Technical Note on a Proposed Common Heat Pump Taxonomy

International Energy Agency

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Executive summary

Heat pumps are an important technology opportunity for achieving secure, affordable and sustainable heating. They are already today starting to outsell natural gas boilers in major heating markets such as Germany and the United States and, as such, hold significant potential to impact future trends for energy consumption in buildings. Predominantly powered by electricity, heat pumps can contribute to diversifying the energy mix, enhancing efficiency and enabling the use of local energy sources that would otherwise be wasted. Heat pumps offer a scalable solution that can also provide flexibility services to an evolving electricity grid.

Tracking heat pump markets is essential to understanding the future heating trends, yet data on heat pump installations remains fragmented and inconsistent across regions. Despite their growing importance to future energy demand for heating, as well as investment needs in electricity infrastructure and fuel supply, reporting practices on heat pump installations differ in scope, definitions, metrics used (ranging from units sold to installed nominal thermal capacity[1]), transparency and frequency. This lack of harmonisation limits the development of reliable comparisons across markets or assessments of the contribution of heat pumps to meeting heat demand, which in turn constrains evidence-based policy design and cross-country benchmarking for policy makers, researchers and industry stakeholders.

The Heat Pump Taxonomy Project, led by the IEA in collaboration with stakeholders from over 50 institutions, proposes a common classification framework to support effective policy making. The proposed taxonomy is based on several characteristics such as application sector, fuel type, source, sink and product type, and it focuses initially on heat pumps used as primary heating equipment in buildings.[2] The proposed framework includes solutions for the challenges in classifying certain types of products, mainly for reversible air-to-air units, which make up the majority of heat pumps sold globally but which also overlap with the cooling market.

The IEA has identified five practical early actions to advance alignment towards a common taxonomy framework. If successfully adopted across regions, the proposed taxonomy would represent an important step towards

[1] Henceforth referred to as “capacity”.
[2] The buildings sector includes energy used in residential and services buildings. Services buildings include commercial and institutional buildings and other non-specified buildings. Building energy use includes space heating and cooling, water heating, lighting, appliances and cooking equipment. It also includes energy used by data centres and desalination plants.

consistent and transparent reporting of heat pump deployment worldwide. The IEA is ready to continue to provide a technical collaborative platform, for example through the recently formed Working Party on Built Environment and Transportation, for piloting and implementing the taxonomy consistently, as well as for working with governments to support this dialogue and for tracking progress.

1. **Accounting for reversible air-to-air units**. Categorising and accounting for air-to-air reversible units would enable clearer reporting of primary heating equipment and their contribution to energy efficiency and heating energy mix diversification.
2. **Accounting for hybrid and non-vapour-compression units**. Establishing reporting approaches to capture the share of hybrid and non-vapour-compression units within total heat pump sales.
3. **Introducing capacity reporting.** Reporting both units sold and associated capacity would capture not only market volume but also their impact in energy systems and would enable cross-market comparisons.
4. **Piloting the taxonomy**. Adopting the taxonomy would require a stepwise approach, beginning with piloting the framework and integrating lessons learned to refine both the taxonomy and data collection processes before advancing further.
5. **Expanding the taxonomy framework.** Exploring options to extend the framework to application sectors beyond buildings, and to adapt data collection processes to expand reported metrics beyond sales to include indicators such as coefficient of performance.

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The Heat Pump Taxonomy Project

The IEA has spearheaded global analysis on heat pumps over the past 5 years. Reports such as The Future of Heat Pumps, The Future of Heat Pumps in China and its Energy Technology Perspectives flagship technology report series illustrate those continuous efforts. Building on its technical expertise, the IEA embarked on advancing data reporting on heat pumps globally, working closely with international partners to systematically monitor and assess global heat pump markets. To further improve market comparability, the IEA has initiated a co-ordinated effort to facilitate discussion on harmonising heat pump data collection and reporting.

In 2024, under the umbrella of the IEA's Committee on Energy Research and Technology (CERT), a Heat Pump Co-ordination Group was established to bring together five IEA Technology Collaboration Programmes (TCPs) that are active in heat pump research and innovation.[3] This Co-ordination Group serves as a platform to streamline efforts, share best practices, and identify research gaps across the international heat pump community. Within this framework, a dedicated Working Group on Heat Pump Data, comprising industry associations, manufacturers and research institutions, was created to discuss heat pump data reporting, definitions and classification methodologies.

This collaboration led to the development of the **Heat Pump Taxonomy Project**, led by the IEA in collaboration with stakeholders from over 50 institutions. Through a series of workshops, technical discussions, and two written consultations in 2025, the group discussed a proposed common heat pump taxonomy and associated challenges, such as accounting for reversible air-to-air and hybrid systems, and explored approaches for reporting capacity-based data.

All project findings are presented in the four main analytical outputs. Collectively, these outputs provide both the technical foundation for harmonised data reporting and a communication tool to raise awareness among policy makers and the public about heat pump technologies. They comprise:

1. This Technical Note on a Proposed Common Heat Pump Taxonomy, which reports on the project's outcomes and its methodology, discusses the analytical rationale underpinning the proposed taxonomy and suggests possible next steps.

[3] The five supporting TCPs are: District Heating and Cooling, Energy in Buildings and Communities, Heat Pumping Technologies, Solar Heating and Cooling and Energy Efficient End-use Equipment. A further five TCPs are observers in the Group: Cities, Energy Storage, Industrial Energy Related Technologies and Systems, Photovoltaic Power Systems Programme, and User-Centred Energy Systems.

2. A Taxonomy Framework: a visual, hierarchical representation of heat pump categories and their relationships, providing a clear reference for classification boundaries.
3. A Cross-regional Data Reporting Mapping Matrix: an analytical tool mapping existing reporting practices by product type and how they compare to the suggested taxonomy, illustrating differences in regional practices and highlighting data gaps and opportunities for alignment.
4. A Heat Pump Taxonomy Technology Explorer: an online platform offering an accessible, interactive way to explore different heat pump types available in the market with fact sheets summarising their technical characteristics, major regional markets and applications.

Mapping the market: How heat pump data is reported today

The focus of this Technical Note is on heat pumps that are used as primary heating equipment, intended as the main equipment providing heat and covering the majority of heating needs. The boundary includes reversible units (such as reversible air conditioners) when they serve as the primary heating equipment. However, units used solely for cooling, or as a minor short-term complement to other heating equipment, are excluded. Within these boundaries, this Technical Note focuses on two main categories of equipment:

- Electrically driven heat pumps. These represent the vast majority of the heat pump market, and present the greatest challenge to achieving harmonisation across markets (and sometimes sectors) to enable more consistent availability of market data.
- Other heat pump products such as thermally driven and hybrid heat pumps, and emerging technologies. Representing niche market segments, this equipment is rarely reported but nonetheless exists and is therefore included in the proposed taxonomy framework.

The Technical Note primarily considers data reported by industry associations in the top heat pump markets (People's Republic of China [hereafter, "China"], Europe, Japan and the United States), while also providing an overview of other available data sources, including those from other countries or beyond industry associations.

Table 1 Heat pump data sources and key challenges identified in the project

Heat pump data landscape – Overview
Industry associations[4]
China: China Heat Pump Alliance (CHPA) • ChinaIOL
United States: Air-Conditioning, Heating, and Refrigeration Institute (AHRI)
Europe[5]: European Heat Pump Association (EHPA) • European Heating Industry (EHI) **Selected national associations within Europe:** Assoclima (Italy) • Bundesverband Wärmepumpe (BWP) (Germany) • Uniclima (France) • Heat Pump Association (HPA) (United Kingdom)
Japan: Japan Refrigeration and Air Conditioning Industry Association (JRAIA)

[4] Presented in decreasing order based on the size of heat pump markets.
[5] Note: the list of national associations reporting heat pump data in Europe is not exhaustive. The selected associations are presented to illustrate different national approaches, which are consolidated, to the extent possible, into a common reporting framework by EHPA.

Heat pump data landscape – Overview
Other data sources
Eurostat (European Union) • Ministry of Economy, Trade and Industry (METI) (Japan) • Heating, Refrigeration and Air Conditioning Institute (HRAI) (Canada) • Energy Efficiency and Conservation Authority (EECA) (New Zealand) • Clean Energy Regulator (CER) (Australia) • Energy Information Administration (EIA) (United States)

Table 2 Key challenges identified in the project

Cross-market challenges
• Inconsistent terminology for heat pump technologies. • Differences in product coverage across regions. • Variation in transparency and frequency of data collection. • Unit-based reporting dominates, but capacity, capacity ranges and performance metrics are often inconsistent.
Barriers to data reporting and availability
National-level barriers: • Fragmented data across supply chain actors. • Voluntary reporting leads to incomplete coverage. • Limited capacity in national statistical offices. • Limited availability of information on installed units and their operation. • Commercial sensitivity limits manufacturer data sharing.
International barriers: • Different heat pump definitions across countries. • Inconsistent metrics (units, shipments, capacity). • Different reporting frequency and survey methods. • Uneven data quality and accessibility due to varied data sources. • Lack of a harmonised international reporting framework.

Understanding heat pump reporting practices today

Heat pump deployment and market trends are documented by different stakeholders including industry associations, governmental and statistical bodies, manufacturers, research institutes and other specialised entities. Among these, industry associations play a particularly central role in monitoring and reporting on sales data. These data are often not systematically collected by other stakeholders, which instead focus on other indicators that can complement market data (such as subsidies, performances, or installed stock).

Industry associations serve as the primary aggregators and disseminators of market data at national and regional levels. Although all major markets for heat pumps are covered by industrial associations, none appear to offer truly global coverage. It is also worth noting that the frequency, accessibility and format of

their reporting frameworks often vary. In this Technical Note, the focus lies on regularly reported and publicly available data (although in some cases the data is behind a paywall) from major markets – China, United States, Europe and Japan – together accounting for over 90% of global heat pump sales. However, associations in other relevant markets such as Canada, Korea, Australia and New Zealand are included in order to map the scope of product reporting in this project.

In China, the world's largest market, China Industry On Line (ChinaIOL) and the China Heat Pump Alliance (CHPA) compile extensive monthly data from manufacturers, government programmes and market surveys, providing detailed deployment breakdowns by product type, regional distribution, components and refrigerant usage.

In the United States, the second-largest heat pump market, AHRI provides detailed monthly statistics on heat pump shipments and performance standards. The EIA also collects data on household heating systems through the Residential and the Commercial Buildings Energy Consumption Survey (RECS and CBECS, last published in 2020 and 2018, respectively), including the number of homes using heat pumps as their primary heating source.

In Europe, the third-largest heat pump market, EHPA, is a reference for heat pump market data, publishing annual reports and maintaining an interactive data platform that covers sales volumes and technology types, as well as providing national comparisons. While EHPA serves as a central hub for European heat pump data, it operates in close co-ordination with national associations, which are themselves members of EHPA and contribute with country-level data and insights. The EHI complements the reporting by offering a broader perspective on heating equipment trends, including oil and gas boilers, heat pumps, biomass and solar thermal systems, dating back to 2005. Its annual data, collected via national associations, provides valuable context for understanding heat pump sales (and stock bi-annually) within the wider heating market. The EHI occasionally also reports heat pump sales more frequently and with more granularity than in the annual report, however this is done on an irregular basis, as needed, and the data is not always publicly available. Importantly, reporting boundaries (for products and countries) differ between EHPA and EHI.

