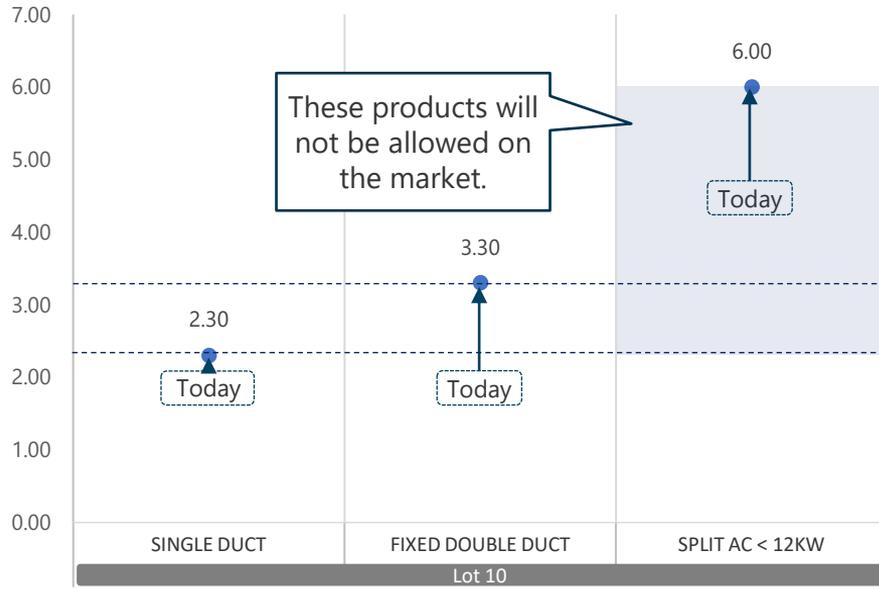


Ecodesign: European Framework Directive which sets common EU wide minimum standards to eliminate the least performing products from the market

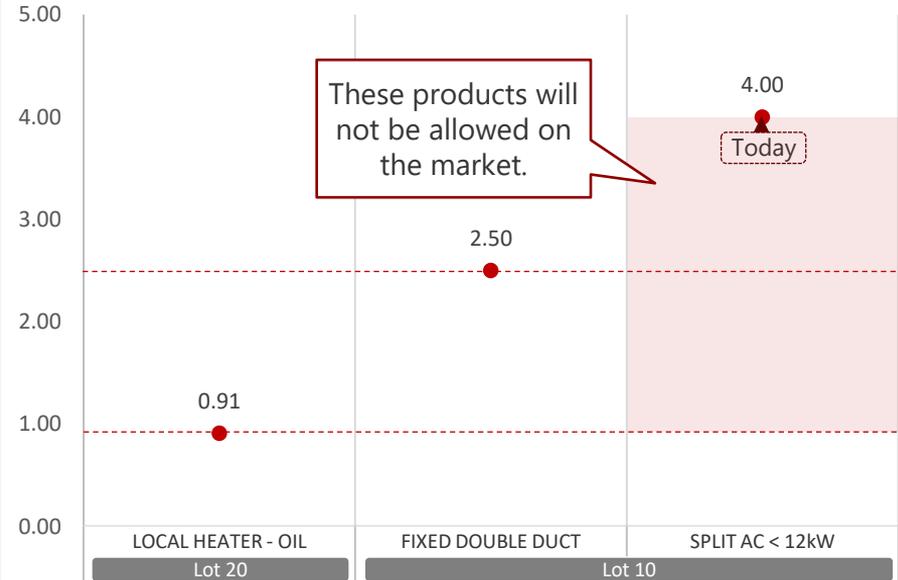
High efficiency of A/A heat pumps - MEPS comparison between systems

Thanks to A/A heat pumps' high efficiency, high values are proposed in the Ecodesign Minimum Energy Performance Standards (MEPS). Future revisions will need to take into account the balance with other systems with the same functions and other relevant regulations.

