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GLOBAL HEAT PUMP BEST PRACTICES: STRENGTHENING THE GLOBAL HEAT PUMP POLICY TOOL-KIT

Heat Pumps in Australia

Rachael Wilkinson
Senior Advisor – Government Relations
Energy Efficiency Council (EEC)

Market Overview

Australia is experiencing a surge of heat pump sales that is expected to continue at least into the mid-2030s as heat pumps continue to replace gas appliances in both existing and new buildings.

Regulatory Approach

National Construction Code (NCC)

Requires new builds in most cases to meet a 7 stars out of a possible 10 through the *Nationwide House Energy Rating Scheme* (NatHERS). Heat pumps can help achieve the rating.

Banning New Gas Connections

Jurisdictions such as the ACT and Victoria have regulated to prevent gas connections in newly built properties.

Minimum Rental Standards

Victoria is consulting on minimum rental standards that will require landlords to replace end of life gas/inefficient electric hot water systems and space heaters with heat pumps.

Financial Support and Market-based Instruments (Victoria)

The Victorian Energy Upgrades Program (VEU)	Funded through energy bills. Certificate based. Incentives for households.
Solar Victoria Hot Water Rebate	Up to $1,000 is available to households for eligible heat pump hot water systems. Capped – a limited number of rebates available per release.
Incentives can be ‘stacked’	Households can have both rebates for the same piece of equipment.

Financial Support and Market-based Instruments (Around Australia)

Renewable Energy Target (RET)	Small Technology Certificates (STCs). Administered by the Federal Government's Clean Energy Regulator (CER).
Low interest or no interest loan schemes	Examples of these include Tasmania's Energy Saver Loan Scheme and the ACT's Sustainable Households Scheme.
Household Energy Upgrades Fund (HEUF)	$1bn fund to provide low-cost finance for efficiency upgrades to Australian homes. Mostly applied to larger renovation projects.

Challenges for Australia

Skill Shortages

Australia does not have enough electricians, plumbers and refrigeration technicians (and we need those for heat pumps!).

Lack of Harmonisation Between Jurisdictions

Australian jurisdictions can have different requirements for products, trades, construction and more. This is confusing for industry and makes it hard to scale.

Standards and Regulation

Australia's standards and regulatory environment lags behind many of our international peers and this can lead to product dumping in our market + other issues.

Boom and Bust Programs/Incentives

Large incentives that come and go can do more harm than good for industry and investment – we have seen some examples of this over time.

Local Manufacturing

Australian manufacturers have been traditionally focused on gas/electric appliances. Australia must determine whether it is appropriate to support that industry to transition to heat pump technology, or accept this capacity will move offshore because of the transition away from these products

Opportunities for Australia

Electrification

Push to ‘electrify everything’ puts heat pump technology in pole position.

Transition from Gas

States and territories moving at different speeds, but to achieve net zero 2050, growing acceptance homes will need to get off gas.

Standards and Regulatory Reform

Although current weakness, we could transform our standards and regulatory environment to become a strength.

Energy Efficiency Scheme Reform

Several jurisdictions are already reviewing their schemes, so they are fit-for-purpose for the next several decades.

Local Manufacturing

There may be opportunities for local manufacturers to capture the benefits associated with the electrification agenda and an increase in demand for heat pumps.

Thankyou.

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GLOBAL HEAT PUMP BEST PRACTICES: STRENGTHENING THE GLOBAL HEAT PUMP POLICY TOOL-KIT

Opportunities for Implementing Heat Pump Technology in Indonesia

Global Heat Pump Best Practices: Strengthening the Global Heat Pump Policy Tool-Kit
July 10, 2024, RAP-GBPN Webinar

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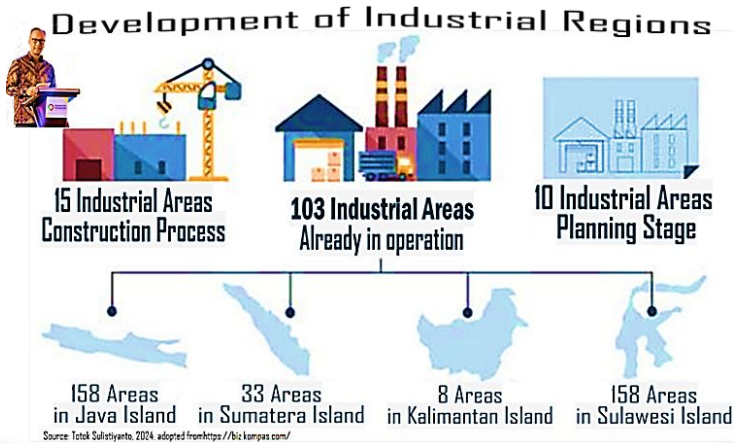
Affiliations: MASKEEI – GBCI – IABHI – ASHRAE

Residential Buildings /Housing

Religious Buildings

Business Buildings



Special Function Buildings

Social and Culture Buildings

General Energy Conservation

Industrial Sector:
- Energy Audit / IGA / ESCO
- Energy Management / ISO 50001
- Online Reporting System
- Certification of energy managers & auditors
- Increasing public awareness
- Pilot Project

INDUSTRY

2022 Consumption: 479 MBOE

Energy Saving Potentials

0-30 %

Commercial Sector:
- Energy Audit / IGA / ESCO
- Pilot Project
- Energy Efficiency Standards
- Online Reporting System
- Energy Management

COMMERCIAL

2022 Consumption: 45 MBOE

Energy Saving Potentials

0-30 %

Transportation Sector:
- Mass Transportation (BRT/ MRT/ LRT)
- *Fuel Switching* (BBM to Gas & Biodiesel)
- Management System Transportation

