Scaling Decarbonization Development Innovation with Emerging Community-Based Developers

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ABSTRACT

The real estate industry is being asked to lead the implementation of building decarbonization solutions across the United States. However, developing best practices for decarbonization, leading development innovation and increasing developer diversity and community ownership remain challenges for large-scale and community-based developers alike. To address these challenges and to provide support, we have created an incubator to support these innovations, starting with a group of emerging, small-scale developers who are leading these efforts. These leaders are working at the forefront of decarbonized development, they are simultaneously addressing diversity and bolstering community generational wealth.

We found that small development firms often take risks to innovate and demonstrate despite lacking an institutional-scaled resources or support ecosystems focused on decarbonization practices. Those with the fewest resources are being asked to lead our decarbonization innovation efforts.

This paper documents the necessity of a cohort and incubator program to provide a decarbonization-specific ecosystem to support small developers and scaled innovation. The incubator creates connections, fosters innovative strategies to access incentives and alternative funding, and assembles resources for small, emerging, and minority developers with the goal of sustainability and affordability. For instance, collaborative efforts with leading developers and utilities can enable the seamless integration of distributed energy resources through optimal metering and interconnection and significantly reduce the utility costs, benefiting the utility, the developer, and the tenant economically. The process described in this paper will result in case studies and how-to resources to provide tangible examples of innovation within the emerging development field.

Introduction

Larger development companies can face structural challenges to deviations from proven business models and while many are beginning to include decarbonization in owner programs innovations has oft relied on smaller, nimble organizations. Yes, these smaller firms and individuals wanting to create energy-efficient housing for their communities face a system that discourages novel approaches and is skeptical of unknown entities. As developers face mandates and societal pressure to make their designs more sustainable, the larger and more established firms generally have the resources to meet at least the minimum requirements; smaller firms, even if they are eager to meet and exceed energy efficiency minimums, may lack the capital, expertise, and access to support resources to do so. Most banks perceive them as risky bets, but securing financing is a crucial first step.

Innovation is vital to achieving affordable and equitable decarbonization in real estate development projects. A zero energy/zero carbon (ZEZC) approach focuses on lowering energy consumption, increasing renewable energy generation, and reducing carbon emissions overall (Torcellini et al. 2022). Embracing ZEZC solutions gives smaller developers a competitive edge over larger, established firms as the industry prepares for and adapts to ongoing and upcoming regulatory changes. The larger development firms are inclined to utilize traditional methods of building that have proven profitable within their process and may not include ZEZC solutions.

When small and emerging firms innovate and showcase decarbonization solutions, they take disproportionate risks; those with the fewest resources are, in essence, leading decarbonization efforts. Therefore, there is a need for improved knowledge and tools for affordable decarbonization in development projects among emerging, community-based, diverse developers. With the increasing mandates for decarbonization and electrification, emerging developers need assistance learning how to de-risk decarbonization and adopt clean technology in their projects. They must navigate requirements for each development individually and benefit less from an economy of scale. To establish competitiveness, they often need to find creative responses to the changing requirements for new construction. Therefore, small and emerging developers would benefit from having access to a network for funding and education.

This paper specifies barriers and highlights opportunities for these developers to include sustainable solutions in their project design. The authors provide examples of smaller developer firms leading the decarbonization effort and discuss our process of forming the mentor-mentee network connected through our cohort. Lastly, we discuss some of the future work that can be done to increase the impact of the cohort.

Methods

This section is an overview of how we identified and collaborated with innovative developers to create spaces for knowledge transfer. This collaborative effort enables us to document pathways for creative innovation and create a network of developers spearheading sustainable design in their projects. This collaboration will result in a portfolio of online resources produced by the National Renewable Energy Laboratory (NREL) to educate developers who want to de-risk decarbonization. The portfolio will include case studies of successful innovation in emerging decarbonized development alongside information on financing and incentives. Moreover, we will discuss the outreach for creating the mentee network and methods for disseminating the findings on decarbonization in real estate to emerging developers.

Identification of Innovation in Real Estate

This work has enabled us to identify challenges and opportunities with decarbonization in real estate. This initiative has only become possible by identifying small firms that are innovative in their approach to ZEZC design. NREL's research portfolio and engagement with local and national organizations have positioned the lab well in identifying innovative firms. It has also established the laboratory as a resource for de-risking various technologies in the built environment. These engagements have created opportunities for us to identify innovative real estate developer partners. Through a series of interviews with the identified firms, we recognized

how developers are connected to various stakeholders and play a central role in bringing them together to design for decarbonization effectively.

