OVERCOMING GLOBAL WARMING ALTOGETHER

Waseda University
Giannetti Niccolo, Kiyoshi Saito

PERSONAL PROFILE

KIYOSHI SAITO
Professor, Waseda University
Dean, Sustainable energy & environmental society open innovation research organization(SEES)
President, Japan society of refrigerating and air-conditioning engineer(JSRAE)

We focus on thermal systems -mainly heat pump systems to optimize energy use of demand side.

Refrigerator

Refrigerated cabinet
(show case)

Air-conditioning

Heating

ROFESSIONAL BACKGROUND
2023- ： President, Japan society of refrigeration and air-conditioning engineer
2022- ： Dean, Sustainable energy & environmental society open innovation research organization
2014 ： Vice dean of school of fundamental science and engineering, Waseda University
2014 ： Visiting professor, University of Indonesia
2008- ： Professor, Waseda University

PERSONAL PROFILE

Sep 2013 – Mar 2016	Waseda University Doctor of Engineering, Mechanical Engineering
Apr 2014 – Mar 2017	Research Associate, Waseda University, Department of Applied Mechanics and Aerospace Engineering
Apr 2017 – Mar 2022	Assistant Professor, Waseda University, Department of Applied Mechanics and Aerospace Engineering
Apr 2022 – present	Associate Professor, Waseda University, Waseda Institute for Advanced Study (WIAS)

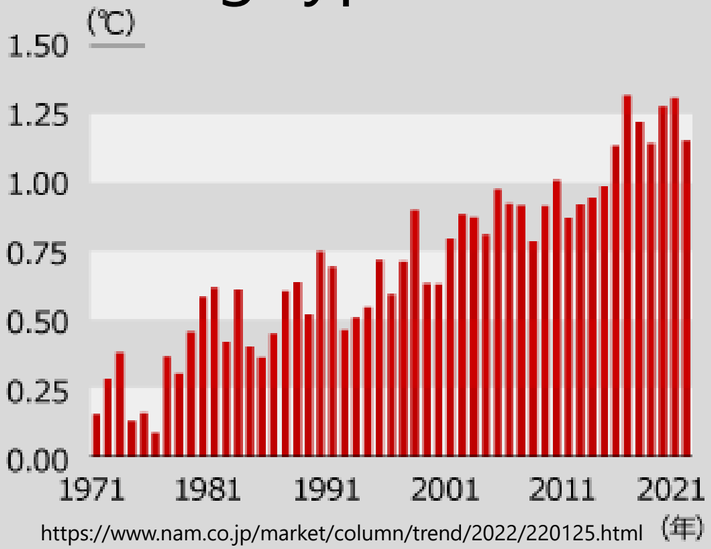
- *Academic Award — 2023.05 Japan Society of Refrigeration and Air Conditioning Engineers*
- *Outstanding Lecture Award — 2021.09 Japan Society of Refrigerating and Air Conditioning Engineers*
- *Young Researcher Award — 2017.08 2017 International Sorption Heat Pump Conference*
- *JSRAE Award — 2016.09 Japan Society of Refrigeration and Air Conditioning Engineers*