TRANSPORTATION

2022 Consumption: 434 MBOE

Energy Saving Potentials

15-35 %

Household Sector:
- EE Standard (Label / MEPS)
- Increasing public awareness

HOUSEHOLD

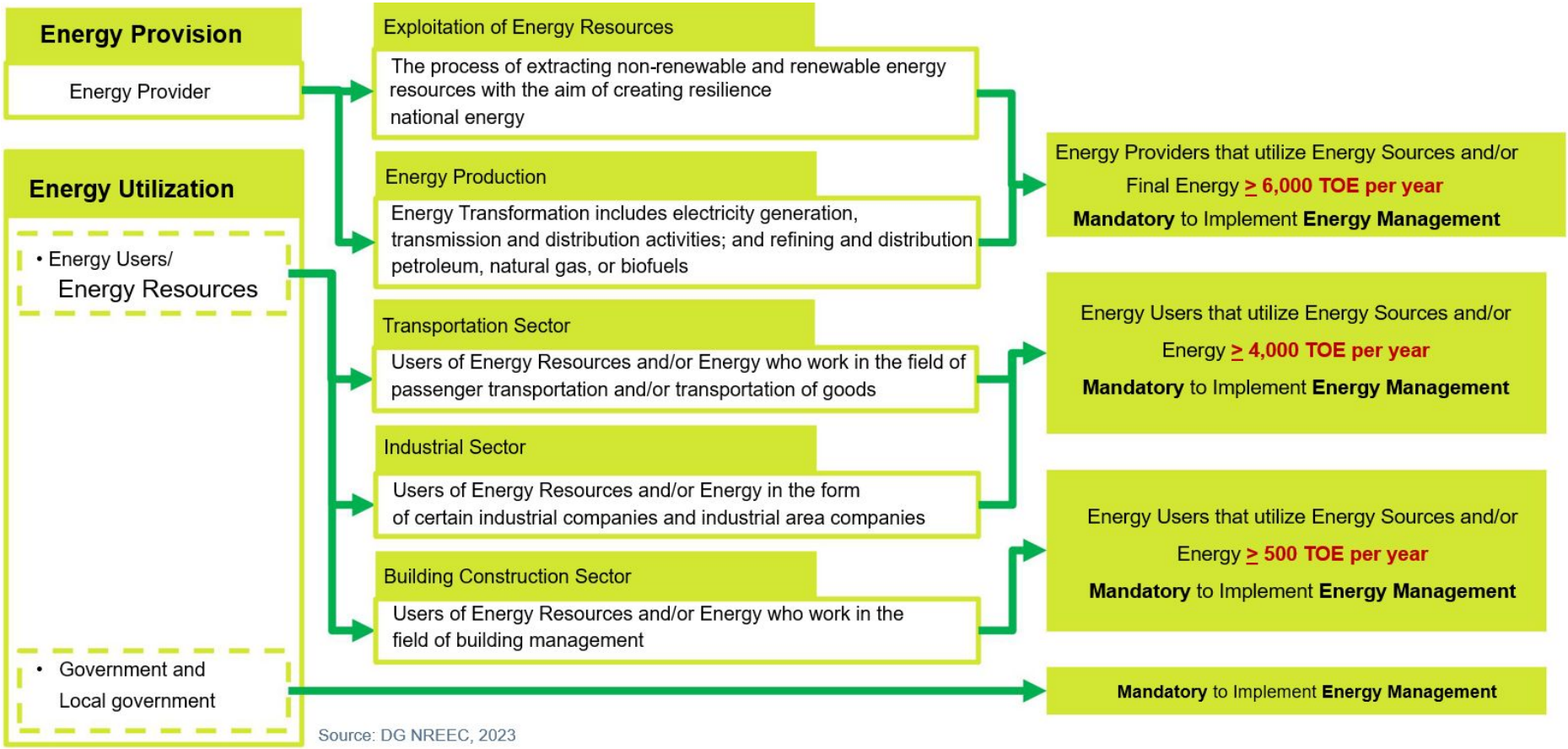
2022 Consumption: 145 MBOE

Energy Saving Potentials

15-30 %

Source: Handbook of Energy & Economic Statistics of Indonesia 2020 Final Edition, KESDM