In Japan, JRAIA is the main provider of monthly statistics on air conditioner and heat pump shipments and Japanese market trends. The Ministry of Economy, Trade and Industry (METI) undertakes a Current Survey of Production to clearly identify the monthly trends in industrial production and obtain information to inform mining and manufacturing policies, with a wider scope covering all industries and products, including heat pumps.

In other markets, Canada's HRAI, for example, provides quarterly statistics on heating and cooling equipment, supported by federal and provincial programmes.

In New Zealand, the EECA collects annual data on product sales under their regulation relating to energy-using products, including heat pumps. By contrast, tracking in Australia is slightly different, as the CER tracks the installation of air-source heat pumps through its Small-scale Technology Certificates (STCs).

Reporting exhaustive data requires solid data sources that provide granular data. These typically include direct surveys to manufacturers or distributors, but combining those with other sources can provide deeper insights. For example, substantial information is contained in energy efficiency certifications, such as the US Environmental Protection Agency's ENERGY STAR, and in trade and customs registries, used to assess imports and exports, as well as funding programmes, such as the Canada Greener Homes Initiative from Natural Resource Canada, and product databases, such as the European Product Registry for Energy Labelling (EPREL).

While the diversity of sources enriches the data landscape, it also introduces challenges related to fragmentation, comparability and methodological consistency across markets.

Differences in terminology

The terminology used to describe heat pump technologies is broad and varied, reflecting the diversity of markets, regulatory and institutional frameworks. This variation is observed not only across regions but also within them, between countries and among different associations and reporting bodies. Such diversity in terminology is a reflection of the broad range of heat pump products, but can pose challenges for consistent data collection and interpretation, as well as international comparison and dialogue.

To better understand the extent of this variation, a review of publicly available materials from 30 national and regional institutions was conducted. Sources included market updates, technical documentation and certification schemes. From this review, over 200 distinct labels related to heat pump systems were collected. Consolidating and analysing these terms revealed that approximately 90 unique expressions are actively used to describe different technologies, configurations, sectors and performance characteristics.

This wide range of terminology could create barriers to cross-market comparison, underscoring the importance of interoperability for taxonomies, to support streamlined reporting and facilitate a broader understanding of heat pump types among policy makers, as well as streamline regulatory compliance processes for internationally marketed products.

This terminology mapping informed development of the taxonomy, enabling widely used and internationally recognised terms to be prioritised at the same time as avoiding overly local or niche labels.

Classification challenges

This section identifies key classification challenges related to the fragmentation and inconsistency of heat pump data reporting[6] across regions — notably the distinction between air conditioners and heat pumps, the limited visibility of hybrid and non-electric systems, and the lack of detailed breakdowns by system type (e.g. air-to-air versus air-to-water).

Heat pumps and air conditioners: where to draw the line?

Reversible air-to-air units, often referred to as reversible air conditioners, are devices based on the vapour compression cycle that can be used for cooling and heating. In several regions with mixed climates, where both heating and cooling services are required, these are among the most popular types of devices used for heating. It is estimated that in China, Japan, Canada and the United States, reversible air-to-air units are by far the most common type of heat pump sold. Even in Europe, where they are less common than in other regions, they still make up a sizeable share of all unit sales.

From a taxonomy perspective, these dual devices pose challenges. National associations broadly agree that reversible air-to-air units used as primary heating equipment should be counted as heat pumps in data reporting frameworks, as those units are displacing alternative types of heating equipment. However, it is not possible to ascertain at the point of sale whether a reversible air-to-air unit is going to be primarily used for heating, although some accounting methodologies have been put in place (see section A proposal to categorise and account for air-to-air reversible units).

Furthermore, reversible air-to-air units are often lumped together with non-reversible air conditioners or other heating-only heat pumps in sales reporting. This means that in some regions, reversible air-to-air units primarily used for heating make up an unknown fraction of all air conditioners or heat pumps sold. The amount is not negligible, as in some regions the sales of air-to-air units to be used for cooling (air conditioners) far outweigh the sales of heat pumps. In the case of China, for instance, ChinaIOL statistics are reported mainly in two categories: “air-source heat pumps” and “home air conditioners”, wherein the latter

[6] Reported figures may vary, as some associations track sales to end-users while others report manufacturer shipments. Both are referred to as sales for the purpose of this Technical Note.

category includes reversible air-to-air units. During 2024, there were more than 50 sales registered as “home air conditioners” for every registered sale of an “air-source heat pump”. This means that even if the fraction of home air conditioners that are reversible air-to-air units is small, they would still account for the majority of heat pump sales in the region.

Accounting for reversible air-to-air units used as primary heating equipment might require multiple steps (see section A proposal to categorise and account for air-to-air reversible units). There is no globally standardised or generally agreed method for this, and to date the only method available was developed in Europe by the EHPA and Assoclima. Their method uses a mix of information drawn from theoretical analyses based on sales by climate, and the results of a survey originally undertaken in Italy by Assoclima which is then extrapolated to other European countries. An explanation of the methodology, together with the correction factors used for each country, can be found on the EHPA website.

In addition to reversible air-to-air units, several other unit types can provide both heating and cooling, posing challenges for sales reporting. However, accounting differences for these units are generally less significant than for reversible air-to-air units, often with minimal impact on sales. The key unit types are:

- **Heat-recovery cooling equipment**. These are cooling-only units (such as non-reversible chillers) that recover heat from the cooling process. The recovered heat is available only when the unit operates and is typically stored or redirected for secondary uses, such as pre-heating domestic hot water or heating air in an air handling unit, rather than directly supplying the building’s space heating demand.
- **Reversible chillers**. Chillers are units designed to provide cooled water. However, some of these are reversible, and can also provide heated water. Depending on the region, these may be referred to as “reversible heat pumps”. The distinction is mainly based on application and differences in language and standards for heating and cooling. For example, there are cases where the same product is sold as a “reversible chiller” in Japan and as a “reversible air-to-water heat pump” in Europe. These units differ from heat-recovery chillers which deliver heat as a by-product only.

Hybrid heat pump systems

At the global level, hybrid heat pumps remain relatively uncommon, but do appear to a limited extent in the Netherlands, Italy, Japan and Canada, and only a few of the European heat pump associations report full statistics on hybrid heat pumps.

The IEA TCP on Heat Pumping Technologies defines hybrid heat pumps as "the combination of an electric heat pump and a fossil-fuelled boiler or furnace under a single optimised control strategy". Other organisations have differing definitions, for example, in the 2024 report on Hybrid heat pumps by the Regulatory

Assistance Project (RAP) hybrid heat pumps are instead defined as “an air-to-water heat pump combined with a condensing gas boiler operating under an optimised control strategy”. The European Commission guidance document of the recast Energy Performance of Buildings Directive defines them as “a hybrid product that combines at least two different types of heat generator... For these systems, the part using renewable energy (such as the heat pump or solar thermal) must provide a considerable share of the total energy output. Co-firing, for example direct co-combustion of biomass and coal in a solid fuel boiler, is not considered a hybrid heating system”. Regardless of exact definition, it is generally understood that a hybrid heat pump is an electric heat pump working in combination with another non-electric heating unit (heat pumps with an integrated electric resistance heater, for instance, are not considered as hybrid heat pumps within the scope of the taxonomy).

Hybrid heat pumps are configured either as “add-on” or “integrated” systems:

- In **integrated** systems, the heat pump and boiler/furnace come as a pre-packaged unit and are designed to operate together. Often these systems are designed so that the heat pump handles the heating baseload, and the boiler is only occasionally used to handle peak loads.
- In **add-on** systems, the heat pump is installed and used in addition to a boiler/furnace. This can be done as a retrofit, so that an already existing gas boiler is upgraded to a hybrid heat pump system through the addition of an electric heat pump. The heat pump and boiler do not have to be physically integrated, but do need to operate under a single control scheme to count as a hybrid system.

Hybrid heat pumps can have a variety of operational schemes depending on the configuration of the system – i.e. its size and control strategies – and external factors such as outdoor temperature, heat demand, energy prices, availability of fuels etc. Based on sales data, it is therefore not possible to ascertain whether a hybrid system will operate mostly using its heat pump or using its furnace/boiler, even if the system configuration is known. In principle, a system can be configured to maximise heat pump operation, even if its nominal capacity makes up less than half of the total heating capacity of the full hybrid system.

Hybrid heat pumps pose a challenge with regards to the taxonomy, as they cannot be classified and defined by the properties of the heat pump itself, and instead must be considered in their entirety within the system in which they operate. In the case of add-on systems, it is not always possible to know at the point of sale if the heat pump is going to be used on its own or if it is going to be part of a hybrid system.

Similarly to the experience with plug-in hybrid cars – where assumptions about electric driving mode shares were revised in light of real-world data – future studies

and reporting could allow for assumptions about heat pump contributions in hybrid systems to be refined over time.

Non-electric-driven heat pumps and emerging technologies

Most commercially available heat pumps for buildings today operate on the vapour compression cycle, in which a refrigerant fluid is compressed and expanded in a cycle to transfer heat. Other non-vapour-compression options or non-electric-driven heat pumps do exist, but are limited in terms of installations to date, and are often used for larger applications. Examples of such options are based on sorption cycles, which operate on the principles of either absorption or adsorption.

- **Absorption** heat pumps are thermally driven and operate by circulating a refrigerant through an absorption/desorption process in which a vapour is absorbed into a liquid.
- **Adsorption** heat pumps are also thermally driven and operate by circulating a refrigerant through a cyclic adsorption/desorption process in which a vapour is adsorbed at the surface of a solid.