COOLING REQUIREMENTS ECODESIGN (SEER)



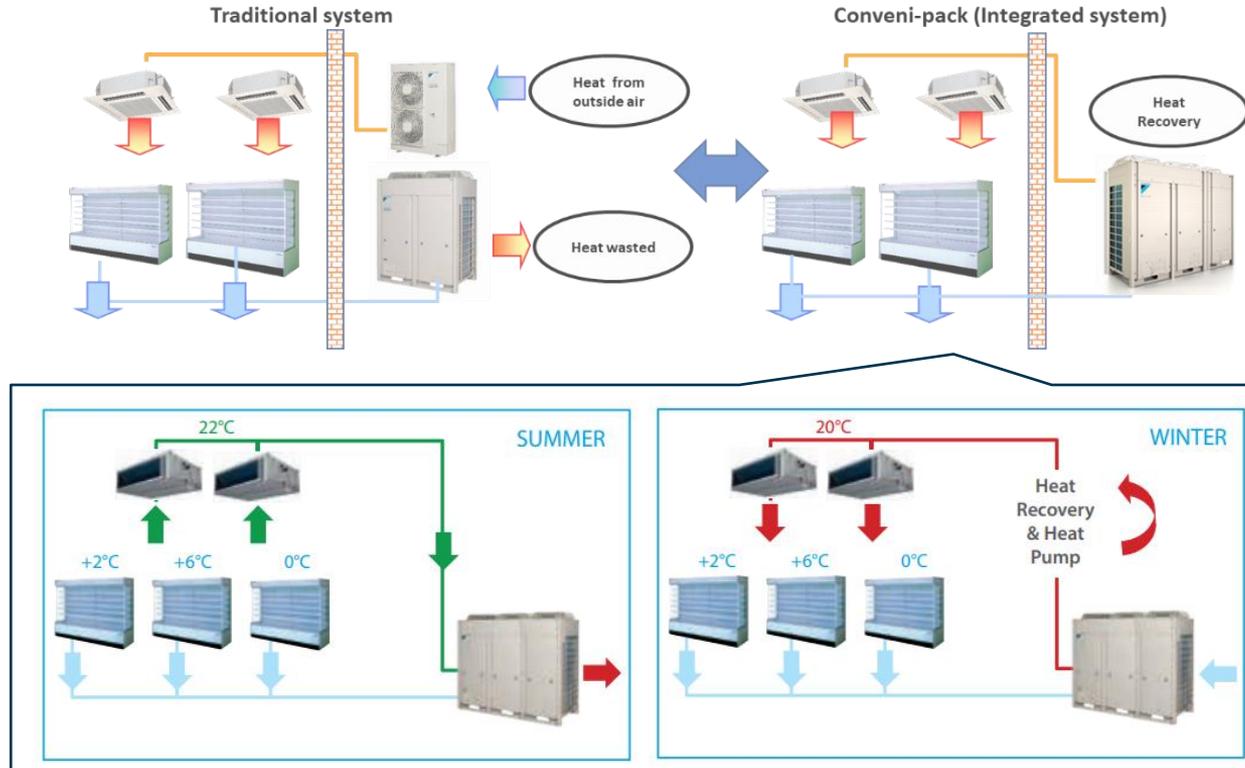
HEATING REQUIREMENTS ECODESIGN (SCOP)



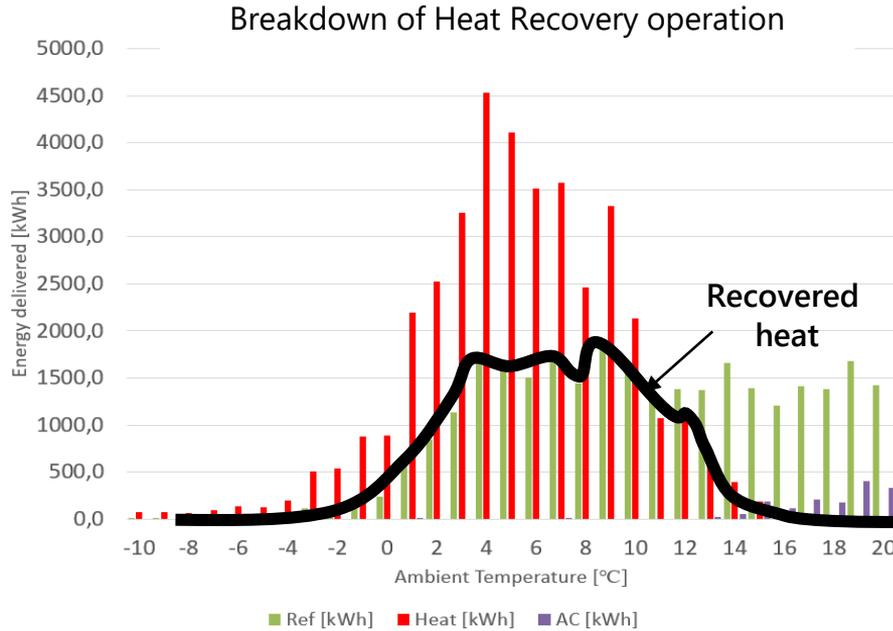
Daikin's efforts to reduce energy demand at system and community level

Energy savings through system combinations – Conveni-Pack

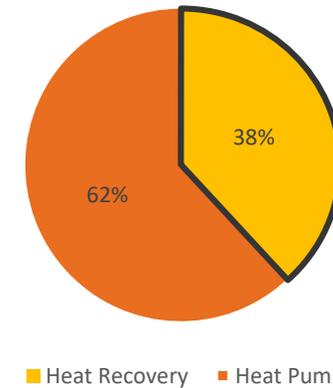
The 'Conveni-Pack' combines refrigeration and comfort cooling/heating functions in one system. By recovering the waste heat in winter, it reduces energy consumption.



