# HILLCREST ENERGY ENGAGEMENT:

Exploring the Lived Experience of Residents in Net-Zero Town Homes to Inform the Future of Affordable Net-Zero Design

certs seed grant







# CONTENTS

Abstract	3
Introduction	5
Methods	7
Results	11
Discussion	15
Conclusion	19

### ABSTRACT

This project engaged in a dialogue with residents living in a net-zero community about their lived experiences and perceptions while providing education about the unique design and sustainability features of their homes. The project team, composed of the Northfield Community Action Center (CAC) and Precipitate engaged with the residents of Hillcrest Village three times over the course of three months using a variety of engagement methods including, group discussions and one-on-one interviews. From these conversations, the project team developed lessons learned and recommendations that can inform future net-zero affordable housing development in a way that prioritizes the experiences of actual residents. The project team identified a number of recommendations from this engagement, most notably that both residents and property management would benefit from additional educational resources and training opportunities to better understand net-zero design and high-efficiency mechanical systems to optimize the user experience and overall function of the home. Additionally, the need for further post occupancy research like this continues to grow as more funding for sustainable and affordable housing becomes available.





4 | Hillcrest Energy Engagement Final Report

### INTRODUCTION

The necessity for affordable net-zero design grows larger every day as we work to reduce carbon emissions in the built environment and improve people's lives in the process. While there are conversations on net-zero design among design professionals, this project aims to highlight the importance of connecting design to the lived experience of those who reside in these buildings. The feedback from residents who live in these buildings highlights what is working well already and identifies critical next steps for future projects. This project engaged with the residents of Hillcrest Village to understand their experience and draw preliminary conclusions to inform future research like this.

Located in Northfield, Minnesota, Hillcrest Village is a "first-in-the-nation Net Zero Energy emergency shelter and supportive housing development where 100% of utilities are supplied by on-site solar panels. Designed, funded, and built by the community, Hillcrest Village represents local solutions to climate change." <sup>1</sup> This 17-unit development began construction in Summer 2021 and began welcoming residents in Winter/Spring 2022. The Hillcrest Energy Engagement Program first engaged with residents in Spring 2023, after residents had been phasing into living at Hillcrest for 1 year. Hillcrest Village offers emergency shelter, transitional housing, and market rate/workforce housing creating a community with a diverse group of residents. In early engagement sessions, the project team and residents explored the many benefits of living in a net-zero home but later extended the dialogue to the lived experience of residents on where Hillcrest could be improved. The project team quickly identified gaps in resident knowledge and barriers to optimizing their comfort, livability and overall function of the space. The findings of this project are critical because while there is an assumption that net-zero design will positively impact the residents of this community, rarely are post-occupancy studies conducted that capture the perspectives and feedback of actual residents. These stories are critical for informing the design of future efficient homes. Above all, this project sought to support a net-zero community that provides housing for populations most vulnerable to climate change, while empowering community members to advocate for what future developments might look like.

This report will describe the research and data collection methods used. Then present the significant findings of the engagement. Finally, it will interpret these results and discuss the limitations of this project and conclude with recommendations for the future of this work based on the feedback received from the residents of Hillcrest.



1 hillcrestvillage.org



Left: Anna Koosmann from Precipitate presenting at Engagement Session 1 Right: Imani Mosher from Precipitate at Engagement Session 2 Bottom: Imani Mosher from Precipitate at interview table at Engagement Session 3





### **METHODS**

This project engaged in qualitative field research to explore and better understand the experience of living in net-zero affordable housing. The research used in this project included onsite observations, participant comments, group discussions, and interviews with the Hillcrest Village residents. The project team engaged with the Hillcrest residents once a month for three months, between April - June 2023. Each engagement session lasted roughly two hours. The materials used included printed information packets that contained educational information on net-zero design, heat pumps, and Energy Recovery Ventilators (ERVs), as well as discussion questions. The discussion questions in the informational packets guided the qualitative research at every engagement session. Knowing that this research meant to identify broad themes and patterns the discussion questions were kept open-ended to give the residents an opportunity to share freely about their experience.