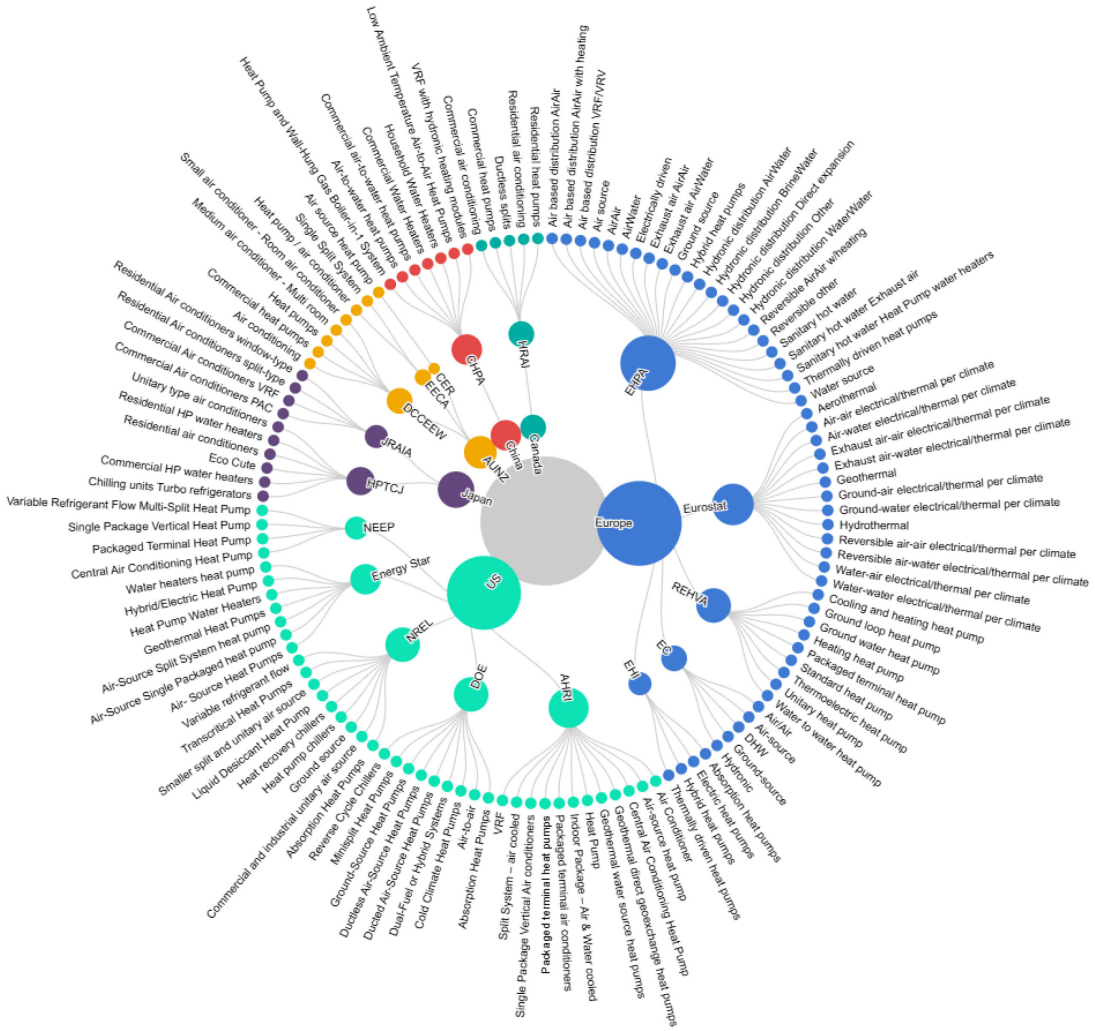
Sorption heat pumps provide the advantage that, being thermally driven and requiring little to no electricity, they can operate using renewable heat sources. They also avoid the need for refrigerants commonly used in vapour compression heat pumps, which are currently being phased out in favour of lower-Global Warming Potential (GWP) alternatives. Sorption heat pumps usually have a lower coefficient of performance than vapour compression alternatives but still offer better efficiency than a comparable boiler/furnace of the same size. Some small-scale commercial options exist for sorption heat pumps for buildings, but they are very limited, and none of the associations have any statistics on these categories of heat pumps. By contrast, large-scale sorption heat pumps are available commercially. They tend to be mostly used in larger multi-residency or service sector buildings, or in district heating and cooling, where they can be configured to provide both heating and cooling.

Besides sorption heat pumps, other examples of non-electric heat pumps exist, such as gas-engine-driven heat pumps that use an internal combustion engine instead of an electric motor to power the compressor in a vapour compression cycle. These heat pumps are uncommon worldwide but do appear to some extent in Japan.

In addition, emerging technologies include solid state devices, thermo-acoustic heat pumps, membrane heat pumps, metal hydride heat pumps, and more, none of which are commercially available today. See the IEA's ETP Energy Technology Guide for more information on emerging heat pump technologies.

From a taxonomy perspective, this equipment is easily identifiable, though it may be produced by manufacturers other than those reporting to heat pump industry associations and can often be used across multiple sectors, including buildings and industry. Currently, these products are often not included in data reporting and represent a negligible market share, but this may change in the future.

Figure 1 Diverse terminologies employed across published materials in selected institutions



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Notes: AHRI= Air-Conditioning, Heating, and Refrigeration Institute; AUNZ = Australia and New Zealand; CER = Clean Energy Regulator; CHPA = China Heat Pump Alliance; DCCEEW = Department of Climate Change, Energy, the Environment and Water; DOE = Department of Energy; EC = European Commission; EECA = Energy Efficiency and Conservation Authority; EHI = European Heating Industry; EHPA = European Heat Pump Association; HPTCJ = Heat Pump and Thermal Storage Technology Center of Japan; HRAI = Heating, Refrigeration and Air Conditioning Institute of Canada; JRAIA = Japan Refrigeration and Air Conditioning Industry Association; NEEP = Northeast Energy Efficiency Partnerships; NLR = National Laboratory of the Rockies (previously NREL); REHVA = Federation of European Heating, Ventilation and Air Conditioning Associations. The size of the bubble is proportional to the number of different terms counted in that market. The list of terms covers most institutions publishing market reports or data in major heat pump markets, but it does not aim to be fully exhaustive.

Around 90 unique expressions are actively used to describe different heat pump technologies across 30 institutions.

Differences in collection and reporting mechanisms

The methods used for the collection and reporting of heat pump market data differ significantly across regions, shaped by different institutional frameworks, industry practices and the level of data accessibility. This section of the Technical Note outlines the main characteristics of the reporting mechanisms in China, the United States, Europe and Japan, providing insight into how data is gathered, processed, validated and disseminated.

Table 3 Overview of regional reporting mechanisms in major markets, 2024

Region (main reporting association)	**Primary data source and scope covered**	**Collection and processing method**	**Dissemination frequency and data access**	**Documentation of methodology**
China (ChinaIOL)	Supply chain data from 500+ domestic and international Heating, Ventilation and Air Conditioning (HVAC) entities, covering domestic market and exports	Monthly collection, cross-validation across the industrial chain, consistency checks, forecasting the next year	Monthly, quarterly or annually depending on product. Limited public access, no detailed regional breakdown	Not publicly available
Europe (EHPA)	Manufacturer data via national associations, covers European-level data (19 countries)	Annual questionnaire to national associations, anonymised and aggregated by third parties, submitted to EHPA and harmonised to ensure consistency across countries; no quantitative forecasting	Annually, limited public access, includes breakdown by country	Publicly available
Europe (EHI)	Manufacturer data via national associations, covers European-level data (13 countries)	Quarterly	Annually, public access, includes breakdown by country	Not publicly available
Japan (JRAIA)	Voluntary submissions from top manufacturers, covers national-level data	Monthly survey, aggregated internally, domestic demand forecasting, global demand estimation	Monthly, public access, no detailed regional breakdown	Limited publicly available information
United States (AHRI)	Voluntary submissions from AHRI member companies, complemented with data from AHAM.[7] Covers national-level data	Monthly collection, aggregated internally, descriptive only	Monthly, public access, no breakdown by state	Not publicly available

[7] AHAM = Association of Home Appliance Manufactures.

While all regions rely on data submitted by manufacturers, Europe offers relatively transparent and structured methodology documentation, already showing harmonisation efforts across countries.

Analysis of 2024 sales suggests that data on only about 35% of global sales month-by-month can be accessed publicly each month, while more can be accessed on an annual level, bringing the total share of sales covered by data to around 50%. Full access to data from China and Europe would increase coverage to 90%.

Differences in products reported

Despite the diversity of terminology and reporting processes across regions, some commonalities in the products covered in data reporting can be identified across regions. All major industry associations classify heat pump products by heat source: each association reports at least one category under natural source (air, water, ground) electric-driven vapour compression systems, which form the technological core of (modern high-efficiency) heat pumps.

Beyond this commonality, reporting diverges significantly across regions. The first point of difference is related to what is included within the "heat pump" category. Key differences include:

- **Hydronic systems (which use water as the heat-transfer medium in the distribution system of the building) are allocated to primary heating use, especially for the residential sector.** Most industry associations classify products according to the end use in which they are used. Heat pump water heaters are consistently reported, as they serve a well-defined and easily identifiable purpose. Electric-driven vapour compression systems using hydronic distribution for space heating, or combined space and water heating, are also broadly reported as primarily heating equipment.[8] The main exception is in North America, where hydronic systems are less common, and reporting is therefore limited. In the residential sector, these products are typically sized for heating loads, making it possible to confidently assign them to the heating market.
- **The greatest reporting challenge arises with reversible air-to-air units, which can be used for both heating and cooling**. From a manufacturer's perspective, the product is the same regardless of its intended use, which complicates allocation to either end use. Accurate accounting therefore depends on the availability of supplementary data (see A proposal to categorise and account for air-to-air reversible units). Currently, Europe (although not all markets, excluding, for example, Germany, the Netherlands and the United Kingdom), Japan, China, and the United States all report sales of reversible air-to-air units. However, only

[8] The hot water function is often not reported separately. Hydronic systems can also be used for cooling, but not many have cooling as a primary use case.

EHPA, the Italian Assoclima and Spanish Asociación de Fabricantes de Equipos de Climatización apply a methodology to estimate the share of sales used as primary heating equipment. The United States counts all such units as heat pumps, while Japan and China classify them all as air conditioners. These differences are a major source of inconsistency in global heat pump data reporting.

- **Other natural source electric-driven vapour compression systems (ground/water-source heat pumps), which represent a smaller share of the market, are reported by industry associations only in Europe and China**. In the United States, they are covered by the Energy Star programme, and in Japan, by a bi-annual survey from the Ministry of Environment targeting installed stock. This may be linked to the difficulty in allocating them to a sector, as they are also frequently used in industry and district heating.
- **Hybrid and non-vapour compression systems are under-represented outside Europe.** Thermally driven heat pumps are reported sporadically in Europe and China, while Japan is the only market that explicitly reports gas engine heat pumps. Hybrid systems (see Hybrid heat) that combine multiple technologies or fuels also fall outside most reporting boundaries. Only Europe consistently tracks these systems, as in some countries they account for a non-negligible share of installations and qualify for national subsidy programmes (e.g. in Italy and the Netherlands).

Furthermore, some regions – notably Europe – disaggregate data by application sector (residential vs. commercial). Others, such as China, classify systems by capacity, since similar products may serve different sectors.

Table 4 Overview of regional differences in heat pump sales reporting by reference industry association in major markets, 2024

Region/ market	Reversible air-to-air	Other natural source	Hybrid units	Non-vapour compression	Key observations
China	Reported, not counted as heat pumps	Not reported	Not reported	Partially, sorption	Data mainly reflects hydronic system
Europe	Reported, partially counted as heat pumps	Reported	Reported in most markets	Reported in limited markets	Most comprehensive reporting, harmonisation across Europe
Japan	Reported, not counted as heat pumps	Not reported by industry association	Not reported	Partially, gas-driven heat pumps and sorption	Data mainly reflects heat pump water heaters
United States	Reported, all counted as heat pumps	Not reported by industry association	Not reported	Not reported	Hydronic systems uncommon

Notes: "Other natural source" refers to air-water, groundwater and water-water units. For more details, see the Cross-regional Data Reporting Mapping Matrix.

Analysis of product coverage across regions revealed significant gaps for all product systems. The findings directly informed the taxonomy's scope: all identified heat pump product categories were explicitly included to ensure comprehensive representation of technologies currently available in the market, including those that are under-reported. At the same time, individual markets retain the flexibility to prioritise categories most relevant in their specific context.

Differences in metrics reported

Traditionally, heat pumps have been classified based on several core categories: by sector (residential, commercial, industrial), by application (heating, cooling, hot water), by source and by sink. These categories help classify heat pumps by their energy input, their output medium and their functional use, which remains critical for technical and policy analysis.

By contrast, most market reports focus on units, commonly reported in terms of overall units shipped or sold. This provides a snapshot of overall market activity, helping track growth and communicate trends simply, as well as supporting consistent year-on-year comparisons.

