General Guideline on Electric Heat Pump Adoption



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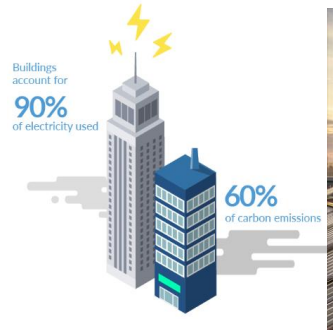
Energy for Brighter Tomorrows

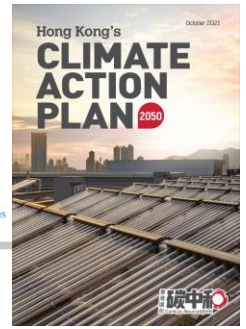
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1. Executive Summary

Hong Kong aims for carbon neutrality by 2050, with the building sector playing a crucial role in this endeavor, as it accounts for nearly 90% of the city's electricity use. Significant energy demands for cooling, heating, and dehumidification lead to high carbon emissions.





Electric heat pumps offer an efficient and cost-effective pathway to reduce energy use and carbon emissions from cooling, heating and dehumidification. This Heat Pump Guideline consolidates key benefits, technology development, diverse applications, practical design tips, local success cases and CLP funding support into a comprehensive reference for industry practitioners.

Developed by CLP Power with strong support from industry partners, this Guideline aims to accelerate heat pump adoption across sectors and contribute to a more energy-efficient and low-carbon Hong Kong.





2. Heat Pump Development

Heat pump technology has evolved from low-temperature heating into a core decarbonization solution, driven by advances in technology, efficiency, and application scope for commercial and industrial buildings.



	Past	Now	Future
Technology advancement	• Supply temperature: < 60°C • Single stage control	• Stable Supply temperature: 60-65°C • Multi-stage control with IoT-enabled	• Stable Supply temperature: >65°C • AI-driven optimization with predictive control
Efficiency enhancement	COP: **2.0-3.0**	COP: **3.0-5.0**	COP: **Above 5.0**
Wider Applications	• **General use in space heating and hot water system**	• **Advanced use in heating, cooling & dehumidification** for swimming pools, hotels, factories and kitchen	• **Specialized use in heating supply, boiler replacement and low-pressure steam generation** for industrial plants

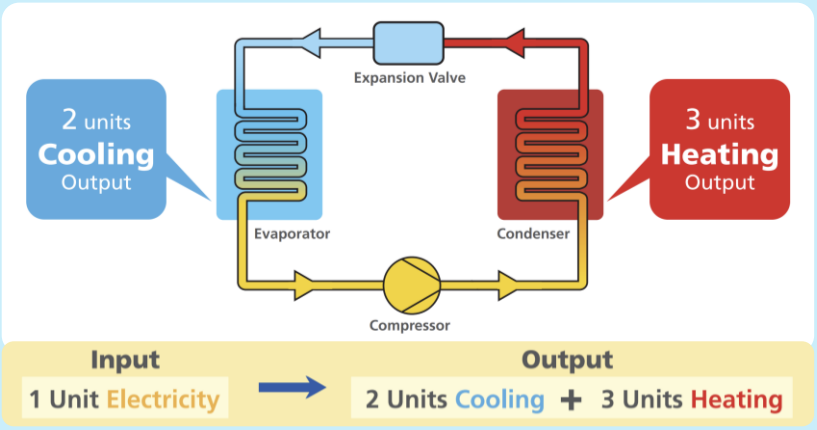
3. Benefits

Electric heat pumps offer an efficient, cost-effective alternative compared to traditional systems, such as gas heating system.

High Energy Efficiency

Up to **500%**

Heat pump provides **heating, cooling and dehumidifying,** which could achieve a combined **COP 3-5**, i.e. 300-500% energy efficiency.



Low Operating Cost

~50%

Lower energy cost due to high energy efficiency.