Conveni-Pack Heat Recovery Demonstration (EU LIFE Project)



Heat Recovery contribution to total heating delivered



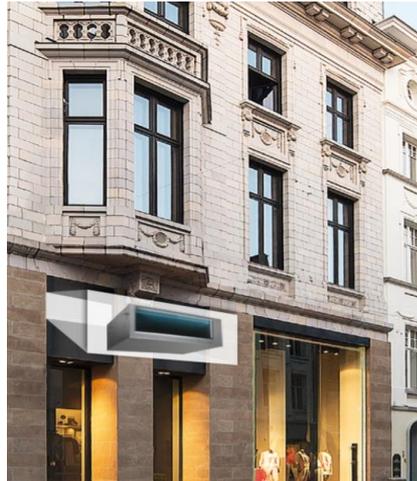
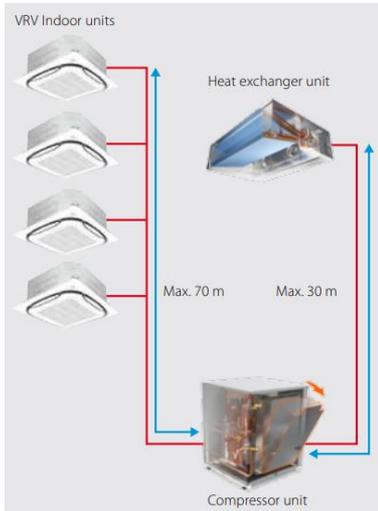
(European average climate)

- Heat from refrigeration cabinets were used to heat indoor space
- Measurements showed **38%** of total heating demand satisfied by Heat Recovery
- This results in about **20%** annual savings in energy consumption

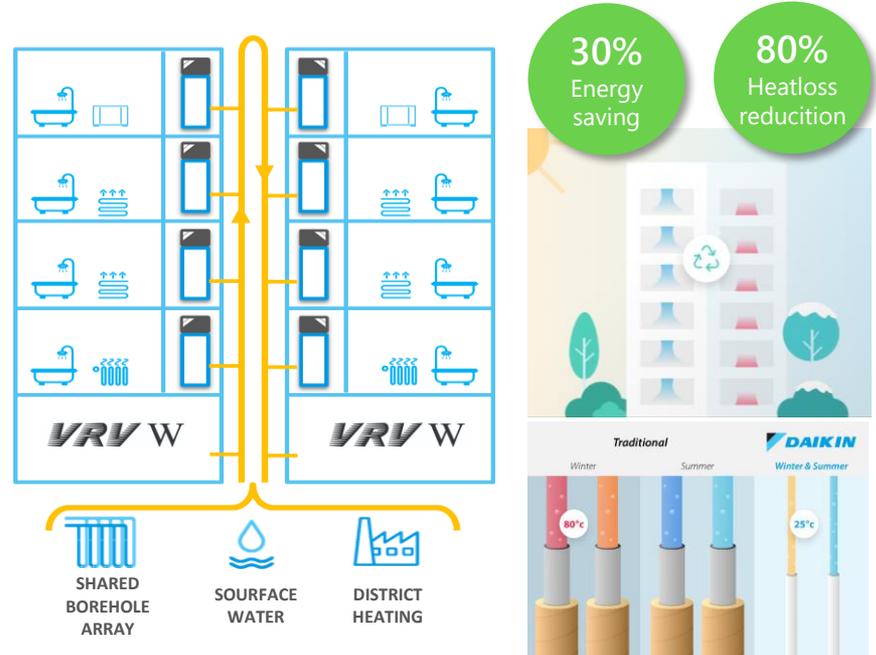
Expanding applications - pioneering application possibilities

In order to encourage wider use of the heat pump technology, Daikin is working on product and systems to meet diverse needs.

'VRV IV-i', which stores the heat exchanger and compressor separately, does not require space for the outdoor unit.



The 'Water Loop' system', shared by multiple users in an apartment complex, achieves energy savings for the entire system.