ENERGY CONSUMPTION THRESHOLD FOR ENERGY MANAGEMENT

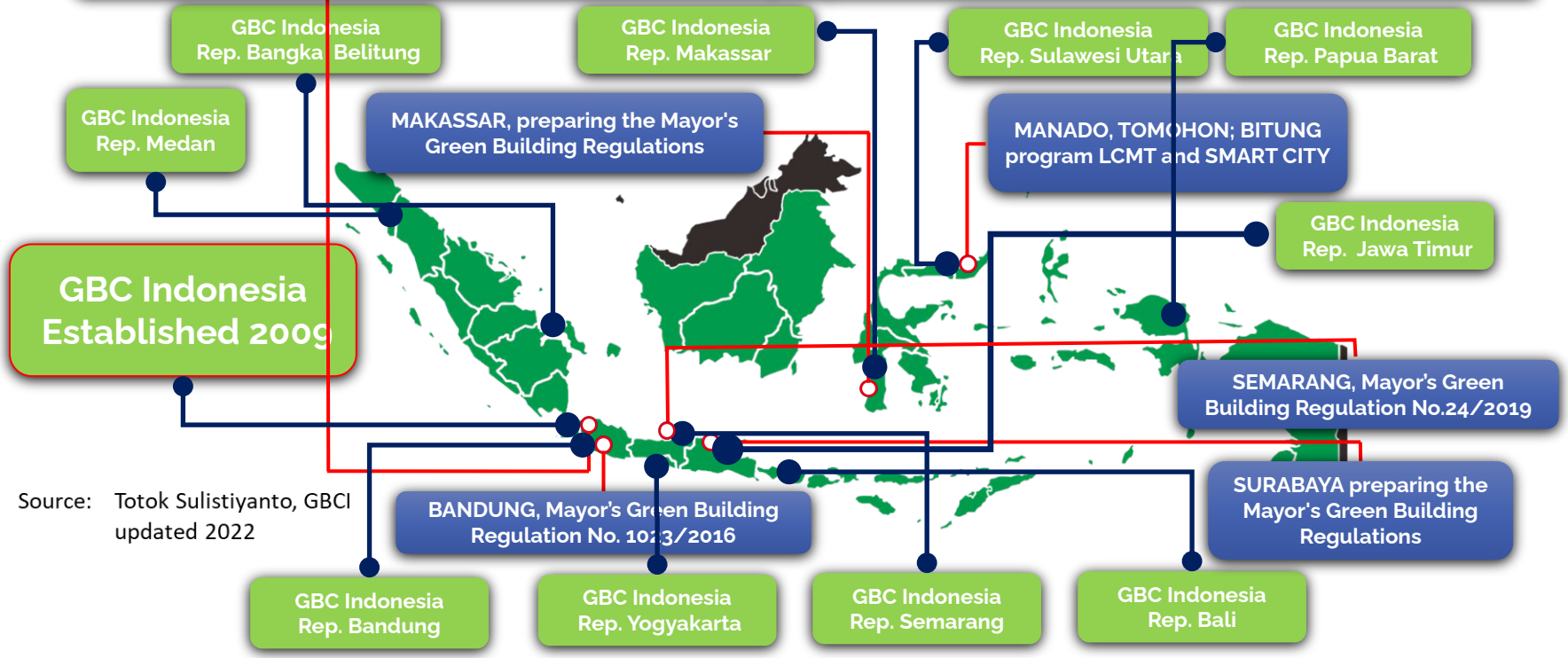


Source: DG NREEC, 2023

GREEN BUILDING MOVEMENT IN INDONESIA

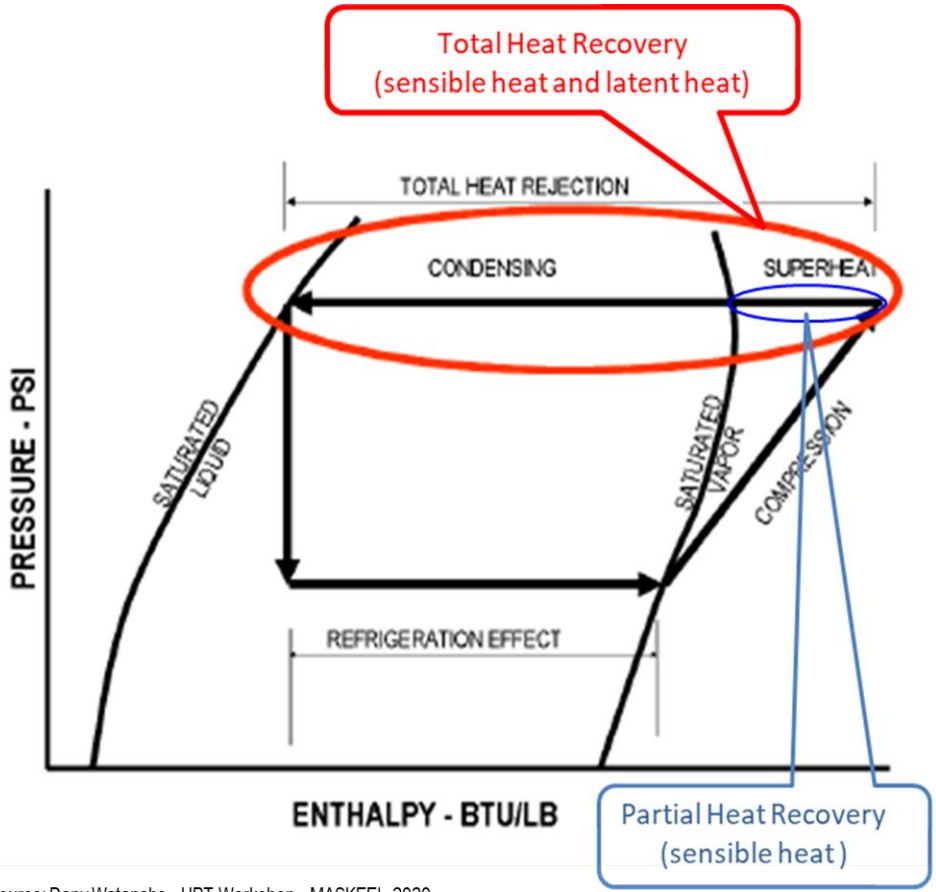
DKI Governor Regulation no. 38/2012 regarding Green building

GR No. 36/2005 replaced by **GR No. 16 /2021** concerning Implementing Regulations of Law No. 28/2002 concerning Buildings
MoPWH Regulation No. 02/2015 replaced by **MoPWH Regulation No.21/2021** concerning Green Building Performance Assessment (BGH)



Source: Totok Sulistiyanto, GBCI updated 2022

HEAT RECOVERY PRINCIPLE



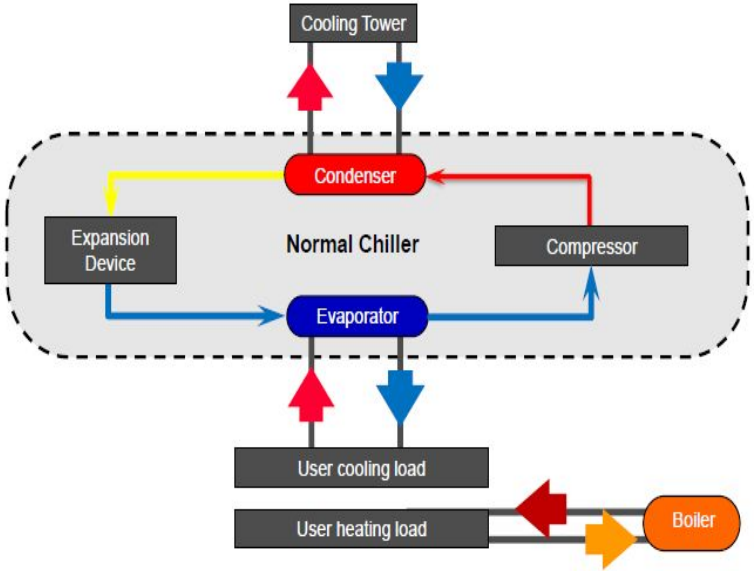
Source: Dany Watanabe – HPT Workshop – MASKEEI, 2020

A heat pump extracts heat from a source and transfers it to a sink at a higher temperature. *(ASHRAE HVAC Systems & Equipment)*

- The development of heat recovery technology is based on the concept of integrated application of energy.
- When cooling is required, chiller release amount of condensing waste heat via condenser (sensible heat and latent heat).
- Reclaiming condensing heat for hot water before emit to atmosphere. In this way, waste heat can be utilized efficiently.
- Enhance the combined cooling and heating COP.

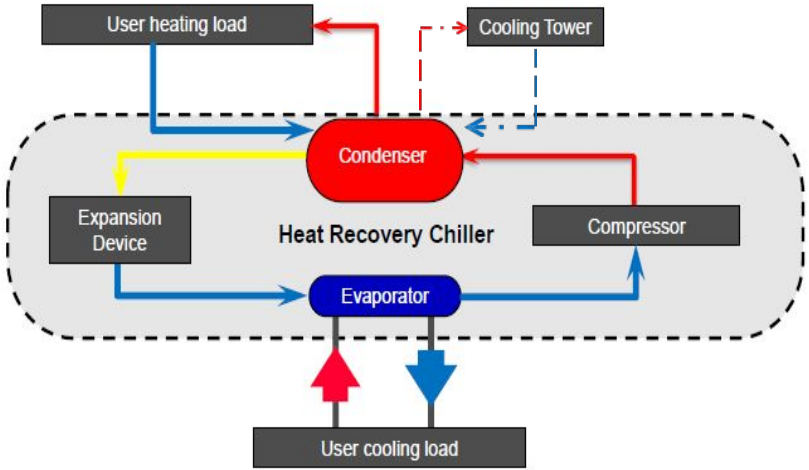
TRADITIONAL "CHILLER + BOILER" VS HEAT PUMP CHILLER

