

The Role of Heat Pumps in the Decarbonization of European Regions

Authors : Domenico M. Mongelli, Michele De Carli, Laura Carnieletto, Filippo Busato

Abstract : Europe's dependence on imported fossil fuels has been particularly highlighted by the Russian invasion of Ukraine. Limiting this dependency with a massive replacement of fossil fuel boilers with heat pumps for building heating is the goal of this work. Therefore, with the aim of diversifying energy sources and evaluating the potential use of heat pump technologies for residential buildings with a view to decarbonization, the quantitative reduction in the consumption of fossil fuels was investigated in all regions of Europe through the use of heat pumps. First, a general overview of energy consumption in buildings in Europe has been assessed. The consumption of buildings has been addressed to the different uses (heating, cooling, DHW, etc.) as well as the different sources (natural gas, oil, biomass, etc.). The analysis has been done in order to provide a baseline at the European level on the current consumptions and future consumptions, with a particular interest in the future increase of cooling. A database was therefore created on the distribution of residential energy consumption linked to air conditioning among the various energy carriers (electricity, waste heat, gas, solid fossil fuels, liquid fossil fuels, and renewable sources) for each region in Europe. Subsequently, the energy profiles of various European cities representative of the different climates are analyzed in order to evaluate, in each European climatic region, which energy coverage can be provided by heat pumps in replacement of natural gas and solid and liquid fossil fuels for air conditioning of the buildings, also carrying out the environmental and economic assessments for this energy transition operation. This work aims to make an innovative contribution to the evaluation of the potential for introducing heat pump technology for decarbonization in the air conditioning of buildings in all climates of the different European regions.

Keywords : heat pumps, heating, decarbonization, energy policies

Conference Title : ICHPT 2023 : International Conference on Heat Pump Technology

Conference Location : Athens, Greece

Conference Dates : October 16-17, 2023