Homeland: •Florence, Italy

ALMOST NO TIME UNTIL TIPPING POINT OF GLOBAL WARMING

https://gooddo.jp/magazine/climate-change/heavyrain_typhoon/12001/

Big typhoon



https://www.nam.co.jp/market/column/trend/2022/220125.html

Temp. rise

https://vdata.nikkei.com/newsgraphics/destruction-map-chikumagawa/

Flood

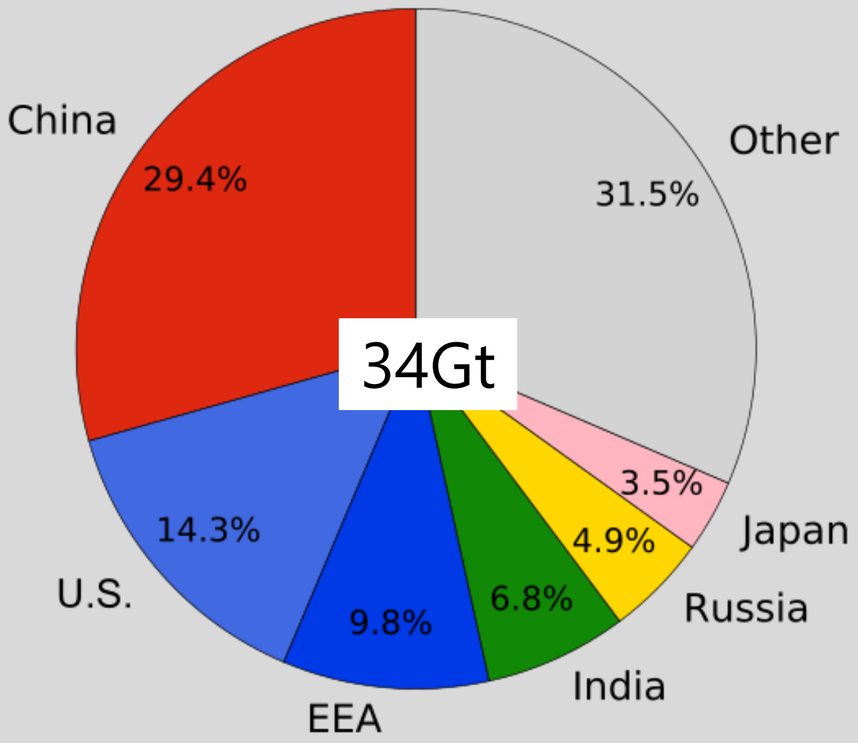
https://gooddo.jp/magazine/sdgs_2030/life_below_water_sdgs/7489/

See level rise

https://gooddo.jp/magazine/land_biodiversity/desertification/7072/

Desertification

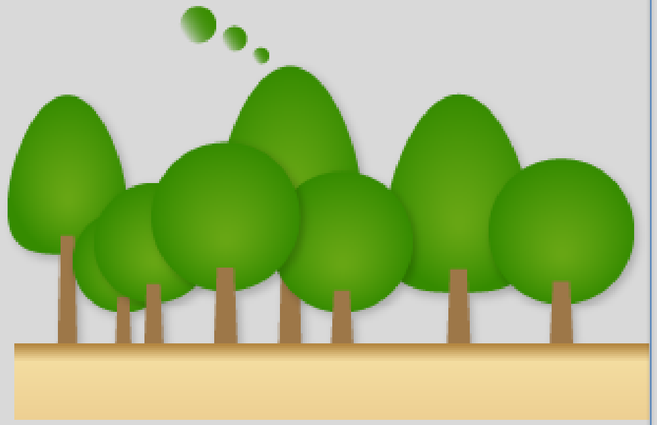
CARBON NEUTRAL SOCIETY BY 2050



CO_2 emissions
in the world(2019)

CO_2 Emissions
From human activities

Nearly
equal



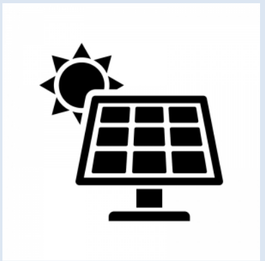
CO_2 absorption by forest
and so on

https://shouene-kaden2.net/learn/carbon_neutral/

Carbon neutral

ENERGY SUPPLY & DEMAND

★Supply side★
(Electric Generation)



Renewable energy

Nuclear

Massive CO2 emission

Combustion based electricity
Natural gas, Coal, Oil

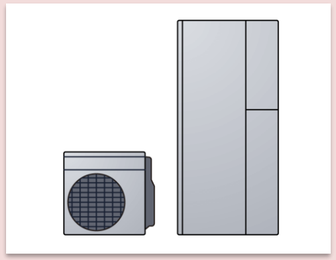
Electric

40%

Combustion heat
Natural gas, Coal, Oil

60%

★Demand side★



Heat Pump
(Electrified heat)

