

OEWG45 Side Event

“Japan’s Fluorocarbons Control Policy and Industry’s Actions toward Carbon Neutrality by 2050” (JRAIA)

# The Role of Heat Pumps towards Decarbonization

3 July 2023

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# Heat Pumps - energy efficiency (EE) technology

## Heat pump technologies around us



Air Conditioner



Refrigerator



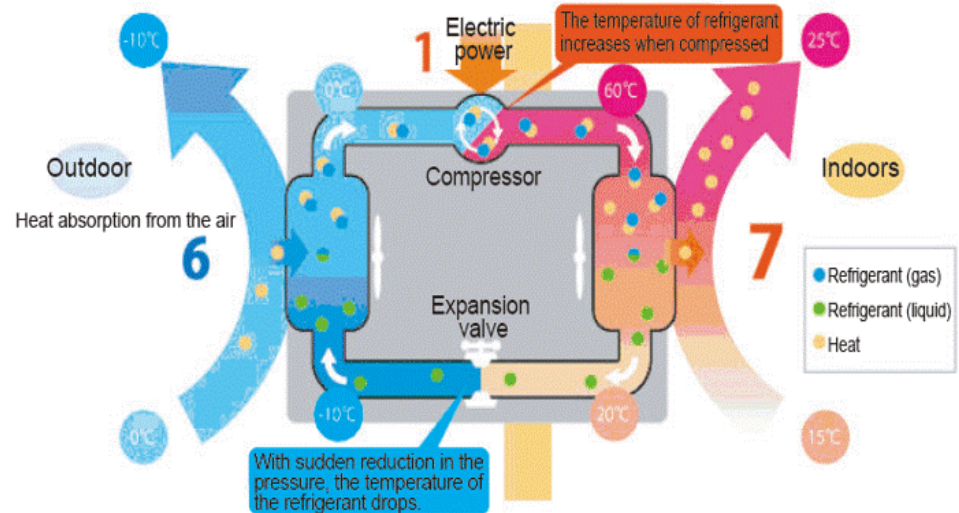
Water Heater



Clothes Dryer

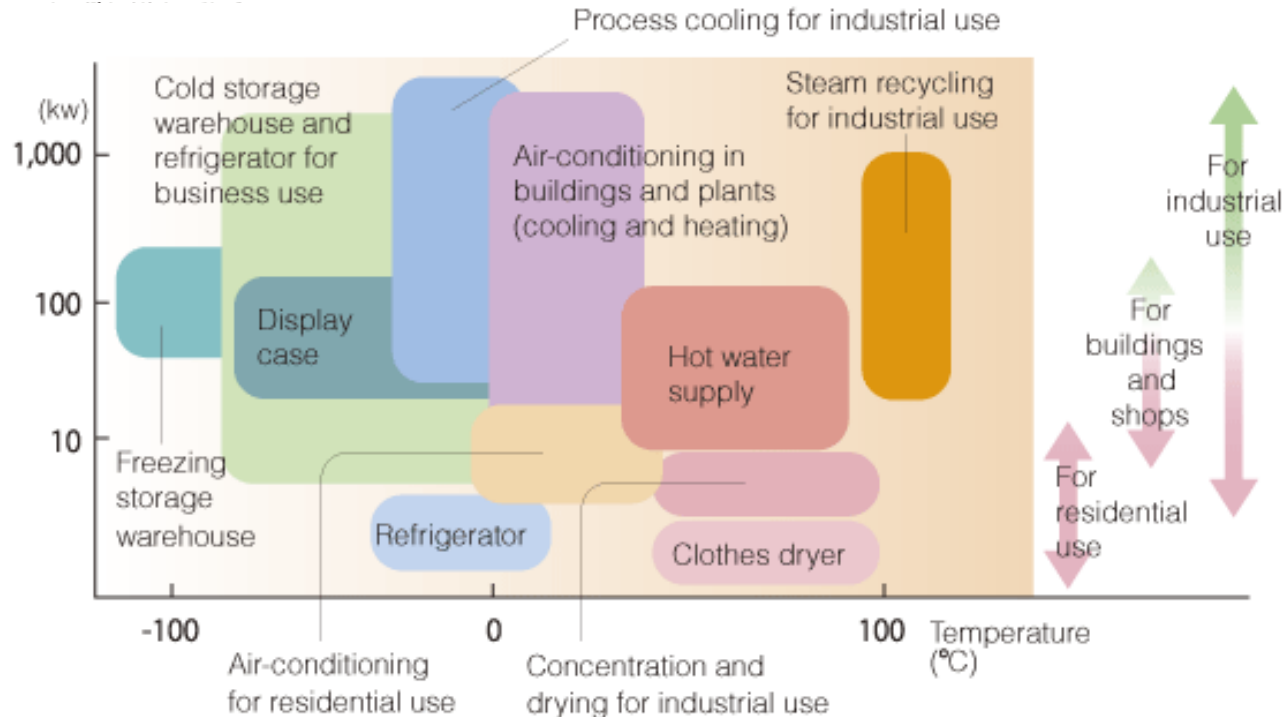
## Efficient heat supply by HPs

1 unit electric power + 6 units heat in the air → 7 units thermal energy  
(an example of heating with a household air conditioner)



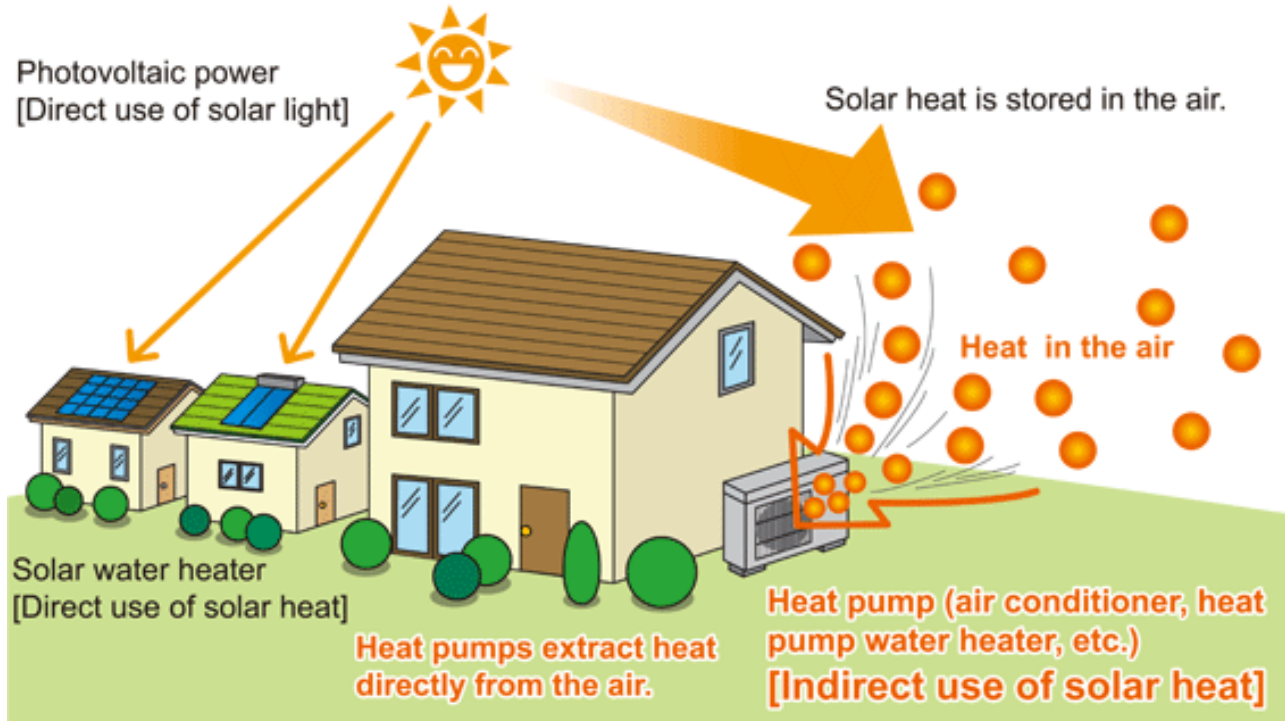
# Heat Pumps - proven technology for various applications