It is crucial for developers to have the knowledge of how various partners such as regulatory bodies, workforce, energy companies, community representatives, and financial entities can impact the process. Moreover, they need to understand how these connections can be made to decrease the risk of a ZEZC design. This comprehensive understanding of all these aspects and their impact on the project empowers the developer to put together a master plan to inform the stakeholders such as the community on various aspects of the project. This plan incorporates guidelines on how to leverage these connections to enable design for decarbonization, giving them the capability to drive the decarbonization process.

Figure 1 provides an overview of the connection points we have identified by interviewing and researching multiple firms. As seen in the figure, developers play a central role in bringing all parties together to make the project happen and decrease the risks involved in the planning. Smaller and emerging developers often struggle with having enough internal staff to ensure the success of a ZEZC financing, business model, and design approach, resulting in the need for developers to acquire various skills to fulfill multiple roles. Therefore, they must know how to leverage connections with different partners to boost their projects.

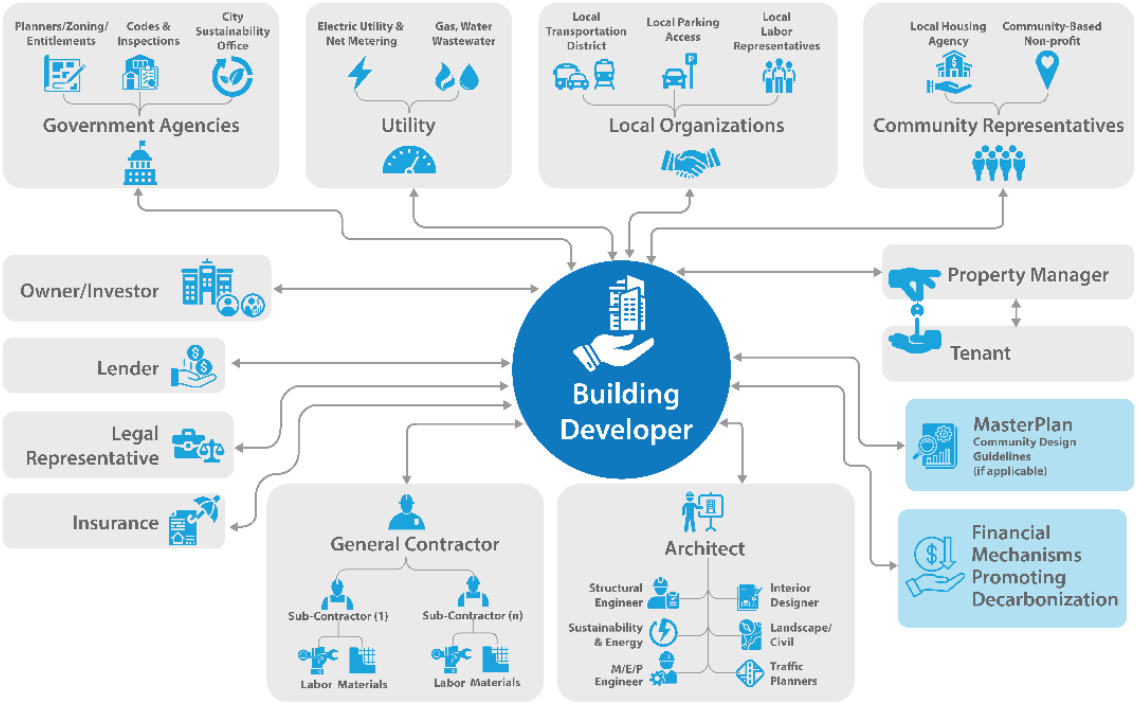

Figure 1: Stakeholders and processes that affect developers' success in a zero energy, zero carbon approach in design. Light blue shaded boxes specify the processes that align the connection points and innovative approaches with the project during the execution timeline. Innovative developers leverage the relationships and connection points to gain more efficiency in the process or benefit from the financial savings to make their projects possible. Summary of innovation examples for these connection points can be found in Table 1.

Government agencies. Local government offices establish the codes and standards needed to align the building industry to the local policies. It is possible that the newly established rules need revisions to be more applicable to various types of development projects. Establishing a relationship with government agencies enables the developers to not only be updated on the latest regulations but also to have an opportunity to voice their concerns to the city. By working closely with the city of Golden's sustainability office, AC Development **(AC Development 2024)** has been able to accelerate the approvals of their innovative design of their Clayworks project (previously CoorsTek Ninth Street Redevelopment).