- 1. What do you like about living at Hillcrest?
- 2. What would you change?
- 3. How has living at Hillcrest Village impacted you?
- 4. What do you want more information on?
- 5. What do you hope to see at Hillcrest Village or in future homes?

These discussion questions remained the same throughout the project to maintain consistent data collection with as many residents as possible, anticipating that attendance would vary across engagement sessions. Additionally, the project team developed slides that were shared with the residents at all three engagement sessions. The slides included more information on the net-zero design features like wall assemblies, more information on daylighting and windows, and heat and humidity reduction strategies. All materials were created in both English and Spanish, which allowed the project team to connect and communicate more authentically and in greater depth with the residents who were Spanish speakers.

#### Engagement Session 1 - 11 April 2023, 5:30pm

At the first engagment session the project team

connected with approximately 15 residents of Hillcrest Village at the Northfield Community Action Center. The project team brought a natural cleaning solution and spray bottle for residents to take home, folders with a welcome packet and contact information inside, and pizza to eat during the session. The welcome packet included the schedule for the Energy Engagement Program, the purpose and goals of the program, frequently asked questions (FAQs) on net-zero and greenhouse gasses, and the discussion questions with additional space for note taking. The welcome packet was paired with a presentation given by Precipitate that introduced the residents to the background of the Clean Energy Resource Teams Seed Grant, and the Energy Engagement Program. Additionally, they compared code baseline wall assemblies and mechanical systems to the highly efficient walls and mechanical systems at Hillcrest Village. The residents asked questions about net-zero design, and began sharing about their experience living at Hillcrest. This engagement session was successful but took a significant amount of time to hear from residents individually in a group setting. Therefore, engagement sessions moving forward were small groups based.

#### Engagement Session 2 - 8 May 2023, 5:30pm

The second engagement session took place at Hillcrest Village cul-de-sac, approximately 18 residents attended this session. The project team brought tables, chairs, tents, subway sandwiches and a flower planting activity. At the first engagement session the project team heard that residents would like more information on the heat pumps and ERV's, so Precipitate provided additional information and fact sheets on those. Likewise, the project team understood that residents would benefit from receiving the information in a way that was more relevant to daily life. So, the project team developed and shared some net-zero basics on building envelopes, strategic solar use, and air quality, more information on windows and blinds, heat and humidity reduction strategies, and ventilation and heat pumps. Residents were invited to connect in small groups to discuss this information and respond to the five discussion guestions once again. Although approx-

#### Hillcrest Energy Engagement Final Report | 7



Top: Heat pump outside of one of the town homes at Hillcrest. Left: Educational materials at Engagement Session 2. Right: Tents and CAC Staff at Engagement Session 3.





8 | Hillcrest Energy Engagement Final Report

imately 15 residents attended the session, feedback was collect from only 7 residents.

#### Engagement Session 3 - 8 May 2023 5:30pm

The final engagement session also took place at the Hillcrest Village cul-de-sac, approximately 20 residents attended this session. Residents were invited to play outdoor games, draw with sidewalk chalk, enjoy pizza, and engage in one on one interviews in response to the five discussion questions with the project team. Also, at this session the project team shared the initial takeaways of the Energy Engagement Program with residents for feedback. Overall, residents were able to connect with each other, ask the project team questions about their homes and share final thoughts on their experience living at Hillcrest Village The final engagement session gathered the most data from residents, collecting feedback from every resident who attended the meeting.

The project team chose a qualitative field research approach to connect with the residents in a more informal and casual way. For most residents at Hillcrest this was their first time engaging with net-zero design, so taking an observational and listening approach allowed the project team to respond to the questions, comments, and concerns of the residents without overwhelming them with technical information. To avoid bias in the project, the data collected was reviewed by multiple people, preliminary results were shared with residents at the final meeting to confirm results were representative of their beliefs, and the project team considered alternative explanations for the feedback received from residents.