## Wide variety of applications of heat pumps



# Heat Pumps - renewable energy (RE) technology

## Heat pumps as a kind of renewable energy, just like PV



# Heat Pumps - *the* key technology for decarbonization

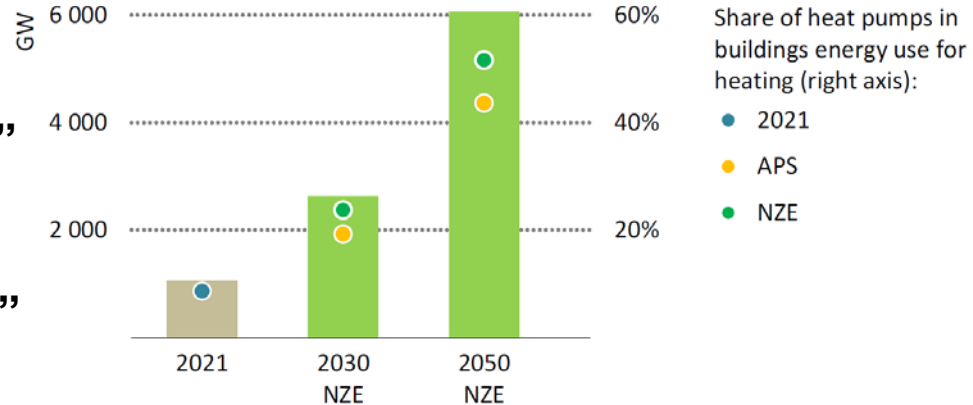
## IEA “Net Zero by 2050”

(18 May 2021)

- 2025 “No new sales of fossil fuel boilers”
- 2030 “All new buildings are zero-carbon-ready”
- 2040 “Net-zero emissions electricity globally”
- 2045 “50% of heating demand met by heat pumps”

## IEA “The Future of Heat Pumps”

(30 Nov 2022)



# Japan's Policy - high expectation for heat pumps

## Japan's Nationally Determined Contribution (NDC)

- **2030, 2050 targets** and implementation of policies (e.g. amending the law)

## Japan's Long-term Strategy under the Paris Agreement

- **Industry:** “For the heat demand in low-temperature such as steam and hot water, utilizing electrification technologies including heat pumps and electric heating wires would be a relevant option for decarbonization.”
- **Building:** “..., the Government aims to achieve the sector coupling of electricity, heat, and mobility in general, using electrified vehicles, heat pump-type water heaters fuel cells and cogeneration, ...”, “... improvement of heat energy efficiency such as heat pump.”, “The Government will also look into the potential flexibility of heat storage type air-conditioning equipment, heat pump water heaters in facilities with large demand for hot water supply, ”

Source

- Japan's Nationally Determined Contribution (NDC): [UNFCCC](#)
- Japan's Long-term Strategy under the Paris Agreement: [UNFCCC](#) (EN), [MOEJ](#) (JP)

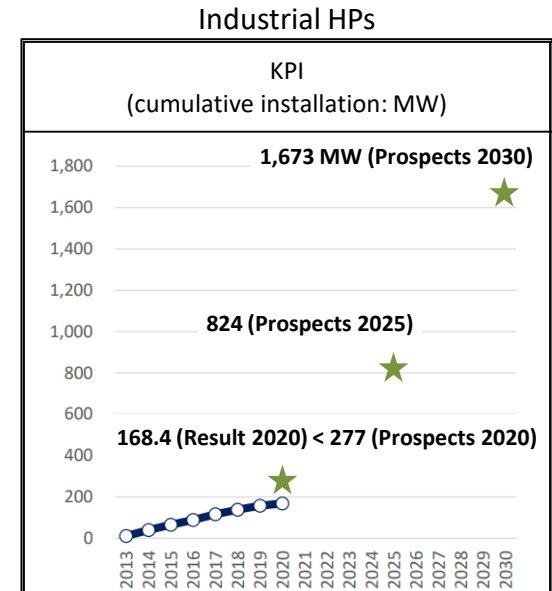
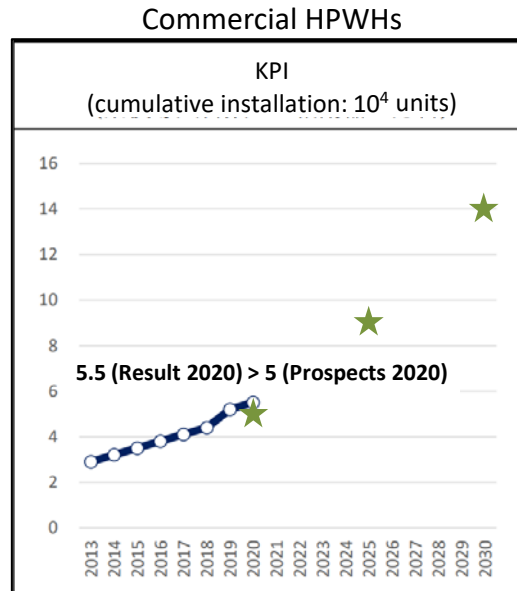
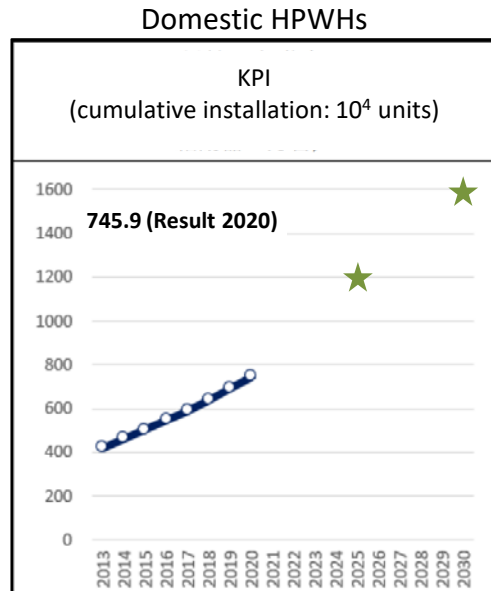
# Japan's Policy - quantitative targets