Traditional application



- Waste heat is released to atmosphere via cooling tower
- Hot water is offered by boiler

Total Heat Recovery application



- Designed by integrated condenser with two separated water loops, one is heating condenser and another is tower/geothermal source condenser
- At heat recovery model, heating condenser supply heat to hot water system bypassing the cooling tower
- No extra auxiliary device is necessary unless there is decreasing cooling load or heat recovery temperature can't meet the requirement

Source: Dany Watanabe – HPT Workshop – MASKEEI, 2020

Heat Pump Applications

Terminal Reheat (38 to 50 °C)

- Variable-air-volume (VAV) cooling systems can often require reheat for terminal zones when one air handler serves multiple zone types or mixed perimeter and internal zones

Domestic Water Heat

- Domestic hot-water usage volumes and patterns depend on the building type but the application of waste heat recovery is well suited to the temperature and load factor demands of chillers used for comfort cooling

Dehumidification (27 to 43 °C)

- If space supply air is overcooled for humidity control, hot-water coils can be used to heat the air for comfort control

Space Heating (35 to 71 °C)

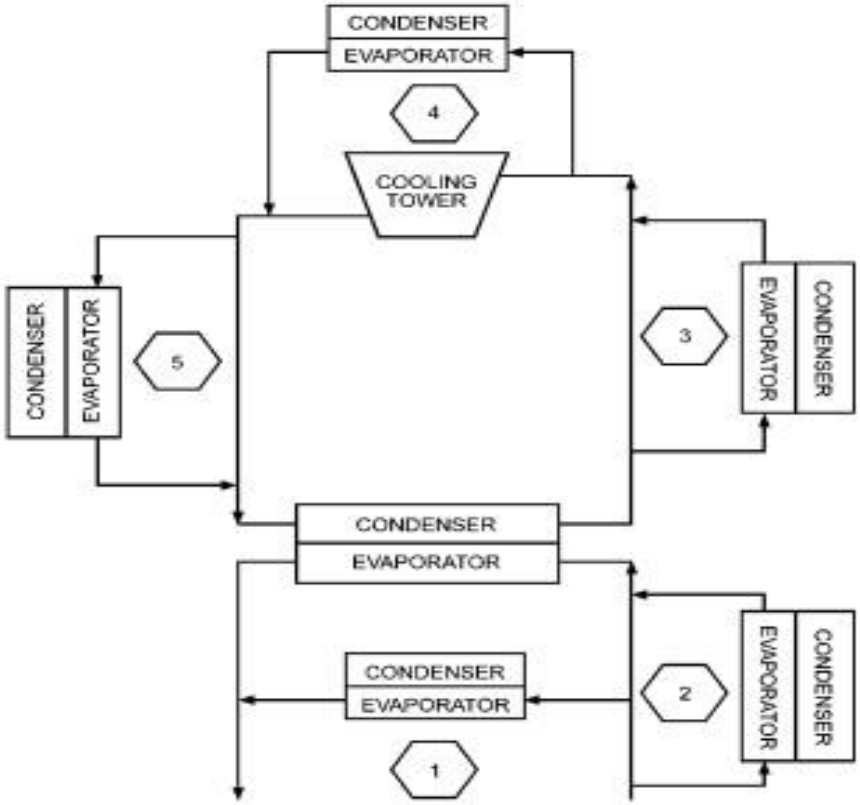
- Buildings requiring simultaneous heating and cooling for perimeter and interior zones, respectively, can be an ideal application of waste heat recovery because of the natural demand load balancing

Process Heating (Temperature Range Depends on Process)

- Although typically reserved for industrial processes, the demand factor of this application can be as high as 100%.

Source: 2020 ASHRAE HANDBOOK - Heating, Ventilating, and Air-Conditioning SYSTEMS AND EQUIPMENT