EV

Electric Appliances

Light

Massive CO2 emission

Boiler

Domestic water heater

SUPPLY SIDE KEY TECH.～ COMBUSTION TO RENEWABLE ENERGY

https://energy-shift.com/news/f592747b-0b1b-4022-abd9-620b9eb21e38

Thermal power station

https://pps-net.org/column/99074

PV

https://hatibeee.com/

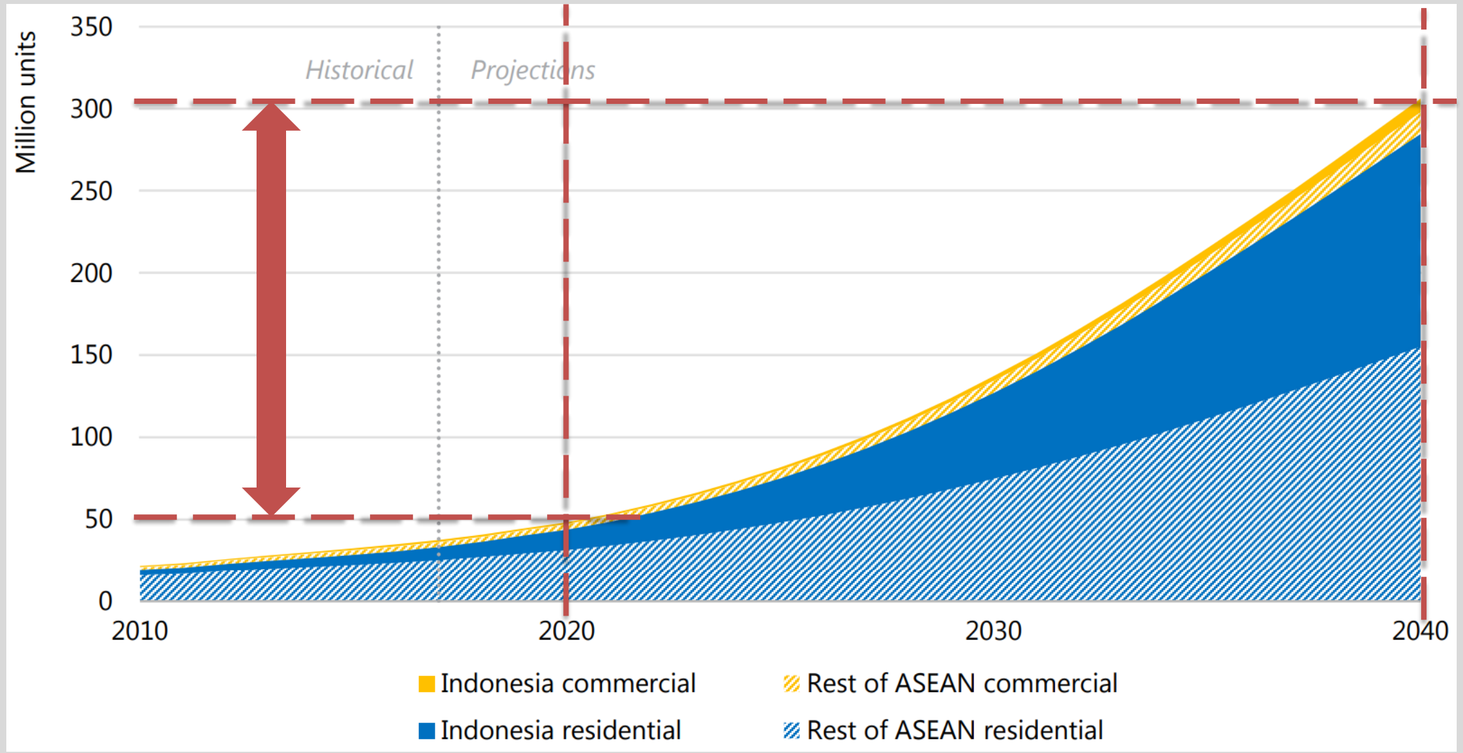
Wind turbine

DEMAND SIDE KEY TECH. ～ COMBUSTION TO ELECTRIFICATION

Direct combustion heat

Electrified heat pump water heater

DEMAND SIDE KEY TECH. ～HIGHER PERFORMANCE SYSTEM

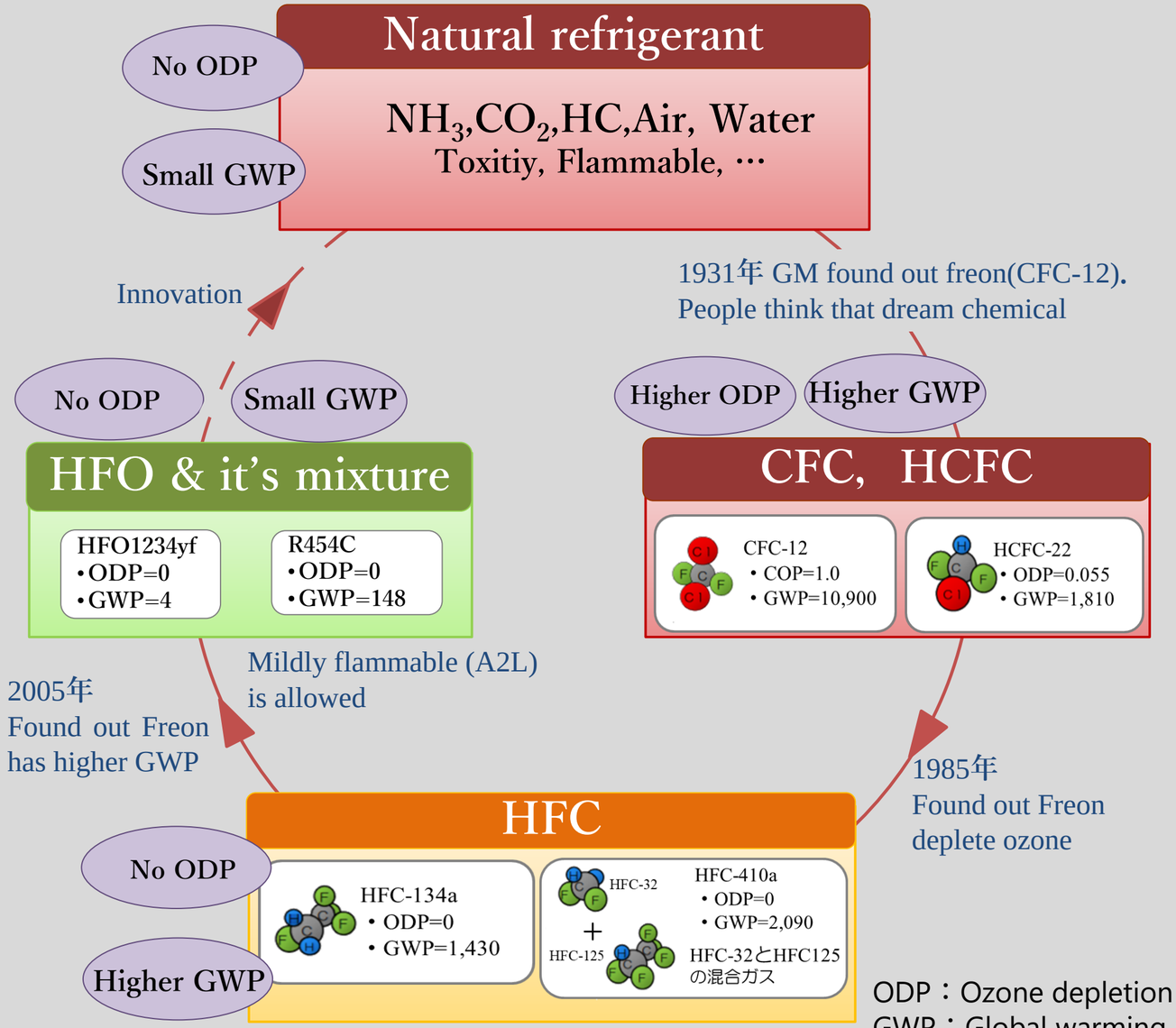