However, this approach presents significant challenges in getting the full market picture, as the definition of a unit can vary across associations and across countries, particularly in cases involving split systems, for which the indoor and outdoor components of heat pumps may be counted separately or jointly, depending on the reporting convention adopted. This makes it challenging to establish a consistent boundary for comparison.

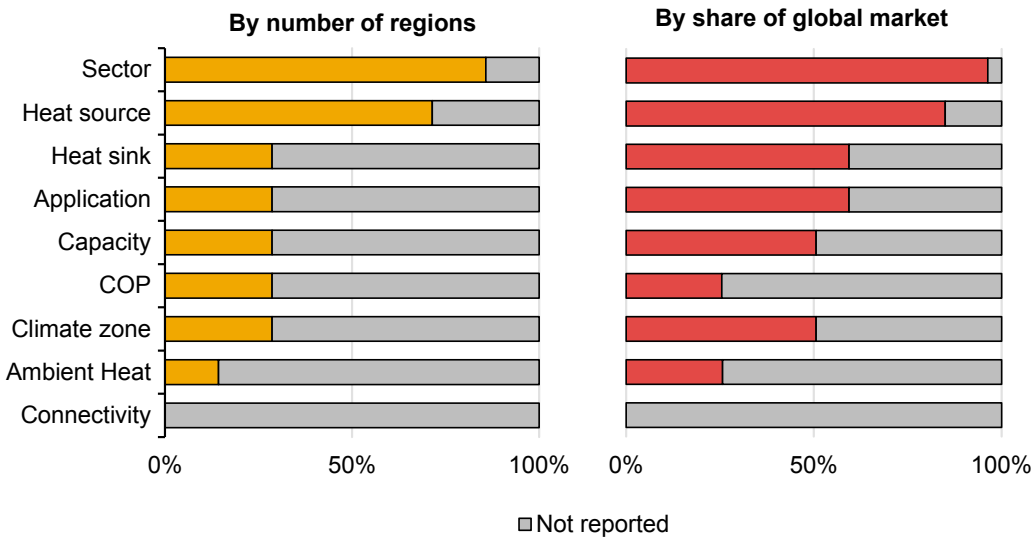
Moreover, reporting solely the number of units is insufficient to inform policy making for energy and industrial strategies. Key indicators such as the amount of fossil fuel – especially natural gas – displaced, and the electricity consumption of heat pumps, are essential. To assess these indicators, data on the capacity per unit is crucial. However, such information is available in less than one-third of the major heat pump markets, covering only about half of the global market.

Even among associations and statistical bodies that do report installed capacity, the level of detail might differ. Some, like Eurostat, provide aggregate capacity figures in gigawatts, while others in the United States or certain European countries offer more granular data, including the number of units sold by capacity range. Ensuring the standardisation of capacity brackets across these sources would greatly benefit aggregation and cross-country comparisons, allowing for a better understanding of local market realities.

Beyond sales data and associated categories and capacities, other critical market indicators – such as efficiency, cost, installation characteristics, refrigerant type, connectivity and operation hours – are rarely reported and often do not overlap

across regions. Better insights into such indicators, as well as into imports/exports, supply chains and refrigerant usage, would improve the evidence base for policy development, support industry strategies and inform regulatory frameworks. ChinaIOL, for instance, provides a relatively detailed level of reporting across all stages of the supply chains, thanks to a strong network of manufacturers (although not all information is publicly available). Other indicators on costs and installations might require using other collection techniques, directly gathering information from consumers. Information on ambient heat is rarely reported. Eurostat continues to play a key role in developing, refining and promoting the methodology for ambient heat reporting, including through international co-operation and methodological guidance.

Figure 2 Share of sources reporting key heat pump indicators in major markets, by number of regions (left) and weighted by market size (right)



Notes: COP = coefficient of performance. Sources refer to associations, statistical bodies or governmental institutions. Markets include China, Japan, the United States, Europe, the United Kingdom, Canada, Australia and New Zealand. Connectivity refers to heat pump products with connectivity function. A dull list of audited institutions is listed in the section Mapping the market: how heat pump data is reported today.

Most sources report only unit sales, while other critical indicators related to heat pump products are rarely reported and often do not overlap across regions.

The finding that most associations within the scope of this Note only report unit sales, with limited data on capacity, efficiency or refrigerants, has reinforced the need for a taxonomy that goes beyond product classification. While the first version of the taxonomy focuses on product categories, it is designed as a foundation for future integration of additional indicators (e.g. performance, refrigerant type), supporting a more holistic reporting framework.

Barriers to harmonised data reporting

While several initiatives are underway to collect heat pump sales data (and related market information), stakeholders involved in these efforts continue to face barriers that limit the expansion and increased frequency of reporting.

At the national and regional levels, the main challenges relate to fragmented data collection across multiple actors in the supply chain, the absence of mandatory or co-ordinated reporting requirements, limited regional breakdown, institutional capacity and resources, and concerns about data confidentiality. These barriers arise largely from the diversity of stakeholders involved, including manufacturers, importers, trade associations and installers, who may provide information to different national bodies without a co-ordinated mechanism that allows data aggregation. This often leads to overlaps, gaps, or inconsistencies between datasets.

In addition, in most countries, reporting by manufacturers, distributors, or installers remains voluntary, resulting in incomplete market coverage. Limited institutional capacity within national statistical offices also constrains their ability to process and integrate such data in broader energy statistics reporting framework, as heating technologies like heat pumps are not always prioritised within such frameworks. Consequently, data collection is often led by industry associations, which must also manage issues related to commercial sensitivity, as manufacturers may be reluctant to share detailed sales figures for competitive reasons.

At the international level, these challenges are amplified. Differences in definitions of heat pumps, variations in reported units (e.g. sales vs. shipments, capacity vs. number of units), and inconsistencies in reporting methods and frequency all hinder comparability. Divergent survey designs, data sources (official statistics, industry surveys, or market studies), and estimation methodologies further contribute to uneven data quality across countries.

Proposal for a common heat pump taxonomy

The common taxonomy proposed in this Technical Note was developed through a series of workshops, technical discussions and two written consultations in 2025, led by the IEA in collaboration with stakeholders from over 50 institutions. It is conceived as a shared framework for heat pump sales reporting, creating a structured way to classify heat pump sales based on shared technical and functional characteristics, as well as those related to application, and building on international best practices.

Benefits of a common taxonomy

A common global taxonomy could significantly enhance the accuracy and comparability of heat pump market data, providing policy makers with robust evidence to design, develop and monitor energy and industrial policies, while giving industry stakeholders a clearer understanding of market dynamics and investment opportunities across regions. It could also enable industry associations to more effectively collaborate with each other internationally. At the same time, its adoption by policy makers and regulators across borders could facilitate compliance for manufacturers operating in multiple markets, and reduce associated costs. Moreover, by improving the transparency and consistency of product categorisation and performance metrics, it could help consumers better understand the relationship between performance and price.

Key advantages stem from standardised and more granular data collection and reporting frameworks, and include:

- **Comparability across markets**. The taxonomy would enable consistent assessment of global market patterns and trends, facilitating cross-country benchmarking and analysis. For instance, comparing air-to-air heat pump uptake in Japan, China and the United States could become meaningful if all those countries report within the same boundaries of product and capacity range (see A proposal to categorise and account for air-to-air reversible units and Capacity ranges in the Heat Pump Taxonomy Technology Explorer).
- **Better-informed policy making**. Access to reliable evidence for designing and adjusting policy instruments related to both demand creation and industrial strategies could support measures including:
  - Targeted incentives with measurable impact. Clear product categories allow policy makers to identify trends and tailor financial incentives to specific heat

pump types, evaluating their effectiveness over time and directing funds where they have the greatest impact. As an example, a subsidy programme could prioritise heat pumps for the renovation of multi-family buildings if sales data clearly identifies such applications.

- Deployment target setting and monitoring. Precise product classification enables the establishment of better-informed deployment targets and consistent tracking of progress, allowing for measures to be adjusted if measured impact is not as expected, in turn ensuring higher impact. Harmonisation of definitions and boundaries for data reporting across countries becomes even more relevant for regionally developed demand creation strategies. As an example, it could facilitate year-on-year benchmarking of the RePowerEU target, including progress at the national level towards the regional target.
- More effective industrial policies. A common heat pump taxonomy enables the identification of supply security risks by allowing imports (from different origins) and domestic products to be compared consistently, as well as the identification of high-value products to effectively prioritise strategic investments along heat pump supply chains. As an example, it would be possible to identify fast-growing product segments and local manufacturing gaps in Europe in order to design policies that increase domestic production and reduce reliance on regionally concentrated imports.
- Effective comparison of best practices. Standardised categories make policy assessments more robust and transferable across regions. As an example, Canada and Sweden would be able to compare adoption patterns under different incentive schemes and identify effective approaches.

- **Greater market confidence**. Improved comparability helps manufacturers, investors and utilities anticipate demand growth; plan cross-border capacity expansion, R&D and workforce development; and design industrial partnerships with greater certainty. As an example, a manufacturer considering entry into Southeast Asia can rely on standardised sales data to assess potential demand for domestic hot water heat pumps, rather than relying on fragmented or incompatible statistics.
- **Strengthened international collaboration**. A common heat pump taxonomy would also indirectly support the alignment of product standards and labelling schemes.

Previous efforts to consolidate heat pump market data

Efforts to harmonise heat pump market data have historically been fragmented and largely regional rather than global. Most initiatives have been led by industry associations or national bodies aiming to improve transparency within their own jurisdictions. For example, in Europe, the EHPA has worked closely with national

associations to standardise reporting templates and definitions across member countries. This has enabled the production of annual consolidated heat pump sales data statistics for Europe, including a breakdown by technology type and applications for countries where the data is available. Likewise, Eurostat also developed a harmonised approach for reporting capacity by heat pump type and ambient heat calculation by sector for European Union member countries

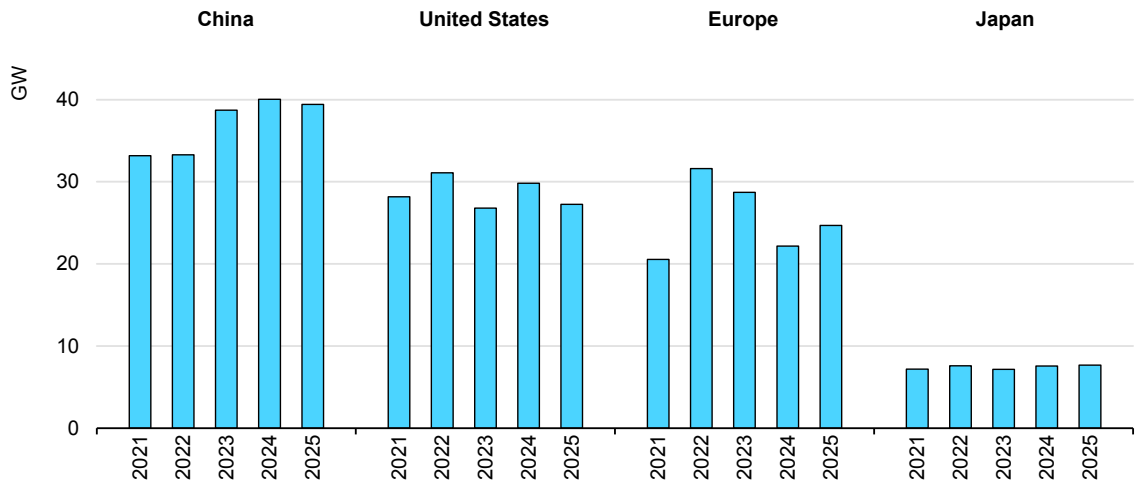
Despite these efforts, there has been no globally co-ordinated framework to align definitions, reporting boundaries and metrics. Existing initiatives remain limited in scope, often focusing on mapping existing policies rather than understanding market trends. International collaboration has been sporadic, with some progress in Europe towards harmonising national systems, but no comparable mechanisms in other regions. As a result, cross-country comparisons are still constrained by differences in terminology, product coverage and data granularity.