An example of educational materials shared with residents during engagement.

### net-zero basics

#### **BUILDING ENVELOPE**

**AIRTIGHTNESS:** These building has virtually no air leaks, ensuring that there are no drafts and minimal loss of heated or cooled air.

**INSULATION:** High levels of insulation retain heat in the winter and coolness in the summer. Triple pane windows ensure comfortable temperatures throughout your home.

**THERMAL BRIDGING:** Thermal breaks are used to reduce heat by preventing conductive heat flow through the thermal envelope.

#### STRATEGIC SOLAR USE

High quality windows are sized and situated to provide ample natural light, with triple-glazing, a special coating that minimizes overheating, and low heat loss through the frames. The windows tilt or turn inwards, and are excellent at preventing outside noise when closed.

#### **AIR QUALITY**

Your home is very well-ventilated to have high quality, filtered air constantly pumped in to maximize your comfort. Exhaust air passes through heat recovery devices to retain heat in winter and coolness in summer.



One of the Hillcrest Village town homes with bikes, outdoor toys, and a small pool in the front yard.

## RESULTS

The research conducted in this project sought to engage with the residents of Hillcrest Village to examine the assumed benefits of net-zero housing and identify how it could be improved for future projects. The discussion questions shared at each engagement session aimed to identify areas of success and opportunities for improvement. The results of these discussion questions will be explored here.

#### What do you like about living at Hillcrest Village?

When asked what they liked about Hillcrest Village residents highlighted the quiet, calmness, and peace they felt at home. Many residents mentioned how much they love their neighbors and the sense of community they felt at Hillcrest, most noting that they loved seeing all the kids in the neighborhood play together. Some residents discussed how Hillcrest gave themselves and their families independence and peace of mind for the first time in a long time. This feedback suggests that Hillcrest Village creates a space for residents to feel at home. Through site observation and engagement the project team noted many residents were interested in maintaining their homes, and outdoor space suggesting that residents feel a sense of ownership and pride over their spaces.

### "[I like] the community, kids, and all the help and support from the CAC"

#### What would you change about Hillcrest?

When asked what they would change about Hillcrest, residents highlighted a few issues and lingering questions. Some residents shared they did not feel adequate heat in their homes over winter, and others pointed out that the conditioning was not felt equally across all levels of the home. These issues were brought to property management's attention. Additional question asked by multiple residents were, where to go in case of a weather emergency as the homes do not have basements and concerns about wifi performance across walls with added insulation. On the other hand, when asked this question many residents said they would not change anything.

#### "I wouldn't change anything"

#### "I wish I could add my own wifi"

#### How has living at Hillcrest Village impacted you?

When asked how living at Hillcrest Village had impacted them, most residents expressed deep gratitude for the opportunity to live at Hillcrest. Highlighting that although some residents had experienced issues with the mechanical systems they are still happy to live at Hillcrest and would like to be a part of the solution. This question received very similar feedback as question one, where residents highlighted the sense of peace, quiet, calm, and independence that came with living at Hillcrest. However, residents who have been experiencing issues with the mechanical systems feel that living at Hillcrest has impacted them negatively because the issues with the heat, and general repairs of the home have not been resolved to their satisfaction.

"Living here was my dream, but I need more support from management to make sure my house functions like any other house. The people who installed my heat pump didn't know what they we're doing and neither do the people who come to fix it"

### What do you want more information or support on?

When asked what they wanted fore support or information on, many residents asked for additional resources to understand how the mechanical systems in their homes worked. Residents recommended more storage through designated garage space, and access to trained professionals who could address any problems with the mechanical systems. Furthermore, many residents asked for formal training and identified an orientation upon moving in as an opportunity to familiarize themselves with the unique features of the net-zero design. Similarly, when asked, many residents were interested in an operations manual that was easy for them to access and understand. This research also engaged with the property management who identified the need for additional education in addition to a robust operations manual. When asked, property



Chalk drawings at engagement session three, with Northfield CAC van and interview table in the background.

management expressed concern about the lack of education they received before managing net-zero properties and subsequently engaging with residents' questions and needs.