Utilities. Working closely with utilities and utility program administrators is important in projects with the goal of decarbonization. Often electrification is an essential step in achieving ZEZC design, and many utilities offer incentives and rebates for electrification. Furthermore, taking advantage of various rate structures and programs such as net metering impacts the financial analysis of a project and this knowledge is required for proper sizing, design, and operational control of the system. As an example, 548 Development **(548 Entreprise 2024)** installs rooftop solar on all their projects in close collaboration with the *Illinois Solar for All* program **(Illinois Solar for All 2024)**. In-house capabilities for solar projects are especially important in affordability when a developer is trying to pair community solar with electrification. This approach enables affordability in building and operational phases of the project.

Local organizations. Using local resources and leveraging local workforces are great ways to reduce costs and ensure project success. Additionally, working with other local organizations can result in better use of space in the projects. For example, the parking requirements of a project can be adjusted if partnering with the local transportation district results in successful transition to alternative forms of transportation for the building's tenants **(High Plains Architecture 2024)**.

Community representatives. The active involvement of community representatives in project design and execution significantly enhances project efficiency. Often, smaller emerging developers are part of the community, which positions them well to design in response to community needs. In turn, gaining community approval streamlines the project. Pure Development (**Pure Development 2024**) is committed to incorporating community needs into their Fox Park (**Fox Park 2024**) development project (**TRYBA Architects 2024**).

Owner and investors. Investors tend to prefer projects that are less risky. As a result, innovative projects can have a difficult time getting funded. Emerging decarbonization developers should know and use various methods of evaluating and reducing the risks involved with their projects. Knowledge of clean tech and their operation within the building is one way of risk reduction. This can be gained from modeling and prototyping. iUnit's **(iUnit 2024)** prototyping efforts reduce the risks of a construction timeline, making it more attractive for investors.

Lenders. There are financial institutes, such as green banks, that exclusively fund decarbonized portfolios in design and operation **(American Green Bank Consortium 2021)**. Developers should learn about and connect to green banks and similar entities that have a mission in funding

projects that address climate change and decarbonization, such as Sunrise Banks in Minnesota **(Sunrise Banks 2023)** which funded an all-electric passive house as seen in Figure 2.

Figure 2: All-electric, passive house-certified Solstice apartments by Footprint Development *(Footprint Development 2024)* were funded by Sunrise Banks.

Legal representatives. Another essential factor for developers is access to legal representation, especially for knowledge of tax law to be able to effectively use tax credits and other benefits in their projects. AC Development's access to their in-house legal team allowed them to rely on tax benefits to incorporate geothermal technologies in their project. It is notable that small emerging developers might not have access to a legal team, highlighting the need for these developers to have familiarity with most of these processes.

Insurance. Resiliency in design can also be highlighted so that insurance companies can grant lower insurance costs for a project. Arnold Development Group's (ADG) **(Arnold Development Group 2024)** passive house project benefits from passive survivability, specifically regarding fire resiliency, which lowered their insurance costs and played a substantial role in financing their project. Building energy resiliency and self-sufficiency also could be a factor in insurance negotiations, especially in harsh climates **(Liou 2023)**.

General contractors. Innovative use of prefabricated or modular design has enabled developers to accelerate their projects. Additionally, close partnership with builders and general contractors allows for streamlined processes and creates learning opportunities to enhance the scalability of a project. iUnit uses prototyping to evaluate the performance of their units and provide a more realistic timeline of construction. Blokable's model of vertical integration of factory (**Figure 3**)

and development has enabled them to reduce the cost of their modular design **(Holm and del Rio 2021)**.

Figure 3: Blokable's in-house modular factory had made ZEZC design affordable. (Blokable 2024)

Architects. Designers, architects, and engineers should all be qualified to assist the developer with the project's energy use and carbon production reduction goals. For AC Development, hiring a sustainability consultant upfront meant understanding the cost of innovation and system integration. In addition, architectural renderings do a great job of communicating the clean tech integration goals in a project, such as solar façade, facilitating communication with other partners, and showing commitment to design.

Property management and tenancy. ZEZC buildings benefit from reduced operational energy costs. Some developers choose to operate the building after occupation to finance the project through the reduced bills. Firstfloor's **(First Floor 2024)** ownership and operation of net energy-positive schools allowed them to finance the clean technology upgrades. ADG included utility costs in the rent for units in a multifamily building that they also operate. Other options, such as a green lease agreement, are other ways developers can align the benefits of decarbonization between the owner and tenants **(Feierman 2015)**. Green lease agreements specify the responsible party to make improvements or use the benefits and incentives to aid the project in achieving its energy and water efficiency goals.

Master planning. Every project, especially innovative ones, needs a proper way to communicate with the various stakeholders. Master planning ensures documenting and communication of the project but also facilitates long-term planning. This document can act as a reference point to ensure the initial objectives and goals of the project are being fulfilled. AC Development's master planning helps them in evaluating the tenancy options of the district, ensuring other aspects of the project such as parking requirements would work seamlessly.