In recent years, the IEA has taken a leading role in advancing sales data reporting on heat pumps, positioning itself as the only institution that systematically monitors and reports on global heat pump markets. Building on data collected from various industry associations, the IEA has established a harmonised framework for data collection that applies consistent boundaries across regions, enabling meaningful cross-market comparisons.

This framework is underpinned by two key principles:

- Capacity archetypes: while most industry associations report the number of units sold or shipped – a valuable indicator in itself – the IEA has adopted a complementary approach focused on capacity trends. Reporting data in terms of heating capacity allows for a clearer link between market deployment and its potential contribution to meeting heat demand. To translate such data into capacity, the IEA applies assumptions on the average capacity per unit sold or shipped, differentiated by heat pump type and regional market characteristics.
- Inclusion of reversible air-to-air units used as primary heating: in several regions – such as central China, Japan, the United States and parts of Europe – reversible air-to-air units are widely used for heating, as the primary heat equipment. Excluding these systems would therefore provide only a partial view of the market. For regions where such units are not explicitly reported, the IEA has developed an in-house methodology to estimate their contribution, drawing on climate data and sales information.

Figure 3 Heat pump sales in key regions according to the IEA accounting framework, 2021-2025



Reporting sales by heating capacity better reflects the contribution of heat pumps to meeting heating demand than reporting unit sales alone.

While the initial efforts undertaken by the IEA mark an important step towards improving the understanding of global heat pump market trends, further work is required to harmonise the identified inconsistencies in data reporting across regions.

A proposed common Heat Pump Taxonomy Framework

Aligning all global heat pump data reporting frameworks around a single common taxonomy is too ambitious a goal – at least in the short term. The goal of the proposed taxonomy in this Technical Note is rather to provide an interoperable basis to enable cross-market comparison. Building on regional best practices, the present taxonomy aims to foster international co-operation to propose common definitions and data reporting boundaries as an initial step in this process.

The IEA has developed a proposal for a common taxonomy framework, grounded in existing reporting practices, and in consultation with several stakeholders. The core principles of this taxonomy and classifications are detailed in this section.

Heat pumps refer to equipment used as **primary heating equipment**, i.e. intended as the main equipment providing heat. This includes reversible air conditioners when they serve as the main heating equipment. However, it excludes reversible air conditioners used solely for cooling, or as a complement to other heating equipment, such as a boiler (see sections A proposal to categorise

and account for air-to-air reversible units and Heat pumps and air conditioners: where to draw the line?). In this first version of the taxonomy, the focus is on units deployable in the buildings sector, residential and services buildings, and delivering heat for space heating and/or domestic hot water provision. While some products covered in this taxonomy can also be deployed in district heating and industry, product coverage for such applications might not be comprehensive and are a possible scope for future extensions of the taxonomy.

Within the proposed taxonomy, products are organised into exhaustive (full product coverage) and mutually exclusive categories (no overlap across categories) and organised into a consistent hierarchy. This is aligned, as far as possible, with existing classification categories used internationally.

In the proposed taxonomy framework, heat pumps are classified based on:

1. Sector: this first criteria for classification focuses on the buildings sector, the principal market segment of current heat pump sales, although some products covered can also be deployed in industry and district heating.
2. Fuel type: electrically driven, thermally driven, hybrid heat pumps and others.
    a. For electrically driven:
        i. Source: air source, ground/water source, including waste heat;
        ii. Sink: air-based and hydronic.
3. Product type: the most common product types typically reported and sold.
4. Sub-type: distinguishes different configurations and system designs across product types, such as split or monobloc units.

Other characteristics that might be relevant for classifying heat pumps (e.g. temperature levels, compressor types and refrigerants) are not used as criteria for classification but are instead considered as characteristics for describing the classes.

Key outcomes of the IEA Heat Pump Taxonomy Project

The IEA Heat Pump Taxonomy Project relies on four key outputs. Three of those outputs are primarily intended for a technical audience consisting of industry associations, statistical bodies, industry analysts and researchers who are already familiar with the fundamental technical aspects of heat pumps. The fourth output, the Heat Pump Taxonomy Explorer, is intended more as an educational tool for a non-technical audience, such as policy makers or the general public.

Table 5 Key outputs of the IEA's Heat Pump Taxonomy Project in 2025

	Key output	Content	Purpose
Tools for a technical audience	Taxonomy Framework	A **hierarchical, tree diagram-style visual of the proposed heat pump classification.**	Help users to quickly understand the overall structure, scope and boundaries of the taxonomy.
	Cross-Regional Data Reporting Mapping Matrix	A **comparative analytical framework** between different regional reporting schemes and the taxonomy's categories and definitions.	Facilitate consistent cross-country comparisons and support harmonisation of reporting practices.
	Technical Note	A **detailed technical report** explaining the methodological foundations, rationale and data sources underlying the design of the proposed taxonomy.	Provide transparency on the development process and establish the technical credibility of the taxonomy.
Tools for a non-technical audience	Heat Pump Taxonomy Technology Explorer (online)	Concise, accessible **web-based platform** offering an interactive way to explore different heat pump types available on the market, with fact sheets summarising their technical characteristics, major regional markets and applications.	Enable non-technical users to easily navigate and understand differences between heat pump product types.

Taxonomy Framework

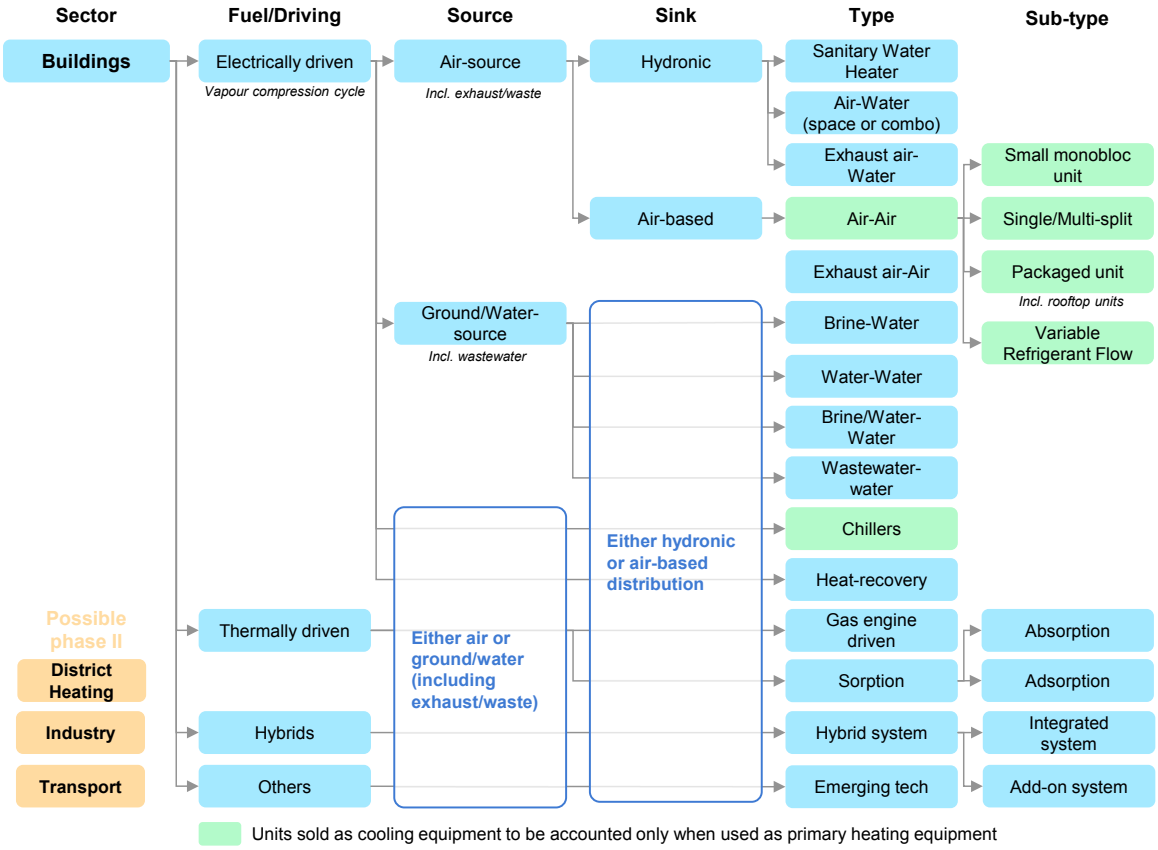
The Taxonomy Framework provides a clear illustration of the structure, scope and boundaries between heat pump product categories. It serves as a reference point for understanding how different heat pump types are organised and related within the overall classification.

Defining heat pump categories requires balancing technical precision with practical data availability. While, in theory, products could be subdivided into numerous subtypes – differentiated by capacity range, efficiency, refrigerant, compressor type, or specific system components (e.g. storage tanks) – such data are rarely available. Most existing reporting frameworks do not capture this level of detail. Therefore, the level of aggregation adopted in the taxonomy reflects:

- existing data reporting capacity across countries
- product distinguishability in the market
- relevance for policy design (see Benefits of a common taxonomy)

The suggested taxonomy is designed to encompass all heat pump products currently on the market. This includes both mainstream vapour compression systems and niche technologies that play a role in specific market segments or regions.

Figure 4 Taxonomy Framework for heat pumps (buildings sector)



Notes: Technologies highlighted in green should be counted in heat pump statistics, only including the units used as primary heating equipment, to the extent possible. See the section A proposal to categorise and account for air-to-air reversible units, which provides more details on a possible method.

The Taxonomy Framework is a visual hierarchy that defines a classification for consistent reporting. It groups products by shared technical and functional features aligned with global best practices, so that users can quickly understand its structure.

The principle of product differentiation considers not only each product's defining technical features, but also its primary application in the heating or cooling market. This is reflected in the treatment of chillers and air-to-air units:

- Chillers – While most are designed primarily for cooling, a subset are reversible and can be used as primary heating equipment, in which case they should be classified accordingly.
- Air-to-air units – Subtypes are separated because their use for primary heating varies across products.

While some of the existing reporting frameworks differentiate equipment by sector of application (for instance, if a heat pump is used in a residential, commercial or multi-family building), the proposed taxonomy does not consider such distinctions.

However, by introducing reporting by capacity range (see Capacity ranges in the Heat Pump Taxonomy Technology Explorer) such nuances could still be captured within the framework to some extent.

Beyond vapour compression systems, the proposed taxonomy also covers non-vapour compression, hybrid heat pumps and other technologies that meet the general definition of a heat pump (see Classification challenges). These technologies often rely on alternative thermodynamic cycles or fuels rather than electricity, and in some cases may have lower commercialisation levels, or lower performance levels – though they still outperform conventional heating systems.

