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Pushing the Envelope: Alternative Form Factor Heat Pump Market Assessment

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EXECUTIVE SUMMARY

This report explores the potential for Alternative Form Factor Heat Pumps (AFFHPs) to serve as a fast-to-deploy, cost-effective strategy for electrifying heating and cooling within ComEd's residential building stock, especially in multifamily buildings, older homes, and cold-climate settings where traditional HVAC retrofits face logistical and financial barriers.

Through technical analysis, product characterization, housing stock mapping, and savings modeling, the project identified a diverse set of AFFHP technologies. These technologies include saddlebag units, two-way and portable window units (sometimes referred to as "wheelie" or "R2D2" units), packaged terminal heat pumps (PTHPs), and vertical stack systems each with specific advantages depending on building type, baseline heating fuel, and climate zone. These opportunities are especially concentrated in older multifamily buildings (particularly in Chicago and other dense urban areas) where over 70% of units use fossil fuel heat. More than 500,000 of these units are in buildings with 20 or more dwellings, based on tract-level ACS data across the broader ComEd service territory.

Key findings from the analysis reveal that AFFHPs can deliver substantial energy savings, particularly in partial heating displacement scenarios. Across ComEd's service territory, the modeled technical potential is roughly 3,000 GWh of annual energy savings in a best-case scenario where both partial and full heating displacement are pursued (see Table 12). This figure represents total potential savings across all applicable multifamily buildings, not savings per dwelling or per unit installed. Fuel-switching from fossil to electric heating in multifamily buildings represents a particularly impactful opportunity, as does targeting buildings without existing ductwork or feasible infrastructure for traditional heat pumps.

The study also draws on early deployment experiences from NYSERDA, CalMTA, and NEEA, as well as interviews with ComEd contractors and property owners, to assess real-world feasibility, user acceptance, and implementation challenges. These insights confirm the practical value of AFFHPs for low-disruption and scalable electrification while also highlighting the need for tailored program design, product readiness, and installation support pathways grounded in local housing and market conditions.

The findings suggest that AFFHPs are not only technically viable but also strategically aligned with ComEd's goals for equity, decarbonization, and cost- effectiveness. By embracing the strengths and limitations of these technologies, and learning from early market transformation efforts, ComEd can deploy a new class of heat pump solutions that meet the needs of hard-to-electrify homes and accelerate the transition to clean energy. AFFHPs also help overcome common behavioral barriers during emergency replacements. By providing same-day comfort, requiring minimal coordination, and appearing familiar to consumers, AFFHPs reduce hot-state or impulsive decision-

making, status quo bias, and risk aversion making them a practical and psychologically accessible entry point for electrification at a key stage in the customer journey.

Key Findings and Recommendations

This study identifies both the technical potential of AFFHPs and the critical program design considerations that will shape successful deployment within ComEd's territory.

While AFFHPs offer a promising path to accelerate residential electrification, particularly in multifamily and older housing stock, successful adoption will require addressing real-world installation constraints, product availability challenges, and customer support needs. We based the recommendations below on technical modeling, housing stock analysis, and lessons learned from comparable programs in New York and California.

The table below summarizes the primary findings from this research and the associated recommendations for ComEd's Energy Efficiency Program portfolio, which are contained in Section 8.0 Findings and Recommendations of the full report.

Table 1. Summary of Key Findings and Program Recommendations

Key Finding	Recommendation
Approximately 1.15 million multifamily units rely on natural gas heating, with the highest concentration in Chicago, making these dense urban areas ideal candidates for electrification with AFFHPs.	Focus outreach and pilot programs on high-density gas-heated multifamily buildings in Chicago and similar areas to maximize potential impact, streamline implementation, and align with decarbonization and equity goals.
The cost to electrify through fuel-switching with AFFHPs ranges from $1–$4 per saved kWh, creating varied cost-effectiveness depending on climate, building type, and existing system configuration.	Use $/kWh saved as a prioritization tool for incentives, directing funds to where total resource cost is highest, and target low-income multifamily programs to overcome higher cost barriers to electrification.
Multifamily buildings using fossil fuels for heating offer the largest technical and economic opportunity for emissions reductions and energy savings within the residential building stock.	Prioritize incentive development for AFFHPs in multifamily buildings with fossil heating systems and create targeted use cases based on fuel type and system configuration to support tailored adoption strategies.

Key Finding	Recommendation
Cold-climate rated AFFHPs, such as saddlebag and vertical stack units, are technically capable but suffer from limited availability in current supply chains	Partner with manufacturers and distributors to develop stocking agreements, aggregated demand commitments, or regional bulk purchase programs to ensure product availability aligns with utility program launch timelines.
Installations designed for partial displacement of existing heating systems offer significantly more technical potential than full replacements, especially in space-constrained or electrically limited buildings.	Design programs to support both full and partial displacement scenarios, including incentive structures that reflect partial displacement value and contractor guidance on suitable applications for each approach.
Despite their design for simplified setup, DIY installations of AFFHPs are rare due to unfamiliarity, electrical constraints, or installation complexity beyond plug-and-play expectations.	Use utility-funded direct install crews to ensure proper setup and coverage. Allow Health and Safety funds to support necessary outlet upgrades or minor electrical work that enables successful installs (Example: Lacking a grounded 120V outlet close enough to the window)
Existing windows, plug locations, and space constraints significantly limit the feasibility of many AFFHPs in real-world multifamily buildings, even when units are technically compatible.	Develop a segmentation and matching framework that identifies product-fit by building type. Account for window size, outlet availability, and unit layout to guide program eligibility and product selection.
Faster adoption of AFFHPs is possible when products are well-integrated into the supply chain, visible to contractors, and financially accessible to customers at the point of purchase.	Deploy midstream incentives, instant discounts, and include eligible products on the ComEd Online Marketplace to improve awareness, availability, and affordability for both contractors and end users.
Emergency replacements often result in defaulting to fossil systems due to decision fatigue, urgency, and unfamiliarity with heat pumps, even when better options are available.	Frame window AFFHPs as fast, simple emergency solutions. Emphasize plug-and-play operation, availability, and comfort benefits to overcome hesitation during time-sensitive system replacement decisions.