#### *"I know my house is different, but I need more information on how"*

#### What do you hope to see in future homes?

When asked about the future, residents offered tangible recommendations for Hillcrest like the addition of a garage for storage space, storm shelter, a community garden, and fire pit. Many residents hoped for more communities like Hillcrest village so that more people could experience living in sustainable new construction. For residents who experienced issues, they hoped for easy access to trained professionals who could support maintenance and repairs of their homes.

#### "A playground for the kids"

#### "I hope to be a part of this work moving forward"

Overall, for many residents living at Hillcrest is a positive experience and they enjoy being a part of a peaceful community. However, there are still opportunities to improve. Residents consistently asked for additional resources and opportunities to learn about net-zero design, heat pumps, and ERVs that should be written in a manual that residents could keep in their homes or access online, in addition to a formal orientation upon moving into Hillcrest. Likewise, residents made it clear that they need better access to prepared and properly trained maintenance professionals to resolve any issues with their homes in a comprehensive and timely manner.

### main takeaways



# DISCUSSION

The results of the discussion-based engagement with the Hillcrest community indicate the need for more education and training for residents, an operations manual for residents and property management, and additional opportunities to build community with other residents. In line with the hypothesis that there are many benefits to living in a net-zero home, residents enjoyed the external facade, upgraded appliances, and the community at Hillcrest. But, as this research intended to further examine the experience and interaction of residents with the unique net-zero features the project team identified significant gaps in the resident's understanding and interaction with the added insulation, air source heat pumps, heat pump hot water heaters, and ERVs. These results suggest that there are opportunities for future project teams to improve the experience of affordable net-zero housing for both residents and property management.

At the second engagement session, the project team was grateful to connect with the manager of the property, a key player to maintain operations of the property and supporting residents. This conversation extended the project teams understanding that there needed to be additional education available to residents and property management. Furthermore, while the property management works diligently to support the residents of Hillcrest, they described the challenges on the lack of access to trained professionals who can resolve mechanical or structural issues in a timely manner leaving property management frustrated and concerns with the homes unresolved. This phenomenon speaks to the larger issue of the lack of professionals in the workforce that are trained to install, maintain, and service the high-efficiency mechanicals at Hillcrest. Reinforcing the need for more trained professionals in the green workforce as an opportunity to support affordable net-zero housing like Hillcrest while creating jobs. Additionally, this feedback highlights the potential benefits of a formal directory with trained and/or certified suppliers, partners, contractors and other key resources available for property managers, residents, or anyone who may need it.

Feedback from this research identified issues with the mechanical systems that may not have been properly commissioned. Residents expressed issues receiving adequate heat in the Winter. As the average temperature during Winter in Minnesota is well below zero with a windchill making it feel even colder<sup>1</sup>, it was alarming for some residents of Hillcrest to experience issues with their heating systems, such as a constant stream of cold air, that could not be easily resolved. Further research is needed to identify causes, if any, of improper or malfunctioning mechanical systems. Also, additional training for property management and residents would have been useful in the situation and should be a priority moving forward.

1 National Weather Service.weather.gov

Pre-Design	Schematic Design	Design Development	Construction Documents	Construction Administration
Information gathering, defin- ing design goals and objectives.	Preparing initial designs, pre- senting design options, and sign-off client approved design to develop in the next phase	Building assem- blies and details are incorporated, architecture tea, coordinates with engineers and con- sultants.	Design phase is finalized, drawings and specifications are completed for construction bidding and permitting.	Selected contractor company builds the project to conform with the design speci- fications, the architect transitions into the owner's agent during construction.