Financial mechanisms for decarbonization. An important step in reducing the risks involved in decarbonization-focused projects is the use of available incentives, rebates, tax credits, and other mechanisms for financing such projects. In addition, having access to a legal team helps in

interpreting the tax laws this step requires, leveraging the established partnerships with other stakeholders such as the utility and the city.

Table 1: Summary of connections developers should make to be able to de-risk their ZEZC projects. Innovation often happens in shaping these connections in creative ways.

Stakeholders and processes	Benefits of engaging this stakeholder	Case study examples
Government agencies	• Provides developers with current and detailed knowledge of local codes and standards. • Provides an opportunity to champion and influence the decision-making process; enables a more streamlined process for project design, approval, and execution.	AC Development Footprint Development
Utilities	• Early involvement enables developers to better plan for service and be more knowledgeable about rates, rebates, and incentives. • Provides developers an opportunity to influence infrastructure upgrades and program development.	Arnold Development Group iUnit
Local organization	• Project costs and requirements can be adjusted by tapping into local resources and connections. • The use of local resources increases the sustainability and reduces the cost of the project through creating alternative transportation, local material purchase, and acquisition of local know-how and skill.	Pure Development, 548 Enterprise UDFS Footprint Development
Community representative	• Community engagement that leads to project buy-in has proven essential in accelerating the timeline. • Evaluating the community's needs and adapting the building's functionality prepares the project to be a successful addition to the community.	Pure Development AC Development
General contractor (GC)	• Hiring a GC who is familiar with decarbonization and sustainable design technologies is crucial for the project's execution. • Some developers keep this position in-house to reduce costs and improve quality control and efficiency. • GCs may stay involved with the building after occupation.	Firstfloor Blokable iUnit Sola Impact

Stakeholders and processes	Benefits of engaging this stakeholder	Case study examples
Architect	• Hiring a like-minded architect and other consultants enables the firm to evaluate creative integration pathways for sustainable design. • This dynamic can continue and impact the operation of the project if the consultants stay involved after occupation.	Firstfloor AC Development
Owner and investor	• De-risking the project by providing data such as the timeline, and feasibility of the project makes it more attractive to investors.	iUnit
Lender	• Partnering with a lender seeking to build a portfolio of sustainable and decarbonized projects—one that does not view them as risky investments—can be a strong partner for getting a project off the ground.	Footprint Development
Insurance	• Developers should be aware of insurance related nuisances present in the location and type of their builds. • Added resiliency to the projects can reduce the insurance costs.	Arnold Development Group
Ownership, operation, and tenancy	• Operational decarbonization is more easily attained (financially) if the owners operate the project and can include the lowered operational costs in the financing of the project. • Occupying a modern and sustainable space can be a deciding factor for tenants that have ESG goals.	Firstfloor Blokable/eSix
Master planning	• Specifying the goals and missions of the project in the master plan can minimize construction deviations.	Fox Park / AC Development
Financial mechanism for affordable sustainability	• Knowledge of available incentives and rebates and how to use them will help de-risk the design for decarbonization. • Working closely with various partners, such as the utility and the city's sustainability office, is needed to (1) increase awareness of such opportunities and (2) ease the process of application and approval.	eSix/H3M Blokable

Mentor Network

The complex relationships between the many stakeholders in the development process can pose significant challenges for small and emerging developers, particularly when striving to integrate ZEZC design principles competitively. With this in mind, the study team sought to leverage insights from seasoned developers adept in ZEZC methodologies. The team collaborated with these forward-thinking developers to explain their approaches through case studies and, along the way, identified prospects and impediments inherent in the industry.

These case studies, currently being drafted, will highlight how the mentors have leveraged the connection points (Figure 1) to accelerate and finance their projects. These highlights include examples of innovation and its impact on the projects.

In addition to case studies, the team's documentation of collaborative efforts underscores the willingness of our developer partners to disseminate their expertise via diverse channels. NREL enhances this exchange by offering personalized discussions, organizing knowledge-sharing gatherings, and facilitating internships. The next section delineates our strategy for integrating mentees with our mentorship network and our approach to expanding these initiatives.

Mentee Network

A national mentee network would provide opportunities to learn about federal regulations from various innovative developers. Yet, local issues such as resource availability, climate, utility specification, and electricity generation fuel mix likewise affect decarbonized building design and system integration. Some design and performance standards regulations have local specifications. Therefore, we intentionally mixed local and national resources and organizations to form the resources for the mentee network.

