# Transforming utility customer service: Residential heat pumps can help decarbonization efforts






In the absence of federal mandates, many states throughout the country are beginning to set their own greenhouse gas (GHG) emission limits. In order for states to meet these limits, significant GHG reductions from both the commercial & industrial and residential sector are necessary. This series of articles will examine how technology intersects with supporting policies to drive residential sector decarbonization. In the residential sector, the emergence of new technologies, or the repurposing of older technologies in new ways, is critical to reducing GHG emissions. Equally important is the role utilities can play in accelerating the adoption of these technologies.

The energy needed to heat buildings is one of the largest sources of GHG emissions, and heat pumps are one of the most frequently cited technologies that are commercially available today that have the potential to significantly reduce GHG emissions in the residential sector. Heat pumps are more efficient than traditional heating sources like boilers and furnaces because they do not combust any fuel to generate heat, but rather use electricity to re-distribute heat stored in air or water. Common configurations of heat pumps include air source heat pumps, ground source heat pumps, and water to water heat pumps.

Air source heat pumps are currently the most installed type of heat pump due to their relatively low cost and complexity of installation as compared to other heat pump technologies. According to a 2020 ACEEE report (PDF), utility energy efficiency programs spent $110 million promoting electrification of space heating, with heat pumps being one of the primary strategies. This represented a 70% increase in spending from the previous year. Utility support through energy efficiency programs for heat pumps is necessary because heat pumps are currently more expensive than boilers or furnaces, and incentives are necessary to help customers overcome those higher costs. In addition to paying incentives, utilities can help the market transform from fossil fuel heating systems to heating electrification through extensive customer and vendor education about heat pumps, developing a workforce that is qualified to recommend and install heat pumps, and getting homes "heat pump ready" through increased weatherization.

New business models are also helping drive the adoption of heat pumps. Ground source heat pumps are a mature technology that have traditionally been deployed at single residences, but also tend to be expensive. All of the infrastructure is typically self-contained within a single premise and is owned by the customer. Recently, National Grid developed a utility-owned geothermal project with centrally sited wells, pumps, and pipes in their New York service territory. The centralized infrastructure provided geothermal services to multiple customers.

Initial results from the National Grid pilot show that participants realized a 11-51% reduction in emissions with reduced energy costs ranging from 33-67%. This business model, which has the utility playing a role as a central owner and operator, removes technical and financial barriers to more widespread deployment of ground source heat pumps. Utilities are primed to play a key role in this market as they commonly undertake many of the functions that would enable ground source heat pump distribution networks, such as deploying large capital projects with long lived underground assets, drilling and trenching, and maintaining infrastructure in public right of ways.

Water to water heat pumps can provide a solution for residential units in larger apartment buildings and condominiums. A particularly interesting strategy is to capture heat from waste hot water, that goes down the drain from sources such as showers and sinks, before it enters the sewer system. The diagrams below depict how this technology utilizes a heat pump to extract heat from that waste hot water to pre-heat the clean cold water supply before it is fed into a hot water tank or boiler. This process reduces the energy required to get the clean cold water supply up to the desired hot water tank temperature.

*Source: SHARC Energy Systems*

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Lynn Mueller, President and CEO of SHARC Energy Systems, a manufacturer of water-to-water heat pump systems, believes these types of systems can be particularly effective at reducing emissions in the residential sector. "Everything that SHARC does is about reducing the Carbon footprint of buildings around the world. SHARC has proven that it only requires one quarter of the energy using our high efficiency heat pumps as it would to produce the same amount of heat using conventional sources," said Mueller. Water-to-water heat pumps may aid in creating a holistic approach to all segments in the residential sector, including single family and multi-family buildings, which will be necessary to meet overall climate goals.

Utility support of technologies that can help drive down emissions in the residential sector is essential. In addition to heat pumps, technological advancements in refrigerators, clothes dryers, windows, and insulation can all contribute to lower emissions in homes. To the extent that these technologies are still more expensive than standard efficiency equipment, utility support including energy efficiency incentives and market development are critical to drive adoption of these emission reducing technologies.

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