Community-level contribution: demand response of residential heat pumps

Demand control that does not compromise comfort was demonstrated using residential heat pump heating, which are rapidly introduced.

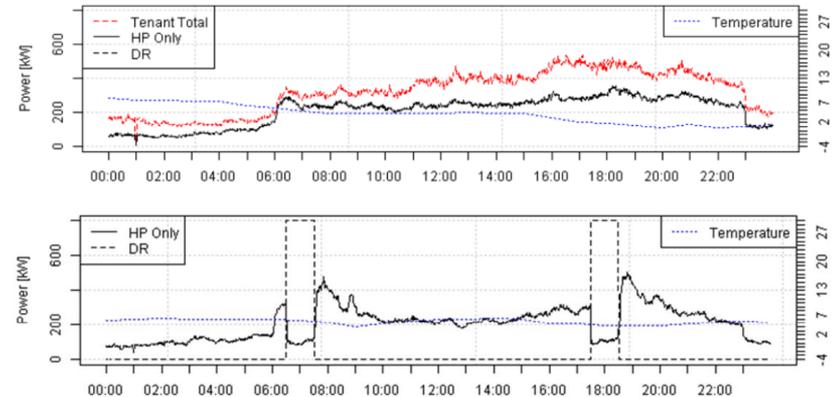
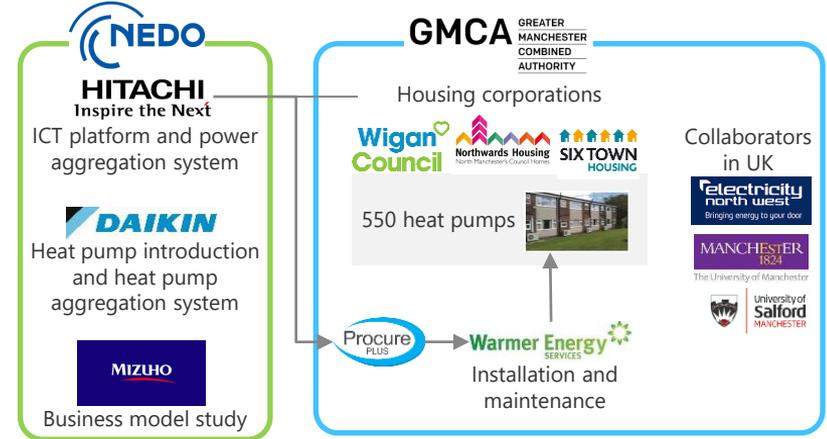
Project overview:

- 2014 – 2016
- 550 heat pumps (monobloc, split, hybrid) + 23 buffer vessels (heat storage)

Goals:

- To verify the effectiveness of electricity aggregation based on demand control capacity by obtained by controlling Air Source Heat Pumps installed in social housing.
- To establish sustainable business models for electricity aggregation.

Reference: <https://www.nedo.go.jp/content/100878404.pdf>



Community-level contribution: commercial VRV demand control

In Portugal, which has a high renewable energy ratio, this project has shown the technical aspects of demand response with air conditioning systems are well established.

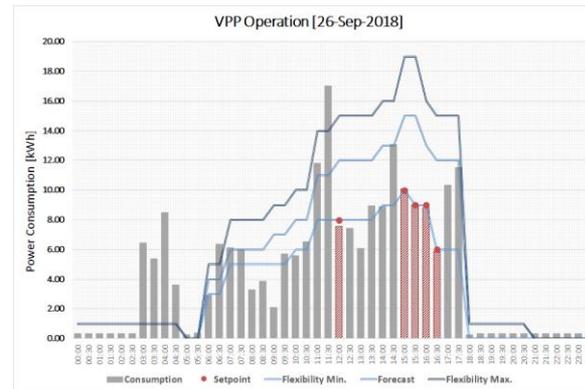
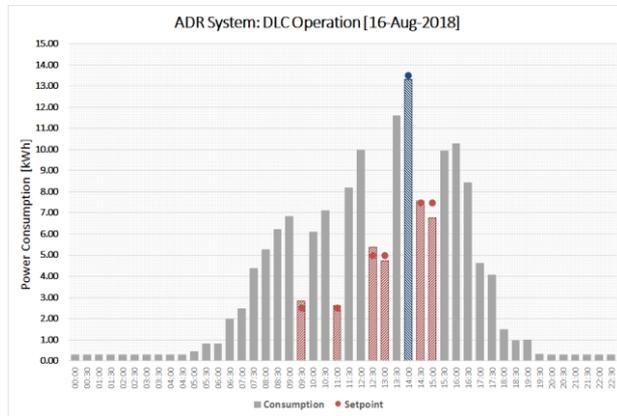
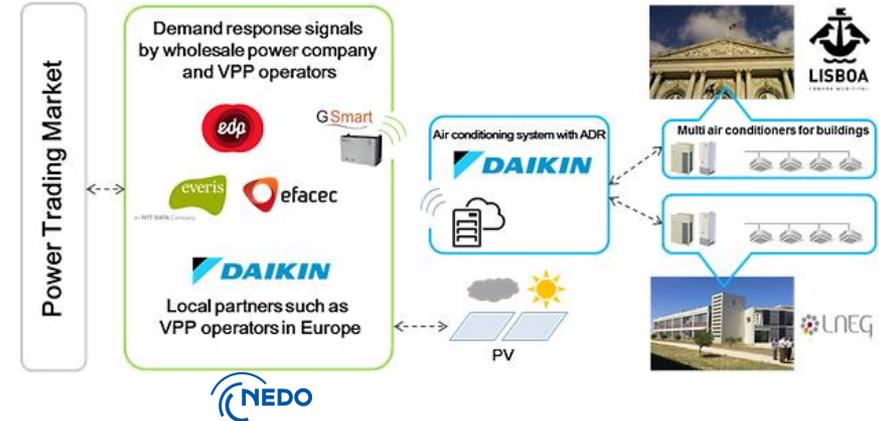
Project overview:

- 2016 – 2020
- 36 VRV (8 and 10 HP) + 30 tank units (cold storage)
- PV installed (78kWp)

Goals:

- Demonstration of AC systems with cold storage as flexibility providers for Automated Demand Response (ADR) and Virtual Power Plant (VPP)
- Evaluate the value of ADR/VPP platforms for different market players, in resolving problems at the local grid level and on smooth integration of renewable energy sources

Reference: <https://www.youtube.com/watch?v=26MegiDf-AI>



For further technological advancement

New EMEA R&D centre Ghent (Planned opening in 2024)

Daikin Europe's 140 million euro investment joins all R&D activities for low-carbon heat pump heating and cooling together into one central knowledge centre for Europe the Middle East and Africa.

- ❑ **More than 350 R&D engineers** who will work on:
 - Low carbon Heating Products & Solutions through **heat pump technology**
 - Solutions for a sustainable cold chain
 - IoT applications
 - Control solutions
 - Artificial intelligence to support smart energy management
- ❑ **> 25 test rooms**, including a unique climatized **EMC test room (Electro Magnetic Compatibility)**



Communication with stakeholders

Daikin exhibits at the COP28 Japan Pavilion its high-efficiency inverter air conditioner which contributes to 50% energy savings from November 30 to December 12, 2023. This will mark Daikin's first exhibit at a COP event.

Daikin also took a stage at side event organized by Ministry of Environment, Japan and Ministry of Economy, Trade and Industry at COP 28.



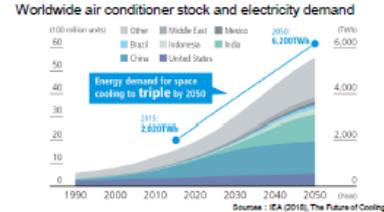
COP28 Japan Pavilion: <http://copjapan.env.go.jp/cop/cop28/en/>

INVERTER Air Conditioners make Immediate Impact, Exceptional Outcomes



Efficient cooling is very important issue in this COP

Due to population growth and economic development, global stock of air conditioner is said to more than triple by 2050, and electricity demand will increase accordingly. To improve energy efficiency and increase access to sustainable cooling, the Global Cooling Pledge is to be launched in COP28.



Energy savings 50% or more

INVERTER air conditioner contributes to 50% energy savings

Inverter technology plays key role to reduce power consumption due to air conditioning. In contrast to non-inverter units, which lose energy by starting and stopping the motor, inverter units save energy by constantly adapting the motor speed to a room's temperature. Our breakthrough technology can cut energy use by over 50 percent.

Feel INVERTER

You can feel INVERTER yourself through the demonstration model!

Side Event on Energy Efficiency and HFC Lifecycle Management

Theme : Higher Energy Efficient Cooling and HFC Lifecycle Management as a Key Contribution to Climate Change Mitigation and Adaptation

Date : 16:30-17:45, December 5, 2023

Venue : Japan Pavilion Event Space



Conclusion

- "Heat pump technology" has a lot of potential for advancement and contribution to the society.
- Policies provide significant support for technological innovation and consumer awareness of new technologies.
- Mutual communication between stakeholders, such as technology experts and policy makers, will shape a better path forward.

Thank you