Reduce Carbon Emission

~50%

Further reduce to **Net Zero Carbon Emission by** 2050 following CLP's decarbonization roadmap

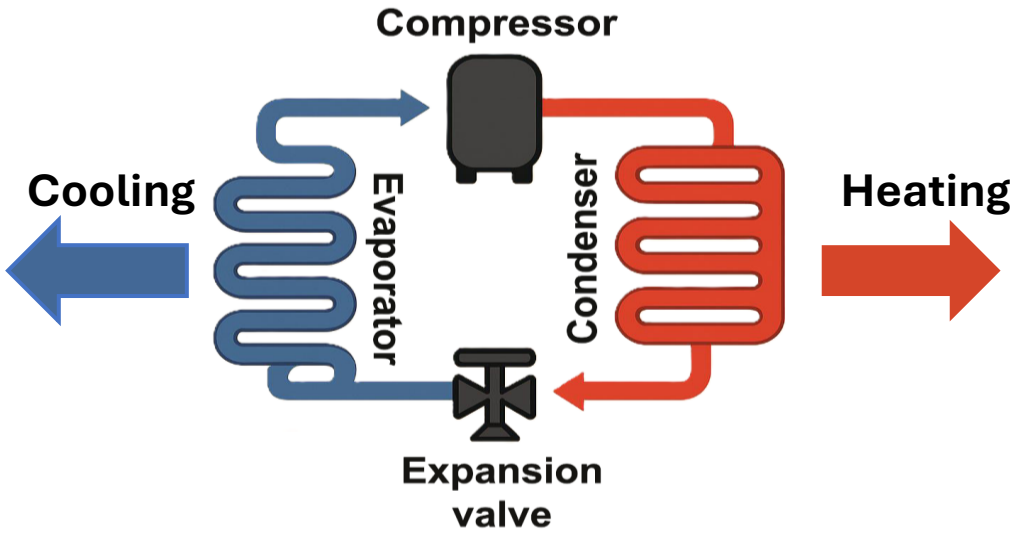
Enhanced Safety

No more risks associated with fuel leaks, and ventilation hazard due to carbon monoxide.

4. Selection of Heat Pump Type and Refrigerant

There are two types of heat pump - air source or water source. With the best choice of heat pump type, we can optimize the energy performance.

Operating Principle:
Electric heat pumps move excess heat to where it's needed to heat, cool, and dehumidify efficiently by transferring existing thermal energy rather than creating.



The heat energy is extracted at the evaporator as the refrigerant vaporized and released at condenser when the refrigerant is condenses to liquid.

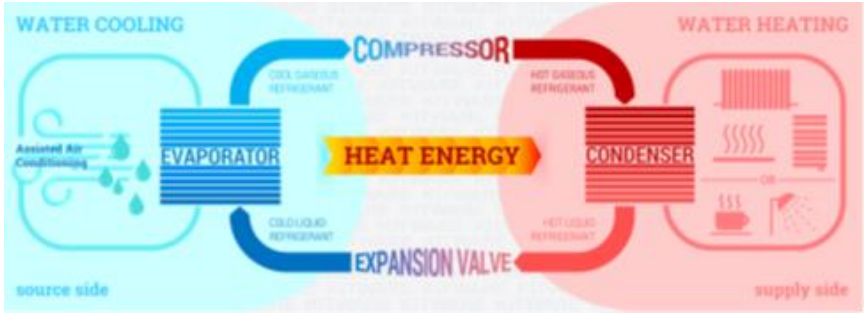
<u>For building with central chiller → Water source heat pump</u>

Integrate the water source heat pump with the **central chiller system** to enhance chiller system overall efficiency

<u>For stand-alone system → Air source heat pump</u>

Transfer heat from air to provide hot water and free cool air for various applications to uplift the thermal comfort such as :

- Spot cooling for kitchen
- Back of house and outdoor area cooling



Recommendation: Select low global warming potential refrigerants (e.g., R513A) to reduce environmental impact.

5. Determining the Right Applications for Heat Pump Solutions

Heat pump solutions are particularly well suited to the following applications, providing an energy-efficient and environmentally friendly means.

Swimming Pool



- Stable warm water
- Dehumidification for pool area & changing room

Hotels



- Hot water for large scale guestrooms and laundry

Factories



- Precise & extreme low RH for production and storage

Kitchen



- Continuous hot water for dishwashing
- Spot cooling for comfort

Indoor wet market



- Dehumidification for safety and hygiene

Clubhouse



- Hot water for shower
- Dehumidification for comfort

Hospital



- Stable hot water supply



6. General Guideline for the Design Supply Temperatures for Typical Heat Pump

Different applications require different heat pump output temperatures. The table below provides recommended temperature ranges for common applications as a reference for system design.