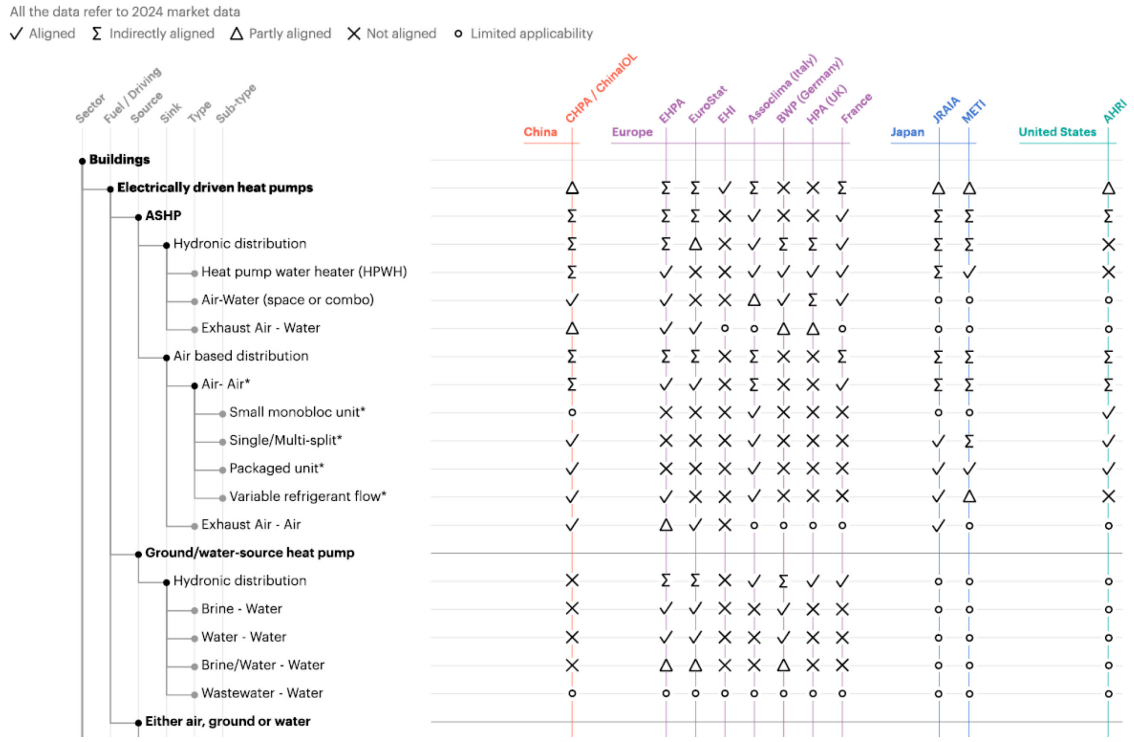
Cross-regional Data Reporting Mapping Matrix

The matrix builds on the Taxonomy Framework, offering a detailed and visual global comparison of how heat pump data are reported across regions and industry associations. It is designed as a reference tool for heat pump data experts and industry analysts, helping to understand different reporting practices and how those could align with the Heat Pump Taxonomy Framework. The matrix only reflects regular publicly available data reporting, and is not a statement on the quality or types of data held internally by the organisations. Each row of the matrix refers to product categories and the columns to data sources, with symbol and colour-coded alignment indicators (see Annex: Cross-regional Data Reporting Mapping Matrix – Definitions for more details). The full version provides a comprehensive comparative table aligning data reported by industry associations, statistical bodies, and other data providers with the taxonomy's product categories and definitions.

The full version of the matrix presents three main features:

- Data mapping by region/country and organisation: a visual overview of which organisations report data (as of late 2025) on each product category, and the alignment of those data – classified as aligned, indirectly aligned, partially aligned, not aligned or limited applicability.
- Original terminology and notes: inclusion of the original-language terms used by data sources for each product type (or the associated product category when definitions or reporting scope differs), allowing comparison across reporting systems. Also provides notes in cases when additional context is needed.
- Product definitions and descriptions: each heat pump category in the Taxonomy Framework is clearly defined. These definitions are drawn from international standards and technical reports but are phrased in accessible language for broader understanding by a non-technical audience. These can also be accessed in the Cross-regional Data Reporting Mapping Matrix – Definitions.

Figure 5 Simplified cross-regional comparison matrix for illustrative purposes



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The matrix has the scope to facilitate cross-country comparability, identify gaps and overlaps, and promote harmonised reporting of heat pump data worldwide.

The matrix is not intended as a mandatory reporting format or a dataset containing market volumes or sales figures. Instead, it functions as a comparative analytical framework – a tool designed to highlight inconsistencies, reveal data gaps, and identify opportunities for alignment between different reporting schemes and the taxonomy structure.

The Heat Pump Taxonomy Technology Explorer

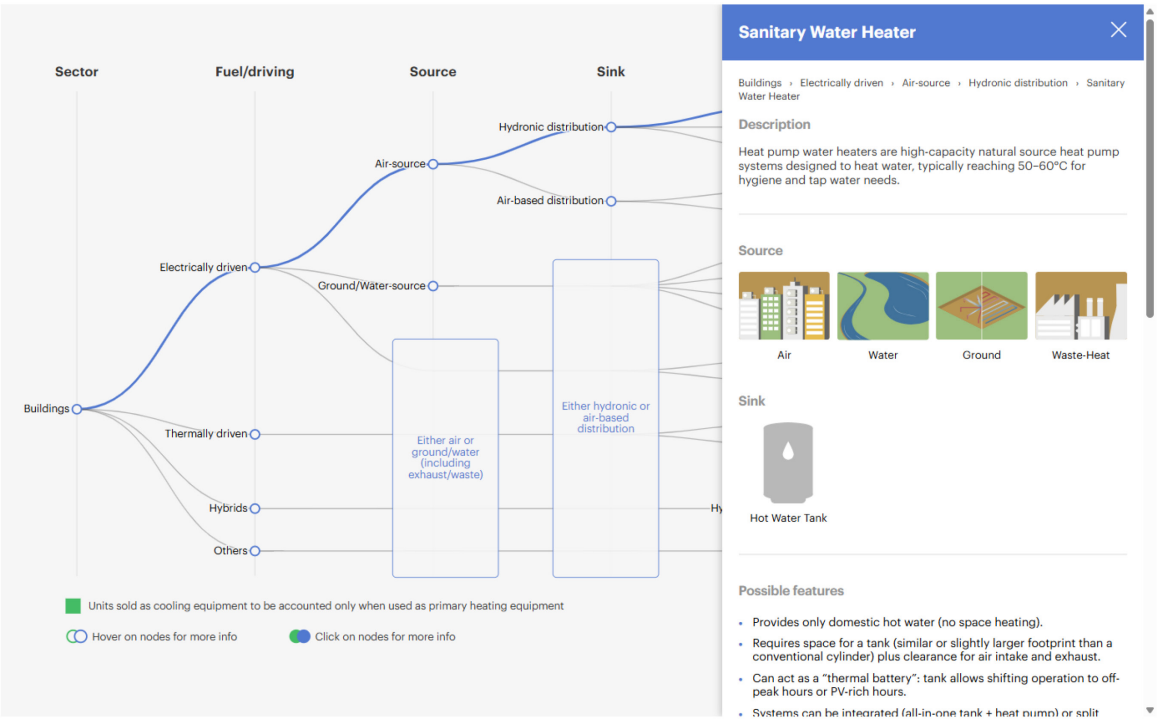
Unlike the other outputs of the project, the Heat Pump Taxonomy Technology Explorer is an online tool targeted at a broader audience that does not necessarily have much previous technical knowledge about heat pumps. Its purpose is to provide a consolidated pedagogical platform for anybody who wishes to learn about heat pumps. It provides a visual and interactive version of the Taxonomy Framework and enables the user to explore and learn about different heat pump products.

Each type of heat pump product has a fact sheet with information on:

- How the heat pump product is defined and classified based on source, sink, type and sub-type.

- Which technical features characterise the heat pump product compared to other products on the market.
- The main markets in which the product is diffused (where data is available, this also includes a market shares distribution).
- Typical capacity ranges (where data is available, this also includes a market shares distribution) (see Capacity ranges in the Heat Pump Taxonomy Technology Explorer).
- Additional information of interest, including but not limited to:
  - Regional and other specificities
  - Highlights on relevant policies, case studies and research programmes.

Figure 6 Illustrative example of a heat pump fact sheet in the Heat Pump Taxonomy Technology Explorer



The interactive learning platform offers a visual product taxonomy framework and fact sheets to help users explore and understand different heat pump types.

Five actions towards a common taxonomy

Alignment around principles for a taxonomy represents the essential first step towards a broader, systematic collection of harmonised sales data. This effort is more than a statistical exercise – it becomes a strategic enabler for comprehensive policy setting.

This section explores five practical early actions that stakeholders could take to build on existing reporting practices and move towards alignment with the Taxonomy Framework. They are:

1. Categorise and account for air-to-air reversible units: enable clearer reporting of primary heating equipment and its contribution to energy efficiency and heating mix diversification.
2. Account for hybrid units and non-vapour compression units: establish reporting approaches to capture the share and sectoral scope of these technologies within total heat pump sales.
3. Move towards monitoring and reporting on capacity indicators: recommend reporting both units sold and associated capacity, to capture not only market volume but also system size, which would support understanding of the impact of such sales.
4. Pilot the taxonomy: outline and implement the key steps for testing and refining the taxonomy in collaboration with national and industry stakeholders.
5. Expand the taxonomy: explore possible next steps to extend the framework to other sectors and support full-scale data collection, including other metrics beyond sales such as data on efficiency ratings, operating hours, refrigerants and more.

The IEA will continue facilitating discussions among stakeholders, and track progress across the suggested steps towards a common taxonomy.

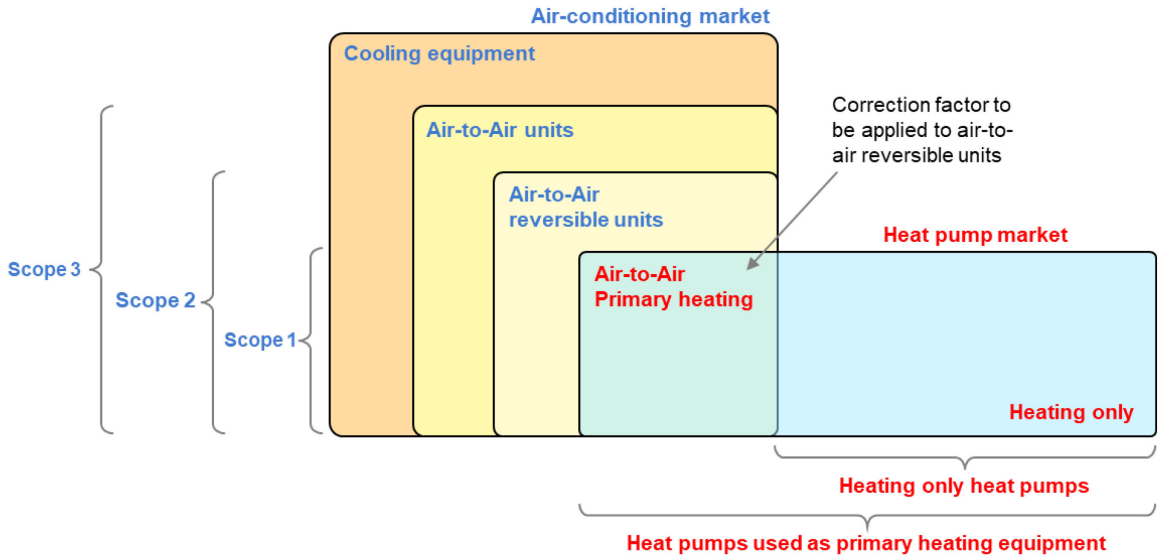
1. A proposal to categorise and account for air-to-air reversible units

Not all regions can immediately quantify how many reversible air-to-air units are used as a primary heating system. By contrast, most countries have reliable data on air conditioning sales – often compiled by national air conditioner or HVAC associations – and, in many cases, on the share of models that are reversible. To improve comparability while reflecting current data realities, the IEA proposes a

three-scope categorisation that can be adopted progressively, clarifying reporting boundaries.

