BDC Presents: Neighborhood Scale, The Future of Building Decarbonization

January 25, 2024

Summary:
Hear from Panama Bartholomy (BDC), Rachel Kuykendall (Pacific Gas & Electric), and Jared Rodriguez (Emergent Urban Concepts) as they discuss the benefits of a neighborhood-scale approach to building decarbonization as well as the different pathways and ownership models for implementing this strategy.

Resources:

- Slides
- Recording
- Neighborhood Scale: The Future of Building Decarbonization (Whitepaper)
- BDC newsletter sign up

Events

- California Policy Call**:** February 20th, 10am PT / 1pm ET
- National Policy Call (New Jersey)**:** February 27th, 10am PT/ 1pm ET
- BDC Presents: Rate Affordability: February 29th, 10am PT / 1pm ET
- The NY Thermal Energy Networks Summit: March 6th, 8:30am ET

Summary

Introduction to Neighborhood Scale, Panama Bartholomy (BDC)

- To achieve federal and state climate goals, we must decarbonize buildings.
- However, there are a lot of buildings—approx 110M (90% of which are residential)—and a lot of emissions from these buildings—accounting for approx. 30% of total US GhG emissions.
- The current market model is a mosaic of actors, decisions, and resources. Though complementary, this "appliance by appliance" approach does not create systems-level change at a pace that will meet existing climate goals. In this unmanaged transition, there are a lot of cracks and a lot of pain points. Multiple this by 110M and the problem looks insurmountable.
    - An *unmanaged transition*...
        - Is not scalable. And without scale with won't meet our climate goals
        - Does not offer a clear path forward for fossil fuel workers in the clean energy future
        - Perpetuates inequity: most people can't afford to replace all of their appliances on their own; and/or they don't get to make those decisions about their home.
        - Creates a negative feedback loop in which those left on the gas system the longest are the least able to pay the increasing rates.
- A *managed transition* can help ensure that inequity is not scaled along with decarbonization.
- We call this managed transition *neighborhood-scale building decarbonization* (or neighborhood decarbonization for short).

- **Neighborhood Scale Building Decarbonization**: This strategy creates systems-level change by transitioning entire communities to decarbonized energy sources and electric appliances with the end goal of managing the transition off of the gas system.
- There are two pathways for neighborhood-scale building decarbonization:
  - Electric Network: An entity (e.g. a utility) organizes and manages the transition for a group of buildings and pairs electric appliances with the increasingly clean electric grid.
  - Thermal Energy Networks (TENs): A group of buildings share energy through thermal loops and ground-source heat pumps for space and water heating and cooling.

PG&E Neighborhood Scale Electrification Efforts, Rachel Kuykendall (PG&E)

- PG&E's climate goal: Net-zero energy system by 2040 (five years ahead of California's climate goal).
- Today, a majority of PG&E emissions come from its gas system.
  - Gas system costs are relatively fixed and costs are spread over the customer base. As people move off the gas system, rates for gas payers will spike because these costs are spread over fewer customers.
  - PG&E must carefully consider how to achieve its climate goals and protect its most vulnerable customers from these rate spikes.
- PG&E has two approaches to neighborhood-scale building decarbonization (for in-depth comparison, see slide 20)
  - Targeted Electrification: geographic electrification *based on reducing gas rates through avoidance of gas utility spending*. An E3 study found this approach cost-effective at 11 sites in the San Francisco Bay Area.
    - Current Progress: Electrified 102 customers, while enabling the retirement of 22 miles of gas lines
    - How Projects are funded: Avoided gas spending
    - Barriers: Dependent on the obligation to serve; inability to access external funding (electrification needs to be four to five times cheaper than status quo for financial parity); inability to capitalize electrification costs over an extended period; and long application process for targeted electrification projects
  - Zonal Electrification: geographic electrification *based on equity, risk, cost saving, etc.*
    - Current Progress: Gas Asset Analysis Tool to evaluate potential areas for zonal electrification, provide a high-level version of this tool (under NDA) to partners; PG&E submitted a zonal electrification program in its 2023-2027 energy efficiency portfolio
    - How Projects are funded: Existing energy efficiency/ electrification programs
    - Barriers: Same barriers as targeted electrification, and the need to build a network of local, trusted partners

Planning for Resource Efficient Decarbonization at the Neighborhood Scale, Jared Rodriguez (Emergent Urban Concepts)

- Heat is a resource that we often discard instead of reusing. A Resource-Efficient Decarbonization (RED) framework includes heat recovery as integral to the decarbonization solution (for more details on RED, see slide 30) and Thermal Energy Neworks (TENs) play a large role in recovering waste heat.

