

# Buildings Energy Efficiency

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## Source Metadata

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## IEA Technology Definition

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The IEA classifies buildings energy efficiency as an end-use technology cluster covering heat pumps, building envelope improvements (insulation, glazing, air sealing), efficient lighting and appliances, and building electrification. The ETP Technology Guide tracks heat pumps as a key technology for decarbonizing space and water heating, alongside deep retrofits and near-zero-energy building standards.

## Technology Readiness & Deployment

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Heat pumps are commercially mature with global sales reaching approximately 10 million units per year in residential and commercial applications. Air-source heat pumps dominate the market, while ground-source systems serve colder climates. LED lighting penetration exceeds 50% globally. Building energy codes are tightening in advanced economies but remain weak or absent in many developing regions. The IEA considers heat pump deployment broadly on track but flags building envelope retrofit rates as far too low.

## Key Metrics & Benchmarks

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Heat pumps deliver 3-5 units of heat per unit of electricity consumed (COP 3-5), making them 2-4 times more efficient than gas boilers. Global heat pump stock exceeds 200 million units. Deep building retrofits can reduce energy consumption by 50-70%. The buildings sector accounts for approximately 30% of global final energy consumption and 26% of energy-related CO2 emissions.

## LATAM Relevance

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Latin American buildings face growing cooling demand due to rising temperatures and urbanization. Air conditioning adoption is expanding rapidly in Brazil, Colombia, and Mexico, making efficient cooling technologies a priority. Heat pump adoption for heating is relevant in southern Chile and Argentina. Building energy codes exist in Brazil, Colombia, Chile, and Mexico but enforcement and retrofit rates remain low. Urban informal housing presents unique efficiency challenges.

## Critical Minerals Link

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Heat pumps require copper (heat exchangers, compressors), aluminium (evaporators), and specialized refrigerants. Efficient appliances and LED lighting use silicon, gallium, and indium. The mineral intensity of building efficiency technologies is modest compared to power generation, but volumes are significant given the massive scale of the buildings sector.

## Cleantech Taxonomy Crosswalk

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Maps to Cleantech Taxonomy sectors: BU (Buildings) — heat pumps, insulation, building codes, efficient appliances; ES (Energy Systems) — demand-side flexibility from smart buildings; XS (Cross-Sectoral) — building-integrated renewables.

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