## Plan for Global Warming Countermeasures and The Sixth Strategic Energy Plan

Source

- Plan for Global Warming Countermeasures: [MOEJ \(JP\)](#)
- The Sixth Strategic Energy Plan: METI ([EN](#), [JP](#))
- Track record: [The document](#) of the Central Environment Council, METI (JP)

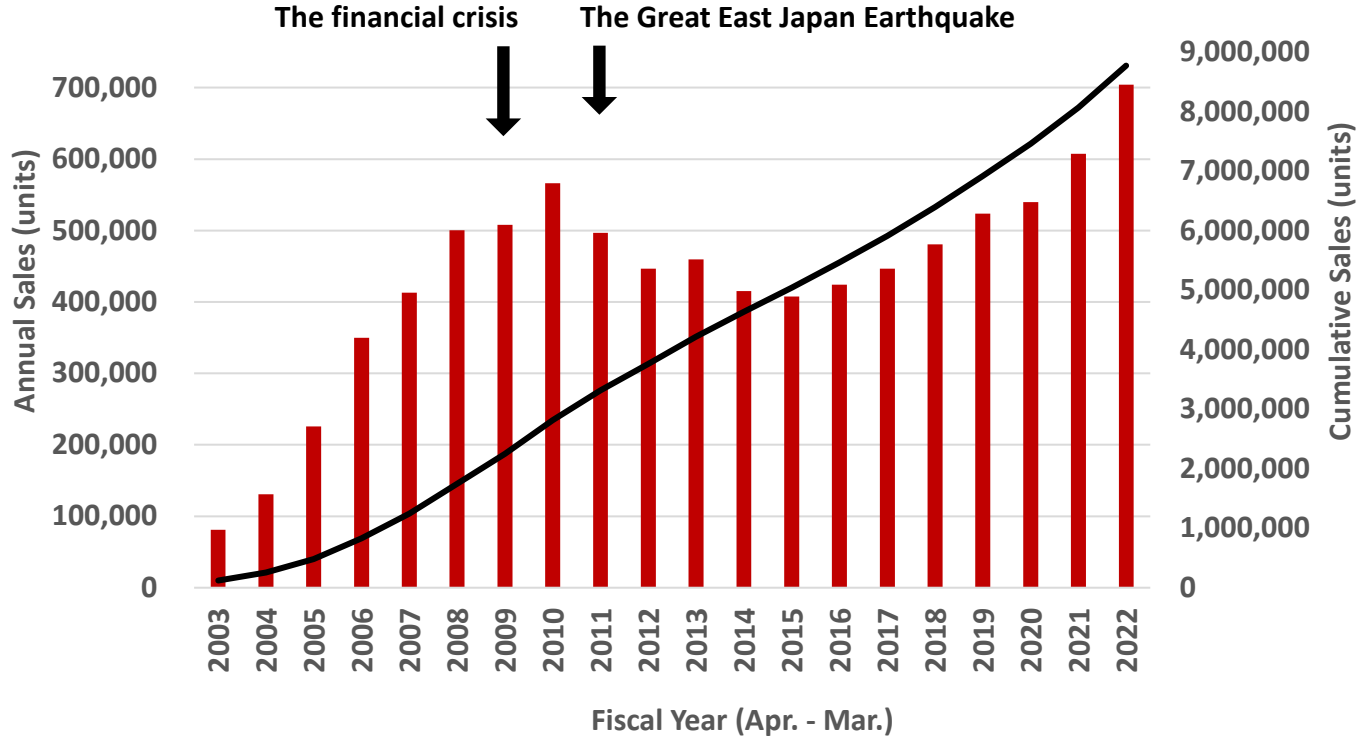
- Quantitative targets are set for industrial HPs and commercial and residential HPWHs