	Hot Water	Dehumidification	Cooling	Recommended Output Temperature for Heat Pump System Design*
Swimming Pool	✓	✓		30–40°C for pool heating, and 40-50°C for dehumidification reheat
Hotel	✓		✓	>60°C for storage, deliver at about 38-43°C through mixing valves for shower and laundry; integrate with central chiller plant for cooling
Factories		✓		>35°C for dehumidification reheat
Kitchen	✓		✓	60–65°C plus booster for required higher temperature >80°C for dishwashing; enable spot cooling
Indoor Wet Market		✓		>35°C for dehumidification reheat
Clubhouse	✓			>60°C for storage, delivered at about 38-43°C through mixing valves for shower
Hospital	✓			60-65°C for hot water use, plus booster for higher temperature if required

*The recommended temperature is provided for general reference only and should be adjusted to suit site-specific requirements.

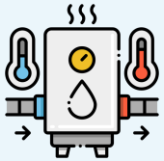
7. Practical Design Tips for Addressing Design Challenges

Consider space availability, required temp and humidity conditions, and existing power capacity when designing heat pump systems. Appropriate configuration and integration can help overcome site constraints and optimise energy performance.

1. Higher Temperature Output for Specific Use

Combination of heat pump and electric heater can be adopted to provide hot water at high temperatures such as above 70°C, meeting high-temperature demand requirements.

- Connect heat pump to the hot water tank in a circulation loop. As one-way connection reduces efficiency.
- Using the electric heater as a back up for peak demand and emergencies to maximize energy efficiency and minimize operating costs.



2. Space Limitation for Installation

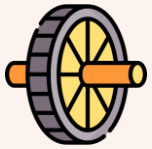
The new heat pump system offers flexible equipment placement and space utilization.

- Air-source heat pumps may be located on rooftops or other well-ventilated areas to provide sufficient airflow for effective heat transfer.
- Water-source heat pumps have minimal ventilation requirements; however, chiller water circuit is required to maintain efficient and reliable operation.

3. Extreme Low Relative Humidity for Industrial Use

Combination of heat pump and desiccant can achieve extreme low RH such as below 30% for specific industrial dehumidification applications.

- Utilize the heat pump as a heat source for desiccant, improving overall system energy efficiency.
- Use heat pump to pre-cool the incoming air, reducing the load on the desiccant dehumidifier.



4. Optimize Existing Power Network for spare capacity

Analyze load profile of existing power network by load monitoring system such as Smart Energy Online(SEO) to optimize circuit loading and release spare capacity for heat pump installation

- Utilize the current demand profile to schedule heat pump operation
- For business customers, please contact Account Manager for SEO subscription details

8. Smart and Future-Ready Heat Pump Systems

Consider heat pump systems equipped with advanced digital technologies, such as big data analytics and AI, to enable real-time monitoring, intelligent control and predictive maintenance for improved efficiency and reliability.