In this project phase, the local network is focused on Colorado. Collaborating with the University of Colorado Boulder has allowed us to teach the technical aspects of sustainable design and identify interested individuals to be included in the mentee network. In addition, we have started collaborating with the Real Estate Diversity Initiative (REDI) program in Colorado to reach a local network of emerging developers. This program provides education and networking opportunities to women and people of color in development. The team will use this collaboration to serve as advisors to the participants and distribute the developed resources to the mentees.

NREL-published resources, including case studies, fact sheets, and educational videos will be used as educational material for this focus. These resources focus on various components of the development ecosystem, as seen in Figure 1, to provide support for minority and emerging developers.

Working with the Urban Land Institute (ULI) is another step toward national impact. This work has made collaboration on the ULI/ASHRAE article "Disproving Heat Pump Myths for Developers" (Urban Land Institute and ASHRAE Task Force for Building Decarbonization 2024) possible. Furthermore, this collaboration will enable us to organize a stand-up cohort of leaders and willing partners nationally. An overview of the phases and accomplishment status can be found in Figure 4.

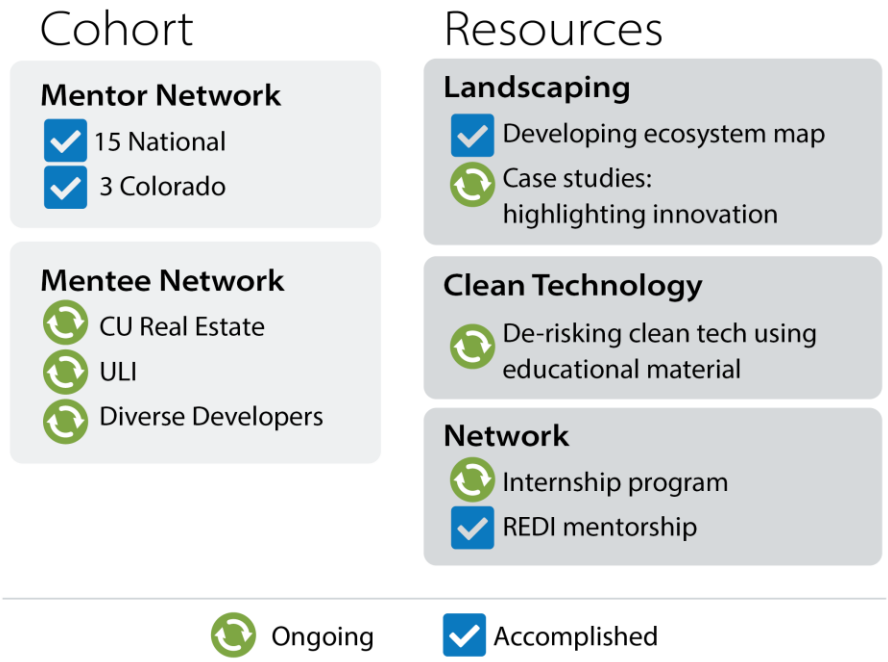

Figure 4: Overview of the status of cohort development and resource planning

Discussion

The creation of the first cohort of top emerging developers in this field showcased innovation and successful strategies they used to overcome barriers to decarbonization and partnered with local incubators and national industry to expand support for emerging developers. Small developers often take more innovative routes for their projects; however, they need to have many skills to see their projects succeed. Because of a lack of staffing and resources, emerging and minority developers could benefit significantly from partnerships and relationships with various stakeholders. Observations indicate that many successful innovative developers are experienced in other aspects, such as urban planning, law, and entrepreneurship. We recognize that this is only achievable for some emerging developers; therefore, this work aims to create a network of support and exchange of expertise needed for innovative development.

Access to this work could allow emerging and minority developers to familiarize themselves more easily with various aspects of ZEZC design. Incorporating these solutions enables community-centric decarbonizing development projects to be more competitive and successful. Moreover, access to technical guidance and mentorship through the cohort provides exposure to unique problems that emerging developers in this space are often facing while providing them with solutions used by the mentors.

Future Work

In this paper, we discussed creating an emerging developer focus group to incubate innovations, providing an educational module in collaboration with established institutes, and developing publicly available case studies and other resources for developers to support emerging decarbonization developers.

In the future, we plan to organize meetups and fellowship opportunities to create space for knowledge transfer and experience development. In addition, including other vital stakeholders in the cohort, such as utilities and city sustainability offices, is essential for a better exchange of information. Future work can also include online courses covering the technologies for decarbonization that will inform developers about what is possible in this space.

Acknowledgement

This work was authored in part by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by U.S. Department of Energy Office of Energy Efficiency and Building Technology Office. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.

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