LOCATING HEAT PUMP

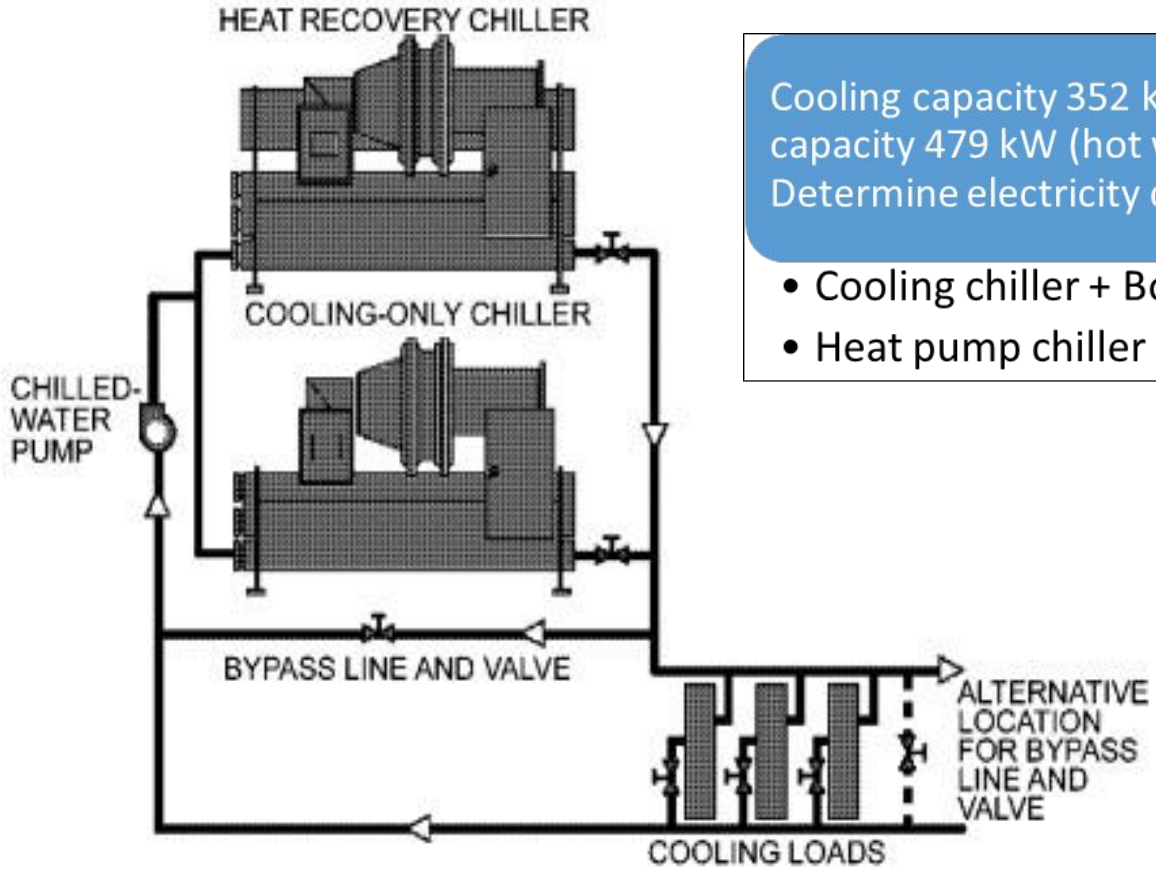


Possible Heat Recovery Heat Pump Locations

Source: Dany Watanabe – HPT Workshop – MASKEEI, 2020

- **Parallel application (location-1),** *a high-lift chiller because it must provide a temperature lift from chilled-water ranges to usable hot- water temperatures, this location can provide the highest overall system savings in a new design*
- **Sidestream Application (location-2),** *this unit can be used to supplement the existing chiller plant capacity and reduce the cooling*
- *tower capacity*
- **Cascade Application #1 (location-3),** *the lowest lift (and highest COP) for the HRHP, fouling must be given special consideration, and*
- *reduce cooling tower fan energy use*
- **Cascade Application #2 (location-4),** *Special considerations must be given to maintaining flow through the tower, potential*
- *overcooling of the cooling tower loop, and the added control complexity*
- **Cascade Application #3 (location-5),** *a higher lift requirement*

Case Study of Cooling Chiller + Boiler vs Heat Pump Chiller



Cooling capacity 352 kW x 2, 7/12 °C Evap Temp, heating capacity 479 kW (hot water temperature 60/55 °C). Determine electricity consumption and payback analysis:

- Cooling chiller + Boiler
- Heat pump chiller

Source: Dany Watanabe – HPT Workshop – MASKEEI, 2020

CASE STUDY – OPERATING COST

ITEM	30XW0502 (Heat Pump Chiller)	Cooling Chiller + Boiler (Electric)	Cooling Chiller + Boiler (Gas)	Cooling Chiller + Boiler (Fuel Oil)
Cooling Capacity (kW)	499	499	499	499
Power Input (kW)		99	99	99
Heating Capacity (kW)	589	589	589	589
Power Input (kW)	-	692	-	-
- Total Power Input (kW)	100	792	99	99
COP (Cooling+heating)	10.9	1.4		
Saving Energy (times)	7.9			
Running @100% load				
- CHWP (kW)	24	24	24	24
- CWP (kW)	9	17	17	17
- Hot water pump (kW)	16	16	16	16
- Cooling tower (kW)	3	6	6	6
- Cooling Chiller (kW)		99	99	99
- Cooling + Heating (kW)	100	792	99	99
Total System Power Input (kW)	151	954	262	262
LPG (ft3)	-	-	2364	
Solar (gallon)	-	-		17
Operating cost (USD)/Hr	15	95	44	62
Operating cost (USD), Annual (2920 Hrs)	44,100	278,539	128,151	180,424
Operating cost (IDR), Annual	639,445,941	4,059,905,686	1,858,183,121	2,616,153,351

Heat Recovery Condenser Information

Fluid Type:	Fresh Water	
Fouling Factor:	0.0440	(sqm-K)/kW
Leaving Temperature:	60.00	°C
Entering Temperature:	55.00	°C
Fluid Flow:	23.24	L/s
Pressure Drop:	58.3	kPa

Fuel Oil Price, Complete and Latest Information on Industrial Diesel Oil Prices in Various Regions | Price List & Rates
Heat Value & Boiler Efficiency (0.85), ASHRAE Journal

Source: Dany Watanabe – HPT Workshop – MASKEEI, 2020

THE HIGHLIGHT OF MASKEEI'S WORKSHOP ON HPT

1. Benefit of HPT (Heat Pump Technology):

a) **High Efficient Technology** **(COP ≥ 6), for every 1 input it gives 6 outputs,** can be implemented in various energy use.

b) Not only designed for heating system, but its application **can be combined both** **the cooling and heating systems.**

c) Some areas in economic system **can utilize get the benefit: Hotels, Hospitals, Restaurants and various industrial sub-sector.** Indonesia has some of ASEAN's largest foods & beverages, and pharmacy industries and 4th footwear producers worldwide.

2. Some aspects to be considered in promoting HPT in Indonesia:

a) Should be focused on **addressing the technology need** at the project development stage, and the first approach is made to the **buildings and factory owners**. The next approach shall be made to **the project consultants** at the design stage.

b) To promote HPT to **the operation & maintenance professionals**, ensuring that they understand the characteristics of the technology and the specific issues related to **how to maintain it in order to keep the performances consistently at optimum level.**

c) it is necessary to jointly conduct further **in depth discussions and to building a better awareness among the stakeholders**, in the form of short seminars, workshops, and capacity building program, that will ensure having adequate number of professional competence in operating and maintaining the technology to producing optimal performances during its economic life.

THANK YOU

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GLOBAL HEAT PUMP BEST PRACTICES: STRENGTHENING THE GLOBAL HEAT PUMP POLICY TOOL-KIT

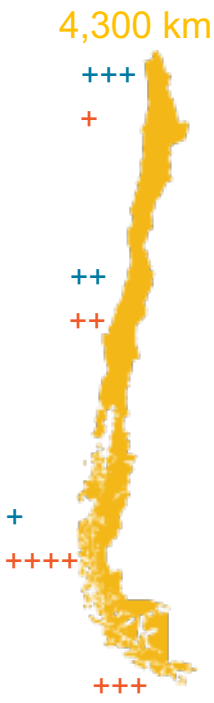
Heat Pumps Policies in Chile

July 10, 2024

Poullette Faraon Chaul
pfaraonchaul@raponline.org
Regulatory Assistance Project

From Tradition to Transition: Chile's Heating Sustainable Future

Geographical & Climate Diversity



- Heating AND cooling needs vary considerably across regions.
  - Increasing needs due to climate change
- Heating and cooling: 53% of residential final energy consumption

Variation in heating sources:

- North: electric heaters, liquefied gas and firewood
- Center: liquefied gas, firewood, kerosene and electricity
- South & Extreme South: firewood