- Requirements for Planning TENs:
    - Coalitions: Identify the voices and needs in the community and create a coalition that represents them. The coalitions will include many different actors such as community-based organizations, housing organizations, trade unions, etc.
    - Organizing Structure and Governance: A clear organizational structure and governance ensures the strategic development of TENs to meet the needs of customers and climate goals.
    - Ownership models: Identify what entity will own the TEN.
        - TENs can be owned and operated by multiple entities such as government bodies, municipal utilities, or community-based organizations.
    - Matchmaking: Identify the linkable parties and connect thermal resources with customers.
- Next Steps for Developing TENs in Your Community
    - Form the Coalition: Identify what expertise is needed at the table, engage a thermal development team, identify a project developer to advance projects, and develop a thermal access agreement to allow the project developer to perform.
    - Engage a Project Developer: Project developers should understand the electric grid constraint, identify thermal energy resources and potential customers, and finance and construct the projects.

Q & A

These questions are organized by topic, with Rachel Kuykendall responding to the Electric Network questions and Jared Rodriguez responding to Thermal Energy Network questions, unless otherwise noted.

Electric Network (responses by Rachel Kuykendall)

1. **What can we learn from PG&E's approach to targeted electrification in regions where our gas and electric utilities are separate companies?**

- PG&E has it easier because we have access to data on both sides of the system. Gas utilities are looking ahead at big investments in their gas systems and rising gas rates and see it as a challenge that electrification can help with. There is also some interest in exploring geographically the ends of their systems and working inwards, similar to how PG&E does targeted electrification. It does look promising considering how many conversations I have had in this space compared to a year ago.

2. **Is the "obligation to serve" entirely at the discretion of the customer or is it based on a menu of services offered by the utility?**

- Obligation to serve lives in a bit of a legal gray area. In California, at least, it's been a very conservative interpretation. For example, if a customer requests gas, we have to provide gas. Obligation to serve does differ across the United States in terms of how it's written in statute and in terms of how it's interpreted, so this example isn't applicable everywhere.
- *Panama Bartholomy (P.B.):* In the context of utilities, an obligation to serve is a utility's requirement to provide service to anyone willing to pay its set rates. Utilities have traditionally assumed this obligation in exchange for an exclusive monopoly franchise. There still is a lot of discussion around this topic, but BDC is planning to release a long-form deep dive into obligation to serve in February, so make sure to subscribe to our newsletter.

3. **Is there a way to check out this GIS tool? Is the high-level version of PG&E's Gas Asset Analysis Tool available to non-profit organizations under NDA or only to local governments?**

- Yes! Feel free to email Rachel at rachel.kuykendall@pge.com and we can begin the process of getting you under NDA to view the Geospatial Electrification Tool.

4. **When you say the scale of projects are on the transmission and distribution system, are you referring to the gas system?**

- Correct. Generally, our early cost-driven targeted electrification projects have been on the gas transmission (high-pressure) system. E3 has a great paper on the benefits and costs of targeted electrification here: Benefit-Cost Analysis of Targeted Electrification and Gas Decommissioning in California. This paper includes additional context on PG&E projects to date.

5. In Rachel's first example, the costs are only to PG&E. **What are the rate differences for the customers, will they pay more for their monthly bills? Can those customers see some of the savings that PG&E expects?**

- When looking at a potential neighborhood-scale decarbonization project, we run an analysis of the projected rate impacts and provide those to the customer. In most cases, assuming the customer can switch to PG&E's new Electric Home rate (Electric Home (pge.com), it is a financial "win" for customers. That said, we still do have challenges in certain customer segments with making electrification work from a cost perspective. For example, restaurants can still be particularly challenging.

6. **How is PG&E thinking about proactively handling local grid upgrades to enable more rapid electrification at scale (to handle the situations where we must upgrade panels)?**

- This is a really nuanced question! As a utility, we're somewhat prevented from "overbuilding" the electric system before load materializes, because any overbuild would need to be paid for by ratepayers. That said, PG&E and other California electric utilities plan grid investments to factor building electrification into electric load forecasts and these load forecasts (which are done in tandem with the CA Energy Commission) are getting better every year. In terms of potential near-term solutions, circuit sharing, and low-amperage appliances offer a great opportunity to avoid panel and/or service upgrades. PG&E also recently proposed in the Building Decarbonization OIR at our PUC that an electric utility should fully cover the costs of a service upgrade that is triggered by building electrification.