Source

- [The Japan Refrigeration and Air Conditioning Industry Association \(JRAIA\)](#) (JP)

# Japan's Market - Residential HPWH (EcoCute)



**Reached 700,000 units annually with an increase of around 40,000 units annually.**

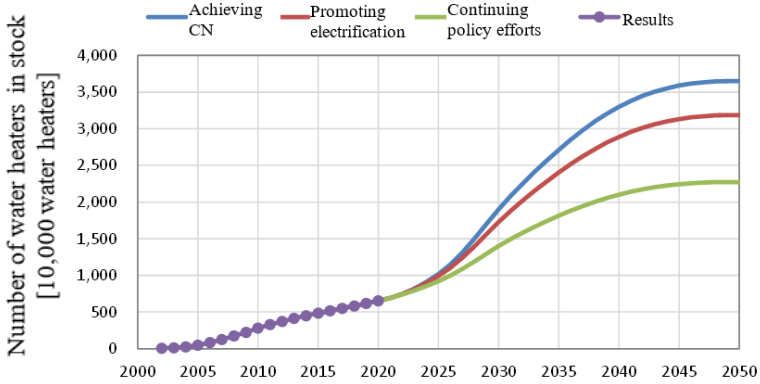
**The cumulative sales will reach 9 million units in summer 2023 at this rate.**



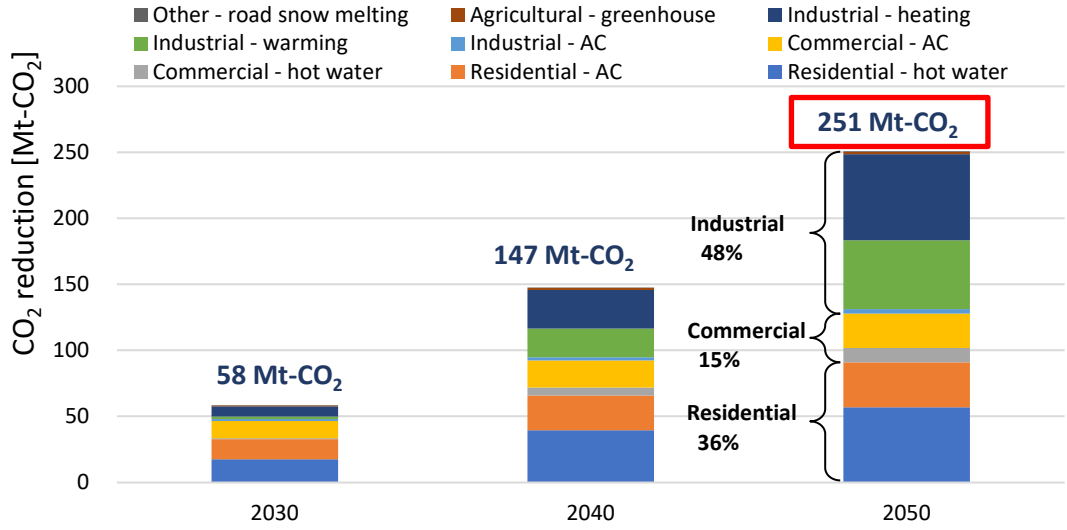
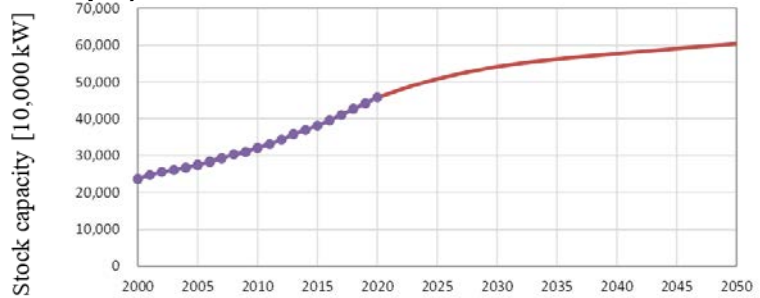
# Japan's Potential - growth needed to achieve decarbonization

