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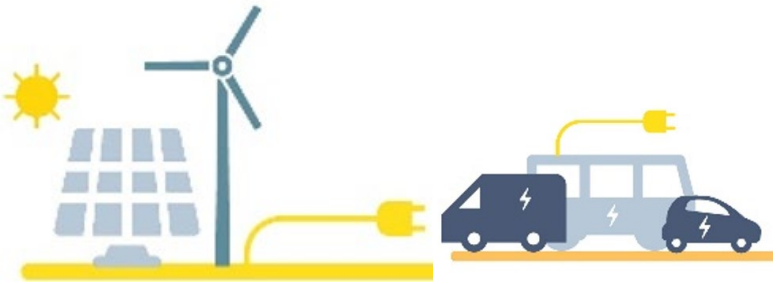
Heat Pumps



Yong Chen
IRENA Innovation and Technology
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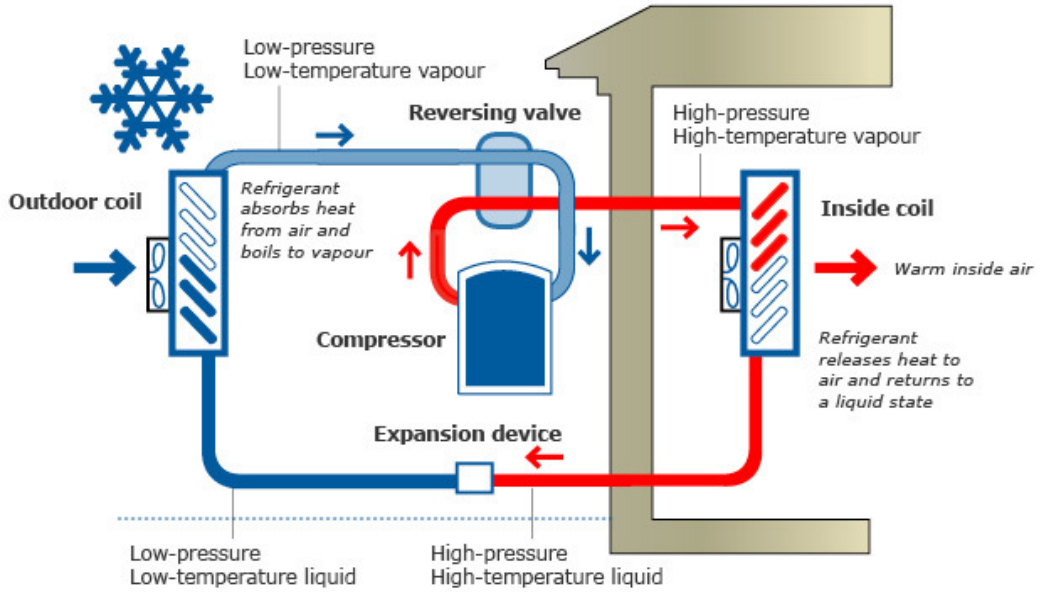
A simple and mature technology

Physics:

- It complies with the first law of thermodynamics
- Heat pumps are devices to move heat from low-temperature sources to high-temperature heat sinks, with COP typically 2.5-5.5, or higher subject to technology, source, climatic condition and end-users' desired temp need.
- Working principle is same as refrigeration system (vapour compression)

Type of HPs

- Ground-source HPs
- Water-source HPs
- Air-source HPs (cold-climate ASHPs can operate at as low as -25°C but back-up heating systems are normally needed in cold areas)



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But it is key for decarbonisation in end-use sectors

Untapped potential for carbon reduction in end-use sectors

- Heat pumps are one of just four major supply side decarbonisation options for heat in buildings (HP, DH, SWH, biomass)
- But it is becoming a crucial tech to decarbonise the building sector, thanks to increased RE electricity and electrification
- Heat pumps and low-cost thermal energy storage, integrated into grid, could provide greater flexibility for the power system operation

Applications:

- Used to supply heating/cooling for residential (space heating and cooling, water heating), commercial (freezing and refrigeration) and industrial applications (process heat), within a wide range of temperatures.
- Scales range from a few KWs up to 35 MW (for DH)
- Most buildings can use HPs efficiently if the heat distribution system can operate with a feed-in temperature of 55°C or below
- For commercial and industrial use cases, it can reach up to 160˚C (industrial process heat)

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