The Heating Challenge

- Firewood is (still) King: 41% heating source
  - 90% in South / rural areas
- Environmental and health impacts:
  - Air quality- significant PM2.5 emissions from firewood (85% national level and 90% in some cities)
  - Forest management
- Government commitment to reducing PM2.5 pollution from heating by 70% by 2050
- Policies and programs in place to foster heating electrification, including heat pumps
- **Goal**: Electric heating to reach 56% of houses and 70% of apartments (2050)

Regulatory Policies

Policies need to be cohesive and well-communicated to maximize impact

Heat and Cold Strategy

- Comprehensive plan for development & adoption of sustainable energy for heating and cooling
- ↓ 65% GHG emissions from heating and cooling
- 80% sustainable energy use in heating and cooling by 2050
- Focus on RES, including biomass, solar PV, supplemented by electric heat pumps
- Development of district energy systems utilizing both ground and air-source heat pumps: aiming to ensure 75% of people have sustainable, reliable, and affordable heating and cooling
- 4 key pillars: sustainability for energy transition, institutional and regulatory strengthening, sector development training, and widespread information and education

Other Policies

- **National Energy Policy**: cover heating, hot water, and cooking demands with permanent access to electricity (2030) & low emissions clean energy (2040), at least 500,000 users connected to district heating networks (2050)
- **Residential Energy Transition Strategy**: cleaner, safer, and more efficient residential energy matrix; coordinating actions for efficient equipment and building conversions; focus on regulating the firewood market and providing affordable heating alternatives
- **Energy Efficiency National Plan**: development of district heating regulatory framework & economic incentives for the dev. of district heating projects (expected to start in 2024)
- **Mandatory energy efficiency labeling of public buildings** (2025)

Financial Support for Heat Pump Deployment

Current Financial Landscape

- **Heater Replacement Program**:
  - Goal: 190,000 heaters – only 18% by 2021 (financing difficulties)
  - Limited reach, mostly benefitted pellet technologies
- **Rechange your Heat Program**: 20% - 30% discounts on electricity tariffs for cleaner heating options to encourage shift to electric heating
- **Heating Subsidy**: for vulnerable families to cover winter gas/electricity bills
- **Electricity Subsidy**: for vulnerable families 15% - 30% discount on electricity bills
- Further programs support thermal conditioning, household improvements and energy efficiency

Recommendations

- Ensure careful evaluation and selection of supported technologies
- Consider broader economic impacts of new technologies (despite higher upfront costs)
- Enhance education and awareness: efficiency, overall cost savings, and benefits of available technologies
- Provide low-interest loans and integrate loan repayment with electricity bills
- Expansion needed for more significant economic signals and support mechanisms

Economic and Market-Based Instruments

Incentives and Initiatives

- (Insufficient) **Carbon tax**: $5 per ton of CO_2 VS $32.5 per ton (gov estimated as social cost of carbon)
  - **!** Emissions from stationary sources using biomass as primary energy source are exempt from this tax
  - Carbon pricing goal: reach at least $35 per ton of CO_2 equivalent (2030)
- **Green Bonds**: Financing for large-scale heat pump projects
- **Green Tax Emissions Compensation System** and **National Emissions Certification Program** (recent implementation): to support carbon neutrality, aiming to foster investments in new technologies, potentially incentivizing the use of heat pumps at the industrial level

Potential Improvements

- Enhance carbon pricing to reflect social cost of carbon
- Define allocation of carbon pricing towards decarbonization goals
- Include all emitting sources within the carbon tax applicability

Challenges and Opportunities

Challenges

- Firewood traditional / cultural use
- Support to other less efficient heating technologies
- Not easy to define a “one size fits all” heating and cooling policy
- Incipient stages- implementation “just” started
- Financing limitations to program deployments
- Heat Pumps’ high upfront costs
- Lack of awareness and information on benefits and overall cost savings
- Need for better coordination and communication among stakeholders
- Lack of information publicly available

Opportunities

- Significant environmental and health benefits from reduced PM2.5 emissions
  - Heat pumps emit ~ 230-300% less CO2 in domestic heating tan natural gas, electric fan or kerosene heaters
- Government incentives and policies in place supporting clean energy transitions
- Potential for district heating systems incorporating heat pumps
  - By 2050, could supply 40% of the heating market, reduce particulate matter pollution by 99%, save US$ 2,500 million in public health costs, and save 2,800 lives annually[1]

[1] Aalborg University, 2019. Heat Roadmap Chile. Quantifying the potential of clean district heating and energy efficiency for a long-term energy vision for Chile. https://www.districtenergyinitiative.org/sites/default/files/publications/heatroadmap-chile-170620201019.pdf

Closing Remarks

- Heat pumps are critical for Chile's decarbonization and air quality improvement goals
- Positive and promising outlook for heat pumps in Chile
- Need for cohesive policies that consider cross-sectoral benefits, thermal insulation, and overall cost efficiency to maximize impact
- Need to align initiatives to reduce energy demand and environmental impacts

The anticipated broader deployment of heat pumps in Chile, coupled with the country's goals of sector-wide electrification (including household and industrial heating), grid decarbonization, and increased renewable energy usage, requires meticulous planning and modeling. This careful approach is essential to maintaining energy security and ensuring grid stability through enhanced flexibility.

About RAP

Regulatory Assistance Project (RAP)® is an independent, global NGO advancing policy innovation and thought leadership within the energy community.

Learn more about our work at raponline.org

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GLOBAL HEAT PUMP BEST PRACTICES: STRENGTHENING THE GLOBAL HEAT PUMP POLICY TOOL-KIT

