

colorado affordable housing 30PRL Case Study | Boulder, Colorado



Project data

Project Location	Boulder, CO
Climate Zone	5
Housing Tax Credits	Federal 4 percent Housing Tax Credits and state Affordable Housing Tax Credits
Placed in Service	2021
Project Size (sf)	181,370 sf
Floors (#)	4
Units (#)	120 (17 studio, 48 one-bedroom, 44 two-bedroom, 11 three-bedroom)
Buildings (#)	3
Construction Type	New
Fuel Type	All-electric
Green Building Certifications	2015 Enterprise Green Communities Certification
Total Development Cost	\$53,353,161 (2021)
Operational Cost	\$6,886 Per Unit Per Annum (2022)



Overview

30PRL is one of several all-electric projects that Boulder Housing Partners has completed. The development is located within the city's first Transit-Oriented Development district. Construction of 30PRL began in late 2019 and it was placed into service in 2021. Of 30PRL's 120 units of affordable housing, 20 are set aside for an independent living program serving individuals with intellectual and developmental disabilities through a partnership with Parker Personal Care Homes, and an additional 10 units are set aside to support individuals and families exiting homelessness.

To learn more, visit BHP's website at:

<https://boulderhousing.org/properties/30prl/>

Electrification strategies and features



Water Heating

Individual heat pump water heaters (HPWHs)



Space Heating & Cooling

Individual hydronic heating & split system condensing cooling



Ventilation

Central energy recovery ventilation (ERV)



Cooking

Electric resistance stoves

Planning and design approach

The decision to pursue an all-electric design for 30PRL was driven by several factors, including building energy code requirements, BHP's mission and values, and cost. Boulder is one of Colorado's jurisdictions that has adopted a high-efficiency energy code to reduce carbon emissions from buildings and promote healthier and more sustainable homes. BHP credits local building energy codes for incentivizing all-electric design for new construction projects. Importantly, BHP is a mission-driven organization working to develop a decarbonization plan and achieve net zero energy across their portfolio, which contributed to the decision to adopt an all-electric design for 30PRL. Finally, because the five-acre lot that 30PRL is situated on was formerly a car lot, installing the gas lines needed for residential development was cost-prohibitive, further affirming the choice to pursue an all-electric design.

30PRL's electric water heating is achieved with heat pump water heaters (HPWH) located in mechanical closets in each dwelling unit. The mechanical closets feature Louver doors, which allow for sufficient air intake and exhaust for the HPWH to function. HPWHs are considered highly efficient, operating at nearly triple the efficiency of traditional electric resistance water heaters. This efficiency contributed to the decision to use HPWHs in 30PRL, despite the higher upfront cost and more involved design approach compared to electric resistance water heaters. *To learn more about [electric water heaters](#), visit the [technical roadmap](#).*

For space heating, 30PRL uses a hydronic Aquatherm system which connects to each HPWH and uses the hot water to deliver heated air throughout the apartment. Because these systems do not provide cooling, 30PRL utilizes a separate, split system condensing unit on the roof for air conditioning. *To learn more about [electric space heating and cooling](#), visit the [technical roadmap](#).*

30PRL also utilizes a central energy ventilation recovery (ERV), a best-in-class ventilation system. These ERVs are designed to exhaust air from the building and bring in outdoor air while transferring heat and humidity from one air stream to the other. This design improves heat recovery efficiency and reduces heating needs and operating costs otherwise needed for conditioning the outside air. These efficiency measures are especially important in Colorado, where the coldest days of the year can put additional strain on HVAC systems. *To learn more about [ventilation](#), visit the [technical roadmap](#).*

BHP uses electric, energy-efficient appliances across its portfolios. While these appliances, namely electric resistance stoves, improve indoor air quality for residents, the major draw for BHP has been simplified operations. BHP has found that it is easier for in-house maintenance to work on these electric appliances, and that electric stoves in particular reduce the risk of fires compared with gas stoves. *To learn more about [appliances](#), visit our [technical roadmap](#).*

BHP did not face challenges procuring qualified installers and consultants who were familiar and experienced with electric water heating and space heating systems. They found that the systems utilized at 30PRL were relatively simple and the installation of such systems were similar to conventional systems. Being in a large metro area, BHP has seen more contractors that are familiar with building electrification technologies.