Number of AC unit in future

Constant speed AC system

Inverter AC system

DEMAND SIDE KEY TECH. ～CONVERSION TO LOWER GWP REFRIGERANT



ODP：Ozone depletion potential
GWP：Global warming potential

Refrigerant started from natural refrigerant. But so many problems.

1931年: GM found out Freon(CFC-12).
People think this is dream chemical.

1985年: Found out Freons deplete ozone.
Refrigerant changed from CFC, HCFC to HFC.

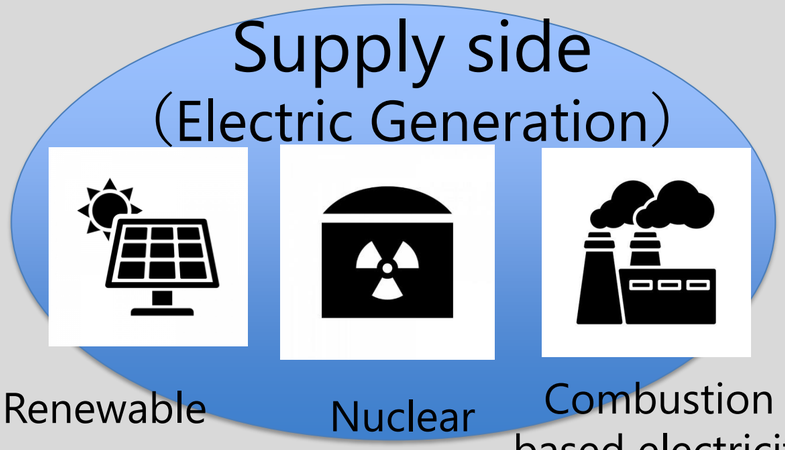
2005年: Found out Freon has higher GWP.
Mildly flammable (A2L) is allowed.
Refrigerant changed from HFC to HFO.