- **Scope 3: All air-to-air units (air conditioners):** Includes all air-to-air units (cooling-only and reversible), regardless of whether they are used for heating. This represents the widest equipment pool and aligns with commonly available sales/stock data.
- **Scope 2: Reversible air-to-air units:** Includes only reversible air-to-air units (capable of cooling and heating). This narrows Scope 3 to the subset with technical heating capability.
- **Scope 1: Reversible air-to-air units used as primary heating equipment:** Includes the fraction of Scope-2 units that are used as the main heating system for a building/dwelling/zone during the heating season.

Figure 7 Illustration of the three-scope categorisation scheme



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Notes: Heat pumps that are used as primary heating equipment, intended as the main equipment providing heat and covering the majority of heating needs. The boundary includes reversible units (such as reversible air conditioners) when they serve as the primary heating equipment. However, units used solely for cooling, or as a minor short-term complement to other heating equipment, are excluded.

The three-scope categorisation scheme aims to enhance transparency of data reporting boundaries for reversible air-to-air units.

Defining and reporting these tiers brings three main benefits:

- **Like-for-like comparability**. Separating all air-to-air units (Scope 3), reversible air-to-air units (Scope 2) and reversible air-to-air units used for primary heating (Scope 1) prevents over- or under-statement of markets that differ in the prevalence and use of air-to-air equipment, enabling fair cross-country comparisons.

- **A pragmatic, stepwise pathway**. National associations can begin with what is widely available (Scope 3), add reversibility shares as capacity improves (Scope 2), and progressively incorporate evidence on use (Scope 1). This accommodates diverse data readiness while signalling how statistics can mature over time.
- **Method convergence and learning**. A common tiered structure makes it easier to share survey designs, installer reporting templates and proxy factors. Regions advancing to Scope 1 can document methods and uncertainty ranges that others can adapt, accelerating consistency and improving data quality globally.

The main challenge remains determining a solid methodology to identify which reversible units are used as primary heating equipment. Units could be categorised as Scope 1 if reported as the main heating system in surveys or other sources such as subsidy programmes or installation registries. Alternatively, verified data (e.g. metered energy or heating-mode runtime during heating months) can also support understanding if the unit is used consistently during the heating season. Where such evidence is not available, countries can apply documented estimation factors – for example, by climate zone (based on heating degree day data), dwelling type and product class – and report the associated uncertainty and data sources – as currently done by EHPA and Assoclima (Italy). Simple design proxies (e.g. declared low-ambient capacity and adequate sizing relative to design load) may be used as interim indicators, provided their use is clearly noted.

2. A proposal for accounting hybrid units and non-vapour compression units

We propose that hybrid heat pumps (see Hybrid heat above for a definition) are listed as a distinct category in this taxonomy. Where possible, this should also specify the share of the total capacity provided by the electric heat pump and boiler components. Additionally, control strategies/operational schemes would be valuable, but the specifics of such reporting are yet to be defined.

For sorption heat pumps it is likewise recommended that they should be reported as distinct categories, if possible, distinguishing between adsorption and absorption. However, reporting for these units, and more broadly for products that can be deployed in different sectors, should distinguish between heat pumps used in buildings and those used in large-scale applications such as district heating and industrial applications.

3. Indicators to report: from units to capacity

We propose that in addition to reporting heat pump sales purely in terms of units, associations move towards reporting in terms of capacity. As explained in the

section above, Previous efforts to consolidate heat pump market data, there would be numerous advantages to this. To report product capacities, two recommended approaches can be used – though other methods may also be suitable:

- **Method 1,** use detailed capacity data: If highly granular data with capacity is available, associations could report the total capacity sold for each product type. Additionally, they could define a coherent split of typical capacity ranges and report the total number of units sold per capacity range for each product type (or at least for those where data is available). This is already done in some regions, but initiatives remain isolated.
- **Method 2**, use estimated or typical capacity values: In cases where highly granular data is unavailable or no direct information on capacity is available, associations can define an estimated average capacity or a representative capacity range for each product. For example, if most air-to-air units in a region typically fall within the 6-12 kW range, this range (or the capacity value of the most popular units sold) should be reported alongside the total number of units.

4. Piloting the taxonomy in five steps

We outline five steps that could enable the application of the Taxonomy Framework to data reporting. The IEA can provide a technical collaborative platform for piloting these steps and implementing the taxonomy consistently, as well as for working with governments to support tracking progress toward broader heat pump deployment.

Step 1: Ensure transparency on reporting boundaries. The initial goal of the IEA's heat pump taxonomy is to ensure greater consistency and comparability of heat pump market data across regions and organisations. To achieve this, industry associations are encouraged to review and clarify their current reporting boundaries in relation to the Taxonomy Framework. The accompanying Cross-regional Data Reporting Mapping Matrix can help identify where existing data diverges from or partially aligns with the proposed taxonomy categories.

As part of this exercise, stakeholders should consider explaining their reporting boundaries using the Scope 1, 2, and 3 framework, clearly indicating which categories of the taxonomy are included under each scope. This step promotes transparency and strengthens comparability of market data.

Step 2: Define a roadmap for convergence towards the proposed taxonomy framework. Building on this, further steps could focus on exploring what a convergence process of data collection with the taxonomy would entail in practice. This includes defining timelines, designing or updating data collection templates, and conducting stakeholder consultations to help define responsibilities across the value chain – from manufacturing to installation.

Step 3: Revise data collection templates. A subsequent phase would involve revising existing data collection templates, guided by a clear methodology that:

- Adapts product reporting to the Taxonomy Framework and reports both units and capacity sold per type of heat pump product, as well as defining clear documentation on the data collection method and frequency.
- Integrates Scope 3 reporting, including upstream and downstream activities where relevant, and if not already existing.
- Reports capacity of hybrid units according to heat pump capacity shares and expected usage.
- For both units and capacity reporting of large-scale units, specifies if reporting distinguishes by sectoral applications, ensuring accurate representation within the buildings, industrial or district heat sector.

Stakeholders should be consulted to review and validate the revised templates for feasibility and completeness.

Step 4: Pilot the proposed taxonomy framework. A pilot phase to test the collection of taxonomy-aligned data, identify challenges and refine methodologies.

Step 5: Share experiences and feedback. Finally, feedback from pilot participants should be gathered and shared to refine the framework and support replication across other markets.

5. Possible next steps for the IEA Heat Pump Taxonomy Project

To ensure consistency and comparability across the sector, further discussions and exchanges can be targeted at supporting industry associations in aligning their data collection frameworks to the proposed common taxonomy framework. This alignment would not only improve the transparency and compatibility of datasets but also enable more accurate tracking of market and policy progress against shared indicators, and unpack some of the benefits presented in the section Benefits of a common taxonomy.

This ongoing effort by the IEA, for which progress could be reported every year, could focus on continuing discussions on:

- Providing guidance on data collection templates, and further knowledge sharing to help associations adopt standardised methodologies and reporting formats.
- Broadening the data collection scope to include other indicators that stakeholders consider important, such as refrigerant types, system efficiency under real-world conditions, temperature levels, operational hours, imports/exports, supply chains or connectivity. Additionally, collecting data from installers on what equipment is

being replaced by heat pump installations could provide valuable insights for manufacturers and policy makers. Collecting these additional data points would provide a more holistic understanding of environmental performance and help identify areas for technological improvement and policy support. Integrating results from energy survey data, and utilities data acquired via smart meters for instance with supply-side industry sales data would allow a better picture of actual stock and usage.

- Expanding the taxonomy to better reflect large-scale heating units, such as those used in district heating networks or industrial processes. This could involve refining the process and stakeholders' engagement, as installations in these sectors are rarely reported. The taxonomy could include developing new categories that reflect the operational and technical differences between buildings, district heat and industrial systems. Including these larger systems would fill a significant data gap and support the design of policies and incentives that reflect the full spectrum of heating technologies. The taxonomy could also be expanded to support tracking installations for space cooling units.
- Improving data availability beyond heat pumps that would offer a comprehensive view of the entire heat market. This would make it possible to situate heat pump deployment trends within the wider heating landscape, covering alternative and complementary technologies such as biomass, district heating and boilers. A broader, integrated dataset would ultimately strengthen analytical insights, facilitate cross-sector comparisons, and support more informed decision making for energy transition planning and heat strategies.

Annex

Glossary

Commercial sensitivity: Limitations on the disclosure of data due to proprietary considerations affecting sector participants.

District heating: System in which heat is generated centrally and distributed through a network of insulated pipes to multiple buildings.

Domestic/Sanitary Hot Water (DHW): Hot water supplied for sanitary and household uses.

Electrically driven heat pumps: Heat pumps that use a closed-loop cycle in which a refrigerant is electrically compressed, then condensed, expanded and evaporated to transfer heat efficiently. Some systems are reversible, allowing them to provide both heating and cooling.

Emerging technologies: Emerging concepts, for example solid state heat pumps using thermoelectric or electrocaloric materials. Technologies not available yet on the market.

Exhaust air-to-air: Extracts heat from warm indoor air – typically from bathrooms, kitchens, or utility rooms – via the ventilation system and transfers it to the indoor air.

Exhaust air-to-water: Extracts heat from warm indoor air – typically from bathrooms, kitchens, or utility rooms – and transfers it to a water-based distribution system for space heating, or for both space and domestic water heating.

Fuel type: The primary energy source driving the heat pump system, such as electricity, gas engine or thermal energy.

Gas-engine-driven heat pump: Heat pump powered by a gas-fuelled internal combustion engine instead of an electric motor. It uses the engine to drive the compressor and can recover waste heat from the engine to improve overall heating efficiency.

Global Warming Potential (GWP): Metric used to measure the amount of infrared thermal radiation that 1 tonne of a gas would absorb over a given time frame after it has been emitted to the atmosphere, relative to 1 tonne of carbon dioxide (CO_2).

Ground-source heat pump (GSHP): Natural source heat pumps that extract heat from ground or water, including wastewater.

Heat pump: A device that transfers heat from a lower-temperature source to a higher-temperature sink. It transfers heat from one place to another to provide heating and, if reversible, cooling, using either mechanical energy (via a vapour compression cycle) or thermal energy (in thermally driven systems).

Heat pump water heater (HPWH): Natural source heat pump to heat sanitary water, typically reaching 50-60°C for hygiene and tap needs. May have a storage water tank.

Heat-recovery equipment: Cooling equipment with heat-recovery capabilities, used as primary heating equipment in a building.

Hybrid heat pump: Heat pumps that are installed in combination with another type of heating system, typically together with a combustion furnace/boiler.

Hybrid system: System of appliances which combines at least two different energy sources to provide heating and/or domestic hot water to a building, and whose operation is managed by one control. For example, combining a vapour compression cycle with a fossil fuel boiler in one system.