## We expect heat pumps to play a pivotal role in achieving decarbonization

### Example) Residential heat pump water heaters



### Example) Residential ACs



**We estimate heat pumps can contribute to CO<sub>2</sub> reduction of 251 Mt-CO<sub>2</sub> by 2050, which is equivalent to about one-fourth the emissions today.**

# Future - Even cleaner heating with cleaner electricity

<Calculation Conditions>

Emission factor of gas: 13.95 g-C/MJ (51.15 g-CO<sub>2</sub>/MJ)

Emission factor of electricity (source): IEA, EEA, METI (JP), ELCS (JP), Climate Transparency

Boiler efficiency (HHV-based): 90%

CO<sub>2</sub> emission ratio compared to gas

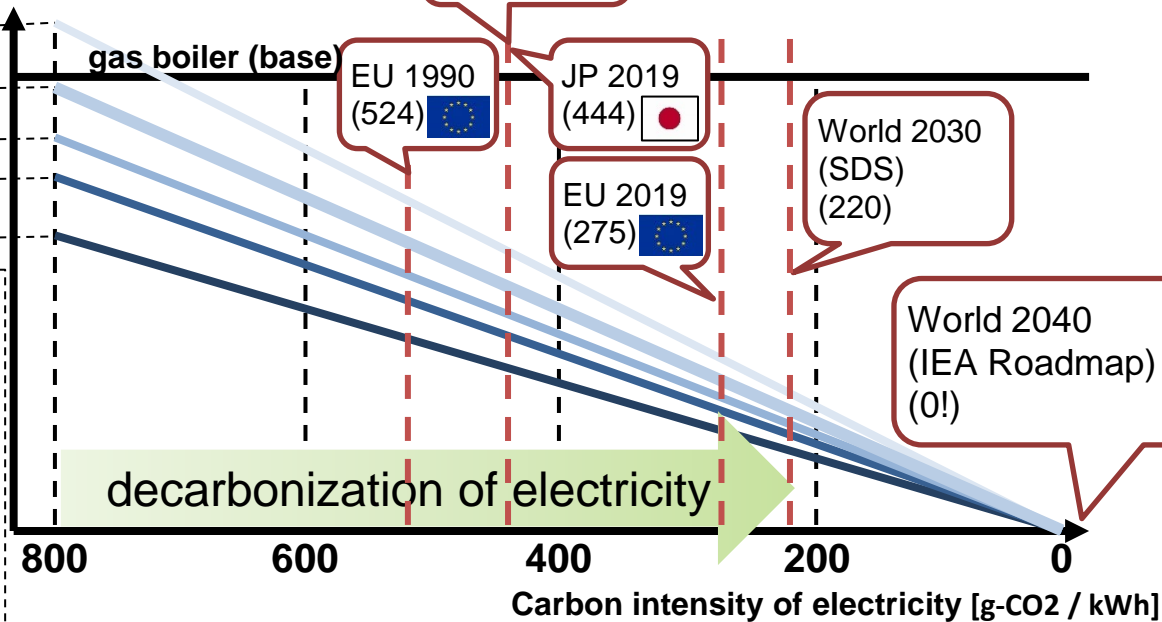
COP = 3.5

COP = 4.0

COP = 4.5

COP = 5.0

COP = 6.0



COP: Coefficient Of Performance (the performance of heat pumps)

SDS: Sustainable Development Scenario by IEA

Heat pumps has already proven to be clean heating technology.

Heat pumps will be an even cleaner heating technology as electricity become cleaner!

## Summary

- **Heat pumps:** are proven energy efficiency technology with wide variety of applications. Heat pumps can also be regarded as renewable energy technology.
- **Global recognition:** Heat pumps are recognized as *the* key technology to make heating more sustainable, thus achieving decarbonization.
- **Policy:** Japanese government has a high expectation for heat pumps. Quantitative targets have been set and market growth can be expected in the near future.
- **Market:** above all, the shipments of heat pump water heaters are rapidly growing.
- **Potential:** According to HPTCJ's survey, heat pumps will have to be further deployed in order to achieve decarbonization. We see around 250 Mt-CO<sub>2</sub> of emission reduction by 2050, which is equivalent to about one-fourth the emissions today.
- **Future:** Heat pumps can contribute greatly to CO<sub>2</sub> reduction. If electricity becomes cleaner, the contribution would become greater. But no need to wait for that.

# Thank you for your attention!

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