#### Traditional Design Process



Having an opportunity to follow up with Hillcrest residents during the three engagement sessions, proved to be valuable for the resident's engagement with one another and it identified the need for a community board or representative to advocate on behalf of Hillcrest residents. The community meetings united residents to build relationships with each other. Residents have also expressed interest in more opportunities to connect with each other through community events like bonfires or movie nights. This feedback and observation suggests that a community board created by and for the residents of Hillcrest Village could support additional community building events and facilitate decision making or advocacy on behalf of Hillcrest Village. The community board could connect with the Northfield CAC to share about the wellbeing of Hillcrest residents and highlight any concerns, it would also be useful for future research like this to have a representative from the community on the research team.

The results of this engagement are key to continuing this research so that the future of affordable net zero design is informed by the people who actually live in it. This research identified the need for holistic education on net-zero housing for suppliers, contractors, property managers and residents that fills the gaps in the design, build, installation, and operating process with additional information on the net-zero design like the added insulation, air sealing, high-efficiency mechanical systems while creating resilient homes where all people can thrive.

#### Limitations

There were three limitations to this research. First, the project team only connected with the residents of Hillcrest Village three times over the course of this research, and the attendance of all residents was inconsistent. Second, the project team needed additional funding to create more educational materials in both English and Spanish, in addition to more time engaging with the residents of Hillcrest with a Spanish translator. Future research teams may need translation services for other languages to effectively connect with residents. Third, the amount of time that residents had been living at Hillcrest Village was inconsistent, meaning that some residents had been living at Hillcrest for one year, others for four to six months as residents phased into living at Hillcrest while construction was finishing. Notably, not all residents had experienced the Winter season at Hillcrest when the project team engaged with them. However, it was valuable for the project team to connect with residents soon after construction was complete to ensure the proper function of mechanicals and take advantage of contractor's warranties to repair or replace equipment as needed.

Nonetheless, the project team is confident in the validity of the results of this research because the engagement framework and discussion questions remained consistent across all engagement sessions allowing the residents that the project team engaged to fluctuate with less impact on the data. The project team made a distinct effort to engage with residents consistently and found success by calling to remind residents of engagement sessions, rescheduling meetings if low attendance was suspected, and knocking on doors to invite residents to participate.



Chalk drawings at engagement session three, with Hillcrest town homes in the background.

# CONCLUSION

By engaging with the residents of Hillcrest this research established that while there are many benefits to living in a net-zero home such as lowered utility costs and better indoor air quality, there are still opportunities to improve. This research identified significant opportunities to improve process through access to additional educational materials for the residents of Hillcrest and the property management on the distinct features of net-zero that impact the functionality of the space and livability for the residents. To more fully address the issues that arose while conducting this research, the project team sees value in a holistic approach to education that extends beyond Hillcrest to connect builders and subcontractors with essential training, and, developers and designers with post-occupancy dialogue, to fill the gaps in the current design process in a way that centers people. Furthermore, this research discovered that residents were looking for more opportunities to connect with their neighbors and build community. The engagement sessions initiated awareness that Hillcrest would benefit from a community board where residents could gather to be with one another, discuss issues, plan neighborhood events, and more. Likewise, the neighborhood association could elect an official representative from the Hillcrest community to serve as a liaison between the Northfield CAC and any other partners.

To gain a more complete understanding, future research should continue to have meaningful conversations and informative meetings with residents who live in affordable, net-zero housing. This dialogue should be paired with a quantitative study that collects temperature and moisture data to verify resident observation and to compare it to the modeled performance of the buildings. The qualitative research from this Energy Engagement Program at Hillcrest Village would benefit from quantifiable data to support the feedback expressed from residents and conclusions drawn by the project team.

Additional information is needed to verify the functionality of the mechanical systems and repair any issues. Support and education for the residents

should continue consistently to support building an understanding of the opportunities to improve affordable net-zero design.

As resources for decarbonization and electrification make their way to other communities like Hillcrest, the time to take this feedback seriously is now. There is so much to gain from listening to each other. By supporting project teams with education and dialogue, affordable net-zero housing has the opportunity to slash carbon emissions while empowering residents.