Cost

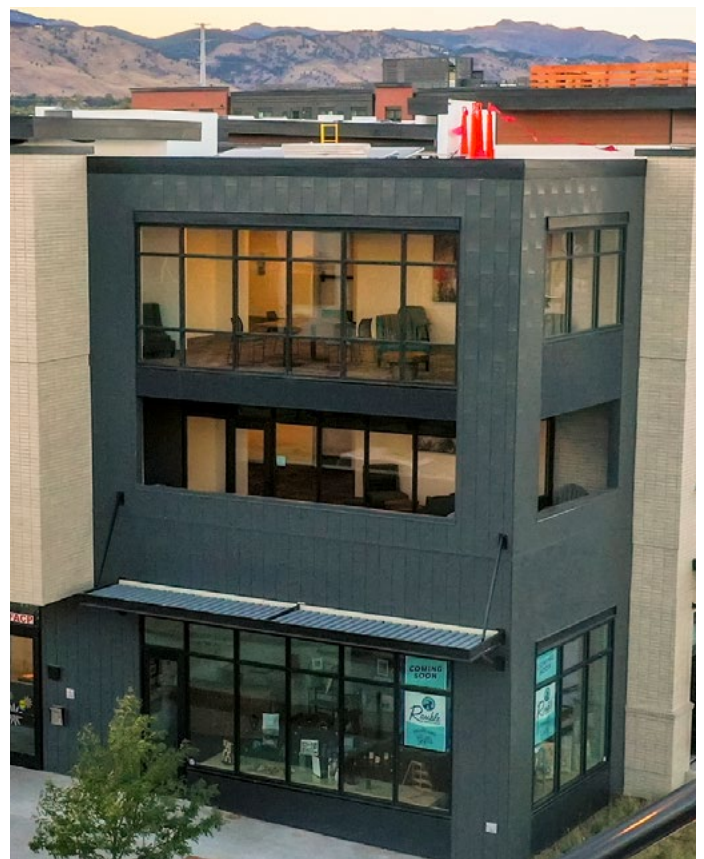
The total development cost for 30PRL was \$53,353,161. BHP, like other developers pursuing the electrification of their portfolios, has reported that it can cost slightly more upfront to utilize all-electric mechanicals. However, as electric domestic hot water (DHW) and HVAC systems become more widely adopted, the cost difference between constructing all-electric and mixed-fuel buildings may decrease.

BHP reports that 30PRL's per unit per annum (PUPA) cost is approximately \$6,886 (2022). This is slightly lower than the Colorado average of \$7,629 and the Boulder County average of \$7,258 based on the [CHFA Per Unit Per Annum \(PUPA\) Reporting](#). This cost, considering that some of 30PRL's electric systems are not operating at maximum efficiency (see the "Lessons Learned" section below), helps to demonstrate the viability of all-electric multifamily housing. To learn more about operating costs in all-electric and mixed-fuel multifamily affordable housing in Colorado, see the [Housing Tax Credit Building Electrification Report](#) (2021), prepared by Group14 Engineering for Colorado Housing and Finance Authority (CHFA), the Colorado Department of Local Affairs (DOLA), and the Colorado Energy Office (CEO).

The greatest opportunity that BHP sees for additional savings is in solar, which they intend to employ in future developments. *To learn more about [residential solar](#), visit the [technical roadmap](#).*

Successes

30PRL has demonstrated that all-electric multifamily affordable housing development is possible in the Denver metro area. 30PRL is part of a master planned, five-acre, all-electric community, including both affordable and market-rate residential units. BHP considers this all-electric neighborhood to be an example that demonstrates the viability of large-scale all-electric developments. The 30PRL design team also considers the quality and aesthetics of the development to be successful, as the affordable housing is not easily distinguishable from the market rate housing in the neighborhood.





Lessons learned

While 30PRL has been successful in many ways, there are lessons that BHP and their design team have learned since the building has been placed in service that will influence how they approach the design of their next property.

The heat pump water heaters (HPWH) have not been as well received by residents as anticipated at 30PRL. Residents have reported that the in-unit HPWHs can be louder than expected, and maintenance staff have even been asked by some residents to turn them off. In these cases, maintenance staff have switched the HPWHs to function as electric resistance water heaters, which are three to four times less efficient but preserve the functionality of the Aquatherm space heating component. The HPWHs also exhaust cold air as a necessary part of their function, and the Louver doors that are designed to allow airflow into and out of the closet can cause some comfort issues for residents. BHP shared that design changes can alleviate both concerns and in future developments BHP will locate mechanical closets containing HPWHs in common corridors rather than each apartment. This will allow cool air to be exhausted into the corridors rather than the apartments and will mean that any noise produced by the HPWHs will be insulated by a wall between the closet and the apartment, rather than a Louver door. An additional benefit is that maintenance staff will be able to access the mechanical closets without entering any apartments, benefiting both operations and residents. *Visit the [technical roadmap](#) to learn more about the pros and cons of different domestic [hot water systems](#).*

There were also some issues encountered with utility metering due to incorrect installation. 30PRL initially used submeters so each resident could pay for their own heat and hot water in exchange for a lower monthly rent. During the submeter installation, however, lines were physically crossed, leading to inaccurate billing. BHP attributes this to installers who were unfamiliar with the equipment and is in the process of exploring a transition to owner-paid utilities at 30PRL. Submetering is a method for minimizing the administrative burden of utility metering. As evidenced at 30PRL, however, experienced installers are crucial to enjoying these benefits. *To learn more about [utility metering](#), visit the [technical roadmap](#).*

BHP’s biggest piece of advice for multifamily developers, owners, and operators considering all-electric design is to work with experienced consultants, especially seasoned mechanical, electrical, and plumbing (MEP) specialists.

Project team

Developer	Boulder Housing Partners
Architect	Coburn Partners
General Contractor	Milender White
Structural	KL&A
Civil	JVA Consulting Engineers
Mechanical, Electrical, and Plumbing (MEP)	Mazzetti
Energy	Group14 Engineering

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