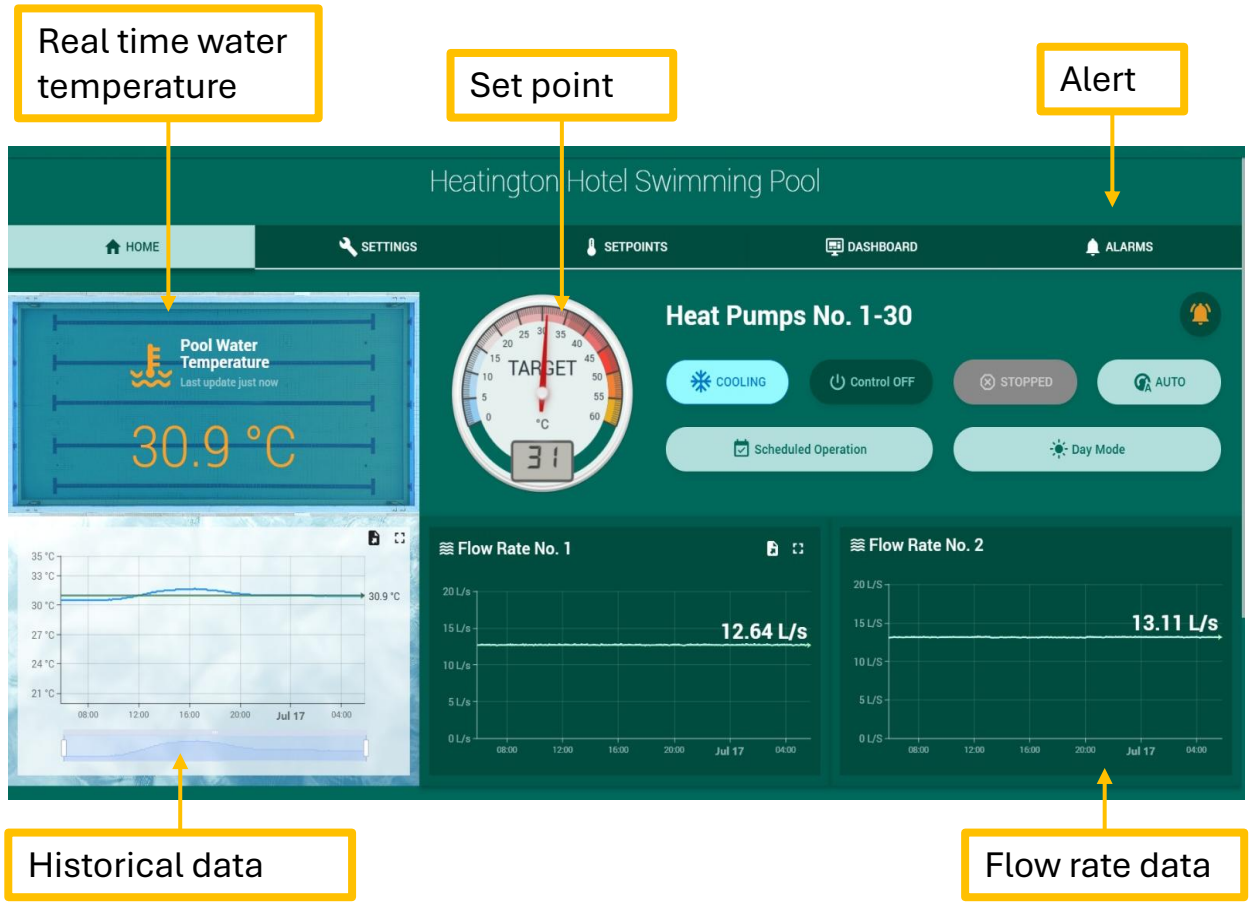
IOT application

Using web-based dashboard or smart device:

- Monitor real-time water temperature & setpoint
- Monitor system status, fault, alarms
- Analyze operation data to improve system efficiency

AI adoption in the future

- Predict required heating and cooling load.
- Automatic control to maximize efficiency.
- Early fault detection to minimize downtime.
- Compares performance with similar buildings and recommends improvements.



9. CLP Comprehensive Support

To encourage customer adoption of high energy efficiency and sustainable technologies, CLP Power provides comprehensive support for customer to adopt heat pump in **both existing and new projects**.

Existing – Heat Pump Retrofitting Project

with Energy Efficiency Improvement



- CLP Eco Building Fund provides subsidy up to $300,000 or maximum 50% for each building annually.
- Application details refer to CLP website: Application Process (clp.com.hk).

New Heat Pump Installation Project

Fuel Switching Project



- CLP account manager will provide advisory support and potential special offer from equipment suppliers for the new installation project.



For business customers, please contact **Account Manager** for Eco building fund and incentive services details.

10.1 Success Case: GO PARK - Sustainable Pool Heating & Dehumidification

新鴻基地產 Sun Hung Kai Properties GO PARK SAI SHA

康業服務有限公司 Hong Yip Service Company Ltd.

GO PARK

Sustainable Pool Heating & Dehumidification



The indoor swimming pool is designed to maintain optimal indoor comfort, customer experience, stable water temperature, and high energy efficiency. Pool water is maintained at 28°C, while indoor relative humidity is controlled at 60% RH within the 1,800 m³ pool hall. The facility adheres to high environmental standards and supports GO PARK's sustainability objectives.

Solutions:

One unit of 270kW heat pump is adopted for pool dehumidification and warm water supply, with electric heaters providing supplementary heating. By recovering waste heat from the humid air inside the pool area to warm pool water and dehumidification, the solution creates an energy-efficient heating cycle.