We have to change current refrigerants to lower GWP ones right away.

TOTAL KEY TECH. ~ GLOBAL OPTIMIZATION WITH DX

Hydrogen

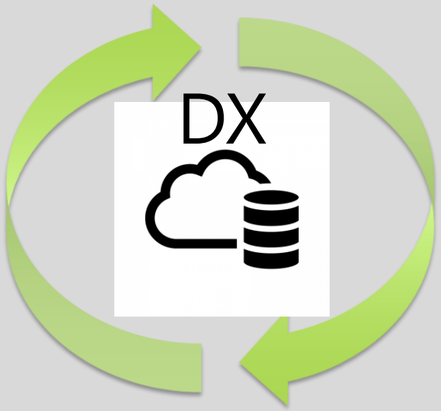
Battery



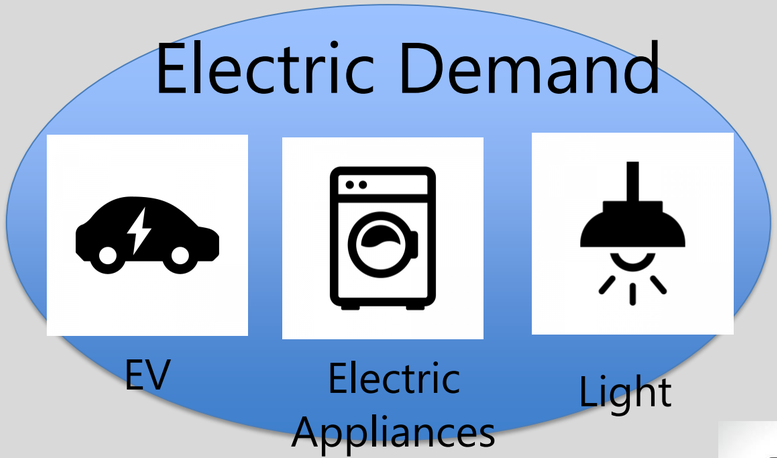
Renewable energy

Nuclear

Combustion based electricity



Thermal storage

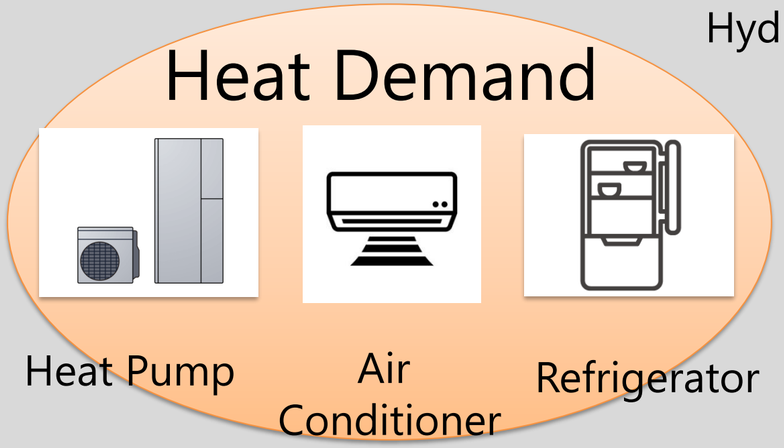


EV

Electric Appliances

Light

Hydrogen



Heat Pump

Air Conditioner

Refrigerator

OTHERS: EDUCATION & TOTAL COLLABORATION

https://www.techfunnel.com/hr-tech/6-steps-strategic-human-resource-development/

Human resource development

https://www.osaka-ue.ac.jp/file/contents/27821

Collaboration of every sector

CONCLUDING REMARKS

Almost no time left to realize sustainable society and the bright future.

Thoroughly promote the effective use of energy

We would like to overcome the global warming by mutual academic and industrial collaboration

https://xn--lckyda9dwb.com/lightcontrol/