Heat Pumps - Challenges and Opportunities in India

Yatharth Kumar Sharma
10 July 2024

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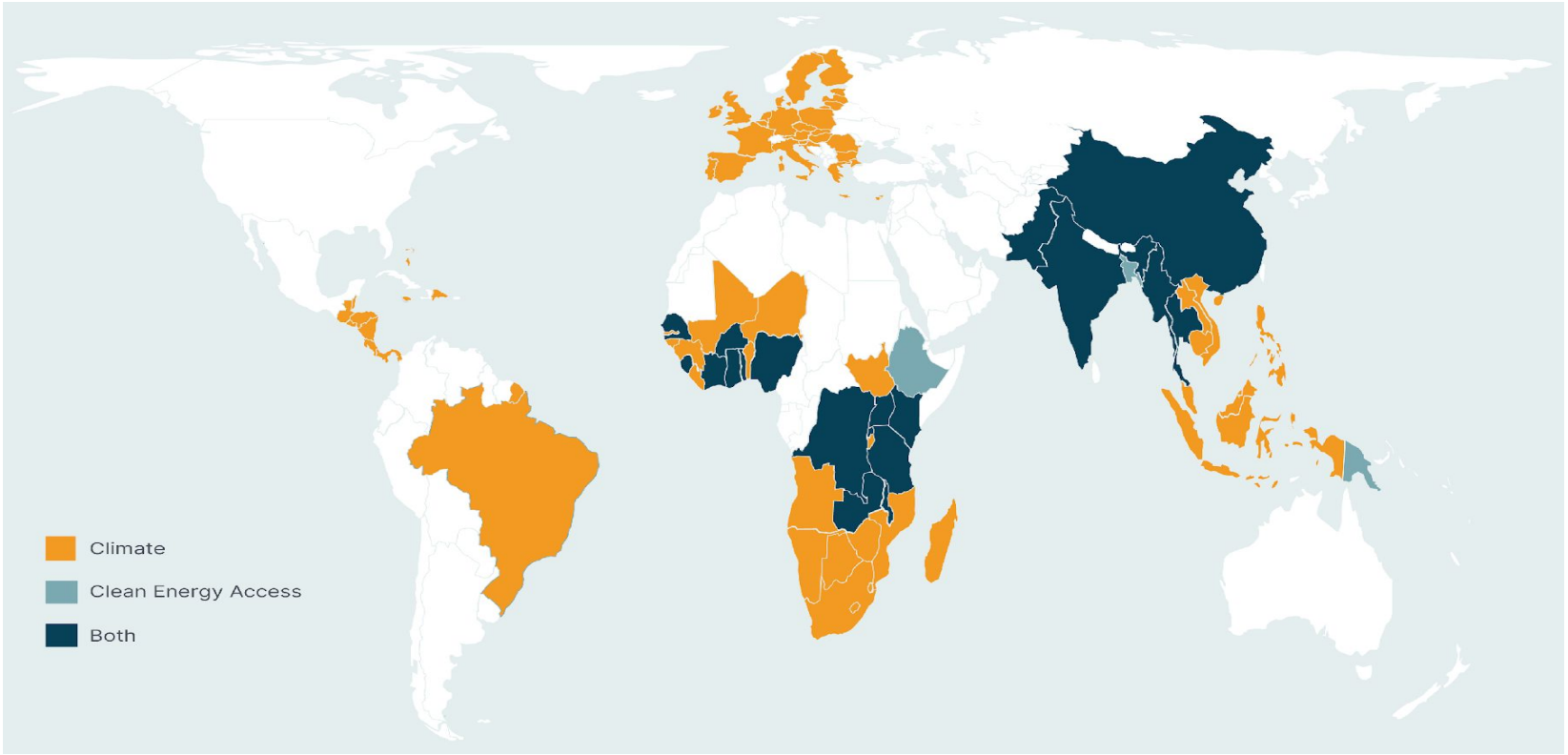
Efficient Appliances for People & the Planet

MISSION

clasp

CLASP improves the energy and environmental performance of the appliances & equipment we use every day, accelerating our transition to a more sustainable world.

Where We Work



Photos from Recent Launches and Capacity Building Sessions

Package boiler

Commercial Beverage Cooler

Solar Inverter

Market surveillance workshop at Kolkata

Cold chain event in New Delhi

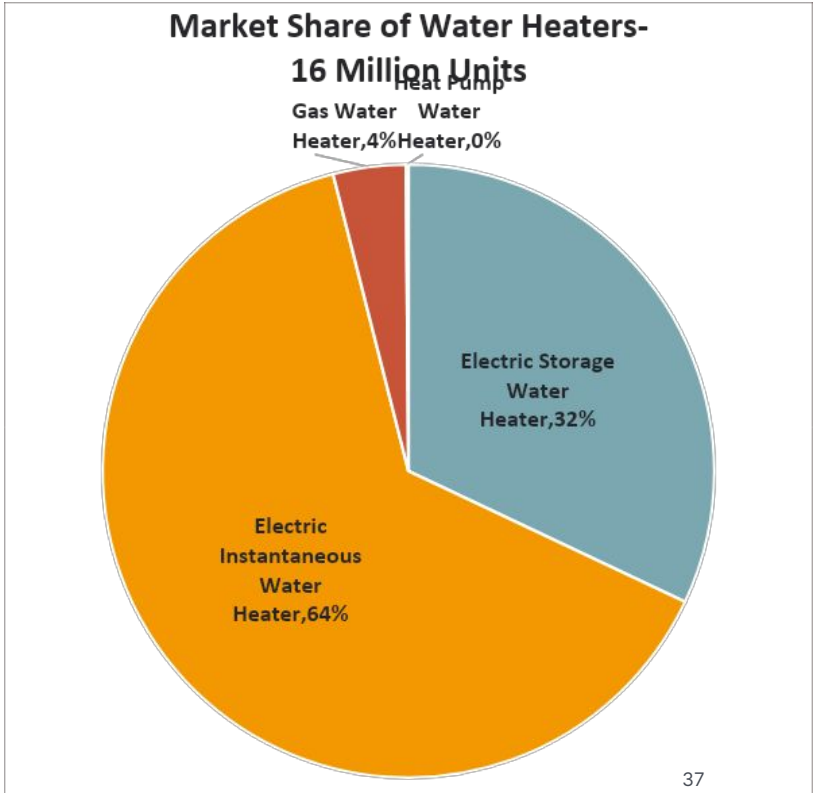
Overview of India's Water and Space Heaters Market

Market Size of Water Heaters

- India's water heater market valued ~ 280 million USD in 2023 and is anticipated to grow with a CAGR of 7.15% by 2029.
- Annual demand of water heaters in India is ~16 million units.

Market Size of Space Heaters – Room Heaters

- India's space heater market valued ~ 95 million USD in 2023 and is anticipated to grow with a CAGR of 6.76% by 2029.



Source: Industry

CLASP's Current Effort in India

Energy Efficiency Policy

- India has a mandatory Energy Efficiency (EE) policy (star labeling) for Electric Storage Water Heaters and a voluntary EE policy for solar water heaters. At present, India doesn't have an EE policy for heat pumps used for water and space heating.
- Annual demand of heat pump-based water heater is ~ 0.01 million units. However, it is anticipated that the market will grow with a CAGR of 5.80% between 2024 – 2032.

Challenges for using Heat Pumps in Water Heating and Space Heating

- High initial cost
- Difficult to retrofit in existing buildings
- Limited use of heat pump-based water or space heaters
- Lack of consumer awareness and local skills/expertise
- Absence of test standards and EE policy

CLASP is working to assess the potential of Heat Pump through market & technology assessment and regulating Heat pumps through MEPS.

Coordination

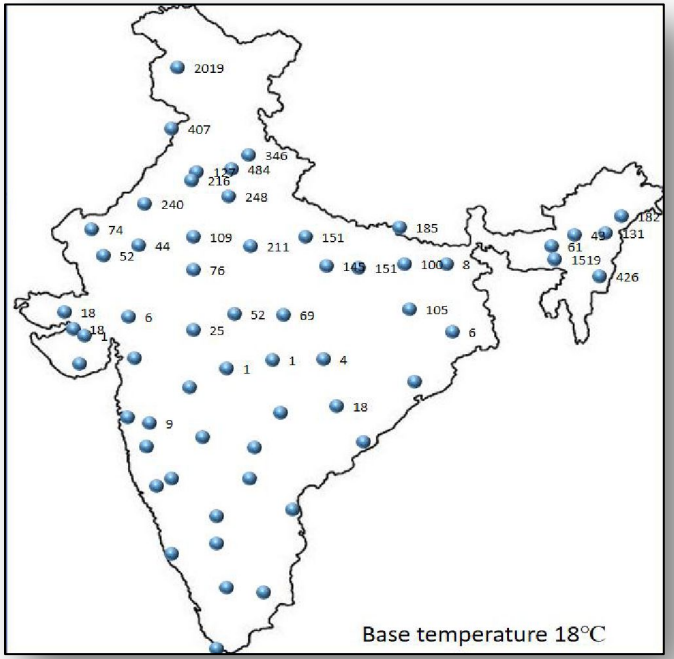
- Stakeholder consultation with industries and association.
- Consultation with the National Standard Body of India to make or update the test standards for heat pumps.

Regulation

- Support Bureau of Energy Efficiency (BEE) to make an EE policy for heat pumps used for water heating and space heating.

Challenges for using Heat Pumps in Residential Sector

Average Annual Temperature

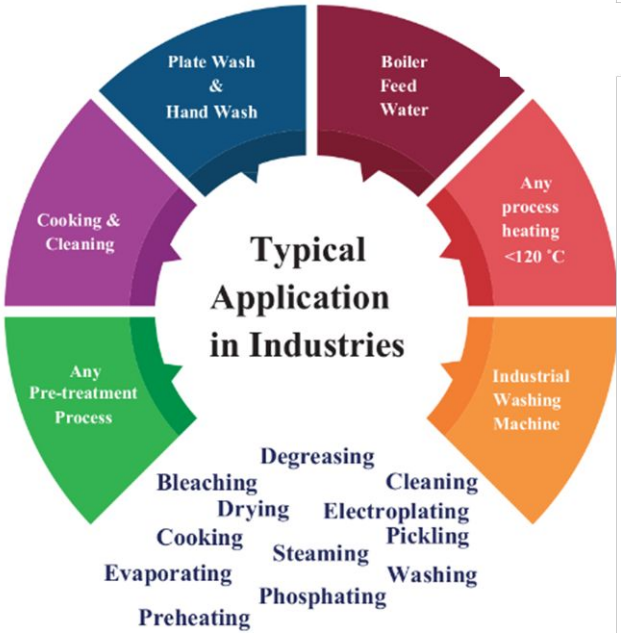


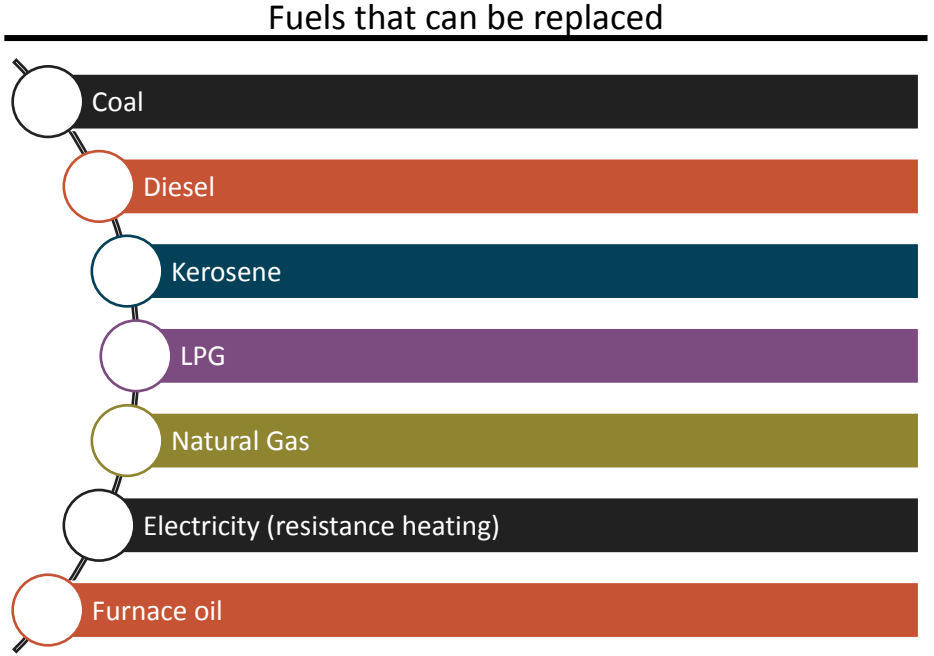
Heating Degree Days of 60 locations
(blank value denotes 'Zero')

Limited use of Heat Pumps in the Residential Sector

Opportunities – Heating for Industries

In FY 2023-24, the industry sector in India contributes 27.55% to the GDP.





Knowledge sharing with other countries with low heating degree days.

Case Study – Heating in Paint Shop

S.No	Description	Paint Shop	
		Before HP	After HP
1	Primary Energy Source	LPG Fired Boiler	Water Source Heat Pump
2	Heating Medium	Water	Water
3	Heat Transfer Method	Plate Heat Exchanger	Plate Heat Exchanger
4	Fuel/Energy Consumption per day	650 kg/day + 700 kWh/day	1800 kWh
5	Fuel/Energy cost	Rs. 50/kg	Rs. 8/kWh
6	Energy Bill per year	Rs. 125.73 L	Rs. 47.52 L

After installing heat pump the energy bill reduce by ~67%

Source: TRIGen Decarbonisation Pvt. Ltd.

Thank you!

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