Results: (compared with traditional heating)

- Achieved ~70% energy saving
- Reduced ~70% carbon emission
- Enhanced comfortable and eco-friendly swimming environment
- Maintained stable pool water temperature and indoor comfort throughout the year



10.2 Success Case: Fortune Pharmacal - Precision Temperature and RH Control

幸福醫藥 FORTUNE PHARMACAL

Fortune Pharmacal

Precision Temperature and Relative Humidity Control



Pharmaceutical manufacturing and storage environments require stringent temperature and relative humidity control to maintain product quality, stability, and regulatory compliance. Certain production processes and raw material storage areas require relative humidity to be maintained at a low level of 20-30% RH to prevent moisture absorption, product degradation, and quality variation. The facility therefore requires a reliable and energy-efficient solution capable of delivering precise environmental control while supporting continuous operation.

Solutions:

Using heat pump with electrical desiccant as a dehumidification system in an existing pharmaceutical manufacturing plant, serving production areas and raw material storage requiring precise temperature and low relative humidity control.

Results: (compared with traditional heating)

- Achieved ~60% energy saving
- Reduced ~60% carbon emission
- Ensured product quality consistency and process reliability
- Supported compliance with stringent environmental control requirements

10.3 Success Case: Eaton HK – Integrated Hotel Hot Water

Great Eagle Holdings Limited

Eaton

Eaton HK

Integrated Hotel Hot Water



By Langham Hospitality Group, the hotel requires a continuous and reliable hot water supply to support multiple operations, including guestrooms and kitchens. Maintaining guest comfort and service quality while controlling energy costs is essential. Existing 7 x 120kW electric heaters have been used for over 16 years. The hotel therefore sought an integrated hot water solution that could improve energy efficiency and contribute to its sustainability objectives without compromising operational reliability.

Solutions:

Five units of 40kW water-to-water heat pump and 1 unit of 40kW air-to-water heat pump are installed to provide hot water for hotel guestrooms and kitchens, with electric heaters serving as supplementary heating for energy conservation. By recovering waste heat from the air-conditioning system for hot water production while supporting space cooling, the system delivers an energy-efficient solution that reduces overall cooling and heating energy consumption.

Results: (compared with traditional heating)

- Achieved ~60% energy saving
- Reduced ~60% carbon emission
- Ensured reliable hot water supply for hotel operations around the clock
- Improved sustainability performance without compromising guest experience

10.4 Success case: Food Factory – Efficient Kitchen Heat Recovery

Dim Sum Food Factory

Efficient Kitchen Heat Recovery



Commercial food production facilities require a consistent supply of hot water to support daily washing and sanitisation processes. The dishwashing operation requires hot water at 60°C to maintain hygiene standards and operational efficiency. At the same time, kitchens are often exposed to high indoor temperatures generated by cooking and processing equipment. The factory therefore sought an energy-efficient solution that could provide reliable hot water while improving the working environment for kitchen staff.

Solutions:

A 15kW all-in-one heat pump system with electric heaters is installed to provide hot water supply for kitchen dishwashing process. The system incorporates a “free air cooling” feature that recovers heat while delivering cooling to the surrounding area, improving overall energy efficiency and enhancing indoor comfort in the kitchen.

Results: (compared with traditional heating)

- Achieved ~70% energy saving
- Reduced ~70% carbon emission
- Ensured safe and reliable operation
- Improved kitchen comfort for staff



11. Way Forward & Enquiry

Collaborative Pathways to a Sustainable Future

We call on the support of utilities, government, developers, service providers, and engineers to work together to accelerate the adoption of electric heat pumps, advance the electrification of heating, cooling and dehumidification, enhance energy efficiency, and drive decarbonisation towards a greener future.

For enquiry:
Please contact our Account Manager at email: accmgr@clp.com.hk



12. Acknowledgement

This General guideline is developed with strong support and input from key partners:

Technical Reference:

機電工程署 EMSD

EMSD: Heat Pump Water Heaters

Use cases reference:

新鴻基地產 Sun Hung Kai Properties

SINO GROUP 信和集團

鷹君集團 Great Eagle Group

JF Thermal 駿峰熱能

幸福醫藥 FORTUNE PHARMACAL