7. **Why does the electrification pathway have to be 4-5x cheaper than gas infrastructure restoration?**

- This is due to the financial treatment of electrification costs. These are currently treated as an expense, so PG&E is unable to leverage outside capital like we would be able to do for a capital cost. Here's a great primer from Utility Dive on utility financing: A basic primer on capital investment financing for regulated investor owned utilities | Utility Dive.

8. **What components are included in the "customer electrification" costs line item?** Equipment replacement + electric service upgrades, or are there additional incentives?

- At PG&E, the costs we consider are the cost to retire the gas pipeline, any necessary front-of-the-meter electric upgrades, and the behind-the-meter costs associated with electrification (heat pumps, wiring, panel upgrades, etc). I will say that this is an emerging field, so there are differing thoughts on how cost-effectiveness should be defined.

9. **How much of the 43,000 miles is transmission and how much is distribution?**

- The 43,000 number was distribution only. PG&E also operates 6,700 miles of transmission piping (Gas Systems | pge).

10. **Are all the other 40,000 miles of pipes just not up for replacement?** Why is the bar [on slide 22] so small compared to the size of the total pipe network?

- Correct. PG&E generally replaces about 150-250 miles of pipeline per year, depending on how the California Public Utilities Commission (CPUC) funds these efforts in our General Rate Case. Because this cost is paid by ratepayers, there is motivation to keep the amount of pipe replacement to the minimum amount necessary to safely operate the gas system.

Thermal Energy Networks (responses by Jared Rodriguez)

11. **Can you speak to what you're seeing in NY and MA with TENs and what that leadership looks like? Also, can TENs be built in California?**

- TENs can be built anywhere and they already exist everywhere. In terms of NY and MA, they approached this leadership differently. In MA, my understanding is that there were regulatory efforts to modify how utilities function. In NY, the reform was through policy through the Utility Thermal Energy Networks and Jobs Act (UTENJA). UTENJA modified some definitions to allow gas and electric companies to serve thermal energy/heat. Previously, gas companies could only serve gas and electric companies could only serve electricity. Now they can serve thermal energy/ heat. There are still terms that need to be defined, but at the same time, there are dozens of projects being developed.

12. **What do you think are the main barriers to TENs? Regulation? Utility Coordination? Political Will? Funding/Capital? And what can be done to overcome them?**

- It seems the biggest barrier is finding folks willing to be the connective tissue in a community to organize the pre-development efforts needed to get these projects off the ground. This is the work I do specifically. Before a project can become *a project,* a facilitator must bring together high-level project teams or coalitions, create a compelling vision or concept, and lock in decision-makers to support the effort. Because TENs can be owned by many types of entities, barriers are specific to that particular project or organizing principle supporting the project. For regulated utilities, the regulatory process or legislation is the barrier. For municipalities, political will is the barrier. Lack of knowledge and lack of understanding is commonly the first big hurdle to overcome in any community. Once the project concept, organizing structure, stakeholders, and key decision-makers are locked in, the rest of the project barriers/hurdles tend to fall in line quickly. Find your project developer! Create your coalition!

13. **Neighborhood-scale distribution will require beefing up hyper-local transformers; who pays for that?**

- The ratepayer or taxpayer always pays. This is why we need a balanced approach to infrastructure development and we always need to keep an eye on purse strings. This is why the regulatory process is so important. It's also why we need multiple approaches to developing infrastructure, including municipal pathways.

14. **Do you all see financial tools such as Public Improvement Districts starting to consider TENs as part of eligible infrastructure?**

- Yes, and Business Improvement Districts too. Ultimately, infrastructure development is economic development so any and all structures we use to induce economic development or development in general can incorporate TENs development.

15. **Can you describe municipal frictions? How can municipal planning/building departments better support decarb efforts?**

- The primary question I ask is whether or not the municipality (or some other municipal or state corporation) is better suited to own TENs infrastructure than the regulated investor-owned utility. Or is there some other organizing mechanism that better fits a particular community? I see building codes as key to accelerating decarb of new builds and major renovations. Emissions caps help induce transition of existing