INTRODUCTION

Heat is the largest energy end-use on a global level. Providing heating for homes, industries, and other applications accounts for around half of the total final energy consumption. Almost half of the final heat demand in buildings is produced using fossil fuels. For the industry sector, this share is even higher. The use of equipment for comfort cooling accounts for 10% of all global electricity consumption and is expected to increase.

- According to the IEA Net Zero by 2050 Roadmap, 55% of the heating needs in buildings should be met by heat pumps to phase out fossil fuels and reach net zero emissions by 2050, which means an increase by a factor of 3-4 in 2030 and a tenfold increase to 2050.
- According to the IEA Roadmap, heat pumping technologies can also contribute considerably to decarbonize the industrial sector and district heating.
- Heat pumps (for heating and cooling) could and need to become flexibility providers to stabilize the grid when the share of intermittent renewable electricity production, by wind and solar, increases and could bridge different sectors in an efficient way and strengthen resilience.
- The demand for comfort cooling is set to soar during the coming decades. Without further action to address equipment and buildings' performance, energy consumption for space cooling will almost triple by 2050 (The Future of Cooling, 2018).
- Without a major acceleration in clean energy innovation, net-zero emissions targets will not be achievable (IEA Clean Energy Innovation, 2020)

Heat pumping technologies are deployed in several markets, some of them with a double-digit growth. Further accelerated growth and efficient integration of the technology in the energy system is needed to achieve multiple energy policy objectives, i.e. improved energy efficiency, greater energy security, net-zero emissions of greenhouse gases, improved air quality and more affordable clean energy. At the same time, new innovations are needed to be able to reach the ambitious global energy targets. Delivering international collaborative RDD&D within the HPT TCP has been a highly efficient way to overcome barriers and fill evidence gaps in the past and will be even more so in the future.

VISION OF HPT TCP

Heat pumping technologies are the cornerstone for a secure, affordable, high-efficiency, clean and net-zero emission energy system for heating, cooling and refrigeration. We are the key worldwide independent actor to achieve this vision across multiple applications and contexts. We generate and communicate information, expertise and knowledge related to heat pumping technologies as well as enhance international collaboration.

MISSION OF HPT TCP

To accelerate the transformation to an efficient, renewable, clean and secure energy sector in our member countries and beyond by performing collaborative research, demonstration and data collection and enabling innovations and deployment within the area of heat pumping technologies.

STRATEGIC OBJECTIVES

Accelerated deployment

A. The deployment rate is accelerated for efficient heat pumping technologies in different applications – buildings, industry, transport, electric and thermal energy systems – to keep pace with the milestones set out in the IEA Roadmap towards Net Zero Emissions by 2050.

B. Innovations related to heat pumping technologies are brought to the market, contributing to fulfilling the net zero emission targets.

Energy security

C. Integrated, affordable solutions for heating and cooling, where heat pumping technology is a key element, are explored, through collaboration with other TCPs, enabling energy savings, flexibility and responsiveness in the energy system and improving security of supply.

Economic growth of secure and sustainable solutions

D. The HPT TCP contributes to removing gaps and overcoming barriers in the sustainable value chain of heat pumping technologies.

Environmental protection

E. More decision-makers (policy, investors, utilities, real estate actors, industry, users etc.) acknowledge the multiple benefits of heat pumping technologies as a sustainable, clean, enabling,

connecting, and affordable heating and cooling solution to reach the climatic ambitions and strengthen energy security. Decisions which promote heat pumping technologies are implemented.

Engagement worldwide

F. HPT TCP has more member countries representing the largest economies, different parts of the world facing different contexts, IEA key partner and association countries.

G. HPT TCP is an active player in, or partner to, IEA, other TCPs, other international initiatives and organisations related to secure and sustainable heating and cooling and flexible energy solutions for everyone.

STRATEGIC INITIATIVES

1. **Advance the RDD&D** of heat pumping technologies through the creation of research opportunities, networking and meeting places for academia, industry, markets actors, investors and policy makers to collaborate under new Annexes (projects/tasks) and other activities (e.g. workshops) within the HPT TCP, see priority areas for RDD&D below.
2. **Contribute to advanced and/or disruptive innovations** through cross-cutting networking and collaboration with other TCPs, IEA, Mission Innovation and other relevant organisations, attracting new actors representing other relevant areas of knowledge.
3. **Communicate the results and impact from the RDD&D work**, tailor the messages and the dialogue using selected channels to reach relevant target groups, including policy makers, energy and environmental agencies, investors, utilities, manufacturers, city and building planners, system designers, architects, industry associations, installers, researchers and end-users. **Arrange a high-quality conference** about heat pumping technologies at least every third year, and establish this conference as the most important networking place.
4. **Providing and enlarging a dialogue platform to share and report back experiences** to those stakeholders and actors who could benefit from such knowledge.
5. **Provide IEA, standardisation organisations and regional or national policy makers with reliable and independent guidance, data and knowledge** about heat pumping technologies, separately or in combination with other technologies.
6. **Increase activities to attract new members,** including IEA key partners and association countries.

RDD&D PRIORITY AREAS

Priority areas	High-level tasks
System integration sector coupling, energy efficiency, flexibility, resilience, storage, digitalization, positive energy districts	• The role of heat pumps in integrated energy systems on building, district and city levels. • Heat pumps as an enabler for sector coupling • Methods for evaluating smart, flexible heat pumps
Robust, sustainable and affordable value chains improving affordability, securing value chains, circular economy, removing barriers for mass deployment	• Systems for circular economy for heat pumps • New business models • Easy to install products (plug and play and self commissioning) • Standardization for scaling • User behaviour/ acceptance of HPT, comfort and flexibility
Extending operation range and applications To fulfill demand from all climate zones, new markets, new applications and new demand. Refrigeration in emerging countries.	• Heat pumps for industrial applications • Heat pumps for district heating and cooling applications • Heat pumps for retrofitting of existing buildings with special requirements • Heat pumps/AC for cooling, dehumidification and drying • Cold climate heat pumps
New technologies and refrigerants Non-traditional heat pumping technologies (for heating and cooling) Refrigerants (low GWP, safety etc.)	• Non-vapour compression technologies • Other areas that need low TRL level research • Efficient operation, components and systems for Low GWP refrigerants • Safety measures for operating with low GWP refrigerants