Hydronic distribution: Extracts heat from the air (outdoor or exhaust) to heat water. The warm water is then sent through tubing in the floor, baseboards or radiators and releases the heat in each room, or through pipes to provide domestic hot water.

Integrated system: A single packaged unit containing both a heat pump and a boiler with unified controls, provided by the same manufacturer. The components are designed to work together. It automatically switches or blends operation between modes.

Interoperability: The ability of different reporting systems to align through compatible definitions, categories and system boundaries.

Monobloc system: Compact unit that heats and if reversible, cools, single rooms. It includes window or packaged terminal air conditioner systems.

Non-vapour compression heat pump: A heat pump that does not rely on mechanical vapour compression, typically operating through thermally driven processes such as absorption or adsorption.

Open-loop system: A system in which the working fluid is taken from an external source, used for the process, and then discharged or returned.

Packaged unit: A packaged air conditioner is a self-contained system that contains all essential components – compressor, condenser, evaporator and air handler – in a single unit, and is typically installed on rooftops or outdoor pads, but can also be indoors in some specific cases. Used for space cooling, and if reversible for space heating. Includes rooftop units.

Reversible air-to-air unit: An air-conditioning unit capable of operating in both cooling and heating modes through a reversing valve.

Reversible chiller: A chiller designed primarily for cooling that can reverse operation to provide heated water.

Scope 1 (air-to-air units): Reversible air-to-air units used as the primary heating system in a building.

Scope 2 (air-to-air units): All reversible air-to-air units capable of providing both heating and cooling.

Scope 3 (air-to-air units): All air-to-air units, including cooling-only and reversible systems, irrespective of their actual use.

Single/Multi-split: Outdoor unit (compressor and condenser) and one or multiple indoor unit(s) (evaporators) connected by a refrigerant line. Used for space heating, and if reversible for space cooling. It can use ductwork to distribute air but can also be ductless.

Sink: The medium that receives heat delivered by the heat pump, typically indoor air or a hydronic distribution system.

Small monobloc unit: Compact unit that heats, and if reversible cools, single rooms. It includes window or packaged systems.

Sorption heat pump: A sorption heat pump uses thermal energy – rather than or alongside electricity – to drive a thermochemical refrigeration cycle for heating and, when reversible, cooling. It transfers a refrigerant through a sorbent material via absorption or adsorption. Heat input then releases the refrigerant to complete the cycle.

Split system: A heat pump configuration in which indoor and outdoor components are physically separated but operate as an integrated system.

Taxonomy: The structured classification framework proposed in this Technical Note to standardise heat pump product reporting across regions.

Thermal capacity (nominal capacity): The rated heating output of a heat pump, expressed in kilowatts (kW), under defined test conditions.

Thermally driven heat pump: Heat pump that uses a thermal source of energy as its driving source of energy, either through combustion or through heat transfer.

Variable refrigerant flow (VRF): Advanced HVAC technology that allows a single outdoor unit to control the amount of refrigerant sent to multiple indoor units, depending on each zone's heating or cooling needs. Typically used in medium or large buildings.

Wastewater-water heat pump: Water-source heat pumps that use low-grade heat extracted from wastewater (such as sewage, wastewater treatment or greywater) and transfer it to a water-based distribution system for space heating alone, or both space and water heating.

Water-source heat pump: A heat pump that extracts heat from a water source, such as groundwater, surface water or a water loop system.

Water-water heat pump: Extracts heat from a water source, such as groundwater or surface water, and transfers it to a water-based distribution system for space heating alone, or both space and water heating. It is an open-loop geothermal source.

Capacity ranges in the Heat Pump Taxonomy Technology Explorer

The Heat Pump Taxonomy Technology Explorer shows certain reference capacity ranges (in terms of nominal thermal capacity). The ranges are based on current practices in use by associations today and thresholds relevant to important legislation. These ranges represent a starting point for associations looking to move towards more unified reporting in terms of capacity.

Table 6 Proposed ranges for reporting in terms of nominal thermal capacity

Range (kW)	Typical example units/use cases	Example(s) of regional relevance
0-6	Single room air-to-air units, small residential water heaters	-
6-12	Typical air-to-air or air-to-water size for most single family homes in the European Union/United States/China	Europe: EU Ecodesign (Lot 10) has 12 kW boundary under which eco-design labelling is mandatory, F-Gas regulation also uses 12 kW threshold for phasing out of some refrigerants
12-20	Larger size units for single family homes	China: Different procedures to assess efficiency whether capacity is over/under 14 kW AHRI (United States): Units below 19 kW are counted as residential, above as service sector
20-50	Multi-family homes, commercial buildings	Europe: EU F-Gas uses 50 kW as a threshold for phasing out of some refrigerants
>50	Multi-family homes, commercial buildings	-

Note: ASHPs = Air-source heat pumps.

Cross-regional Data Reporting Mapping Matrix – Definitions

The Cross-regional Data Reporting Mapping Matrix is defined based on certain criteria:

1. The matrix is not a judgement of the reporting standards or data quality of associations. Its purpose is to provide an illustration of differences in practices across organisations that can support international comparison.

2. The matrix reflects **data reporting alignment** for each source as of late **2025**. Reporting practices are subject to change over time.

3. The matrix only reflects data that is **publicly available**, i.e. data that is presented in regular reports, through a data portal or similar. Data which are sporadically available or only by request is not counted. The data must be widely accessible, i.e. anybody who wishes to access it can do so. It may still, however, be behind a paywall, as long as anyone is welcome to register.

4. Data mapped refers to **sales** or **shipments** of heat pumps**.**

5. Data in the matrix **does not consider Scope 1, 2, 3** as outlined in A proposal to categorise and account for air-to-air reversible units, although highlighting which products would require such categorisation to be counted as primary heating equipment.

6. The reporting alignment levels are defined as follows:

✓	**Aligned**	The reporting uses the same exact product category as the taxonomy.
Σ	**Indirectly aligned**	The reporting does not use the same exact product category as the taxonomy, but by aggregating the reporting of other product categories it is possible to infer the reporting in line with the taxonomy.
(✓)/(Σ)	**Partly aligned**	The reporting uses a similar product category as the taxonomy, but with substantial differences, usually due to using a broader definition than the taxonomy. Sufficient (but not all) information is available to make an aggregation with high accuracy.
×	**Not aligned**	The product exists in the market but is not reported by the same category as the taxonomy.
○	**Limited applicability**	The reporting is not aligned to the taxonomy, and the product is also very uncommon in the market. Aligning to the taxonomy has limited value.

Acknowledgements

The Heat Pump Taxonomy Project was led by the IEA in collaboration with stakeholders from over 50 institutions. The project was managed and co-ordinated by Chiara Delmastro, senior energy analyst at the IEA. The Heat Pump Co-ordination Group led by Ezilda Costanzo (Italian National Agency for New Technologies, Energy and Sustainable Economic Development, ENEA) served as a platform to streamline efforts, share best practices and identify research gaps across the international heat pump community.

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Timur Gül, Chief Energy Technology Officer, and Araceli Fernández, Head of the Technology Innovation Unit, provided valuable feedback and overall guidance. Valuable comments and feedback were provided within the IEA. In particular, Agnieszka Kościelniak, Roberta Quadrelli, Anthony Vautrin, Fabian Voswinkel and Daniel Wetzel.

Per-Anders Widell, Charlotte Bracke and Bérengère Merlo provided essential support throughout the process. Lizzie Sayer edited the manuscript.

Thanks go to the IEA's Communications and Digital Office for their help in producing the report and website materials, particularly to Jethro Mullen, Isabella Batten, Curtis Brainard, Poeli Bojorquez, Gaelle Bruneau, Jon Custer, Astrid Dumond, Merve Erdil, Grace Gordon, Andrea Pronzati, Robert Stone, Clara Vallois.

The following experts provided valuable information and feedback during the workshops, technical discussions, consultations and peer review: Yosr Allouche (International Institute of Refrigeration); Monica Axell (IEA TCP on Heat Pumping Technologies); Veerle Beelaerts (European Heating Industry); Johan Carlsson (Joint Research Centre, European Commission); Ezilda Costanzo (Italian National Agency for New Technologies, Energy and Sustainable Economic Development, ENEA); Greta Corsale (European Heating Industry); Marco Dall'Ombra (Assoclima – ANIMA Confindustria); Eric Devin (Associacion Française du Froid); Fernando Diaz Alonso (Eurostat); Hongtao (Ding Centre of Science and Technology & Industrialisation Development); Marco Duran (International Institute of Refrigeration); Markus Fager-Pintilä (EU4Energy); Musazzi Federico (Assoclima – ANIMA Confindustria); Brian Fitzgerald (Energy Efficiency and Conservation Authority, New Zealand); Yifeng Gao (China Heat Pump Alliance); Duncan Gibb (Regulatory Assistance Project); Caroline Haglund Stignor (IEA TCP on Heat Pumping Technologies); Souhir Hammami (International Institute of Refrigeration); Runqing Hu (National Development and Reform Commission –

Energy Research Institute); Harshad Inamdar (Purdue University); Andrej Jentsch (IEA TCP on District Heating and Cooling); Dima Khoury (United Nations Environment Programme); Kevin Lane (IEA TCP on Energy Efficient End-Use Equipment); Tina Li (China Heat Pump Alliance); Pengcheng Li (China National Institute of Standardization); Giuseppe Lorubio (Ariston Group); Richard Lowes (Regulatory Assistance Project); André Mounier (CIRED); Pamela Murphy (IEA TCP on Solar Heating and Cooling); Thomas Nowak (Qvantum International); Jan-Erik Nowacki (KTH Royal Institute of Technology); York Ostermeyer (ChillServices); Björn Palm (KTH Royal Institute of Technology); Eloi Piel (EuroHeat & Power); Maurizio Pieve (Italian National Agency for New Technologies, Energy and Sustainable Economic Development, ENEA); Yang Ping (ChinaIOL); Stanislas Quenehen (Ariston Group); Stephan Renz (IEA TCP on Heat Pumping Technologies); Philippe Riviere (DG ENER, European Commission); Yang Run (ChinaIOL); Laurens Rutten (European Consumer Organisation); Martin Sabel (German Heat Pump Association BWP); Federica Sabbati (European Heating Industry); Peter Schossig (Fraunhofer-Institut für Solare Energiesysteme); Wang Shui (CHPA – China Heat Pump Alliance); Samantha Slater (Air Conditioning, Heating and Refrigeration Institute); Olivia Smalley (Heat Pump Association UK); Helmut Strasser (IEA TCP on Cities); Emilie Stumpf (Panasonic Europe); Asahi Takahiro (Daikin); Akihiro Takeuchi (Heat Pump & Thermal Storage Technology Center of Japan); Justin Tamasauskas (Natural Resources Canada); Guillaume Uguen (European Heat Pump Association); Jozefien Vanbecelaere (European Heat Pump Association); Zhigao Wang (Energy Foundation China); Jianjun Xia (Tsinghua University); Haisheng Xu (China Heat Pump Alliance); Yu Yanfang (ChinaIOL); Jie Yang (ChinaIOL); Lingyan Yang (China Academy of Buildings Research); Hengyi Zhao (China Heat Pump Alliance); Yanbing Zhao (Energy Foundation China); and Tan Zheng (Energy Foundation China).

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Typeset in France by IEA - May 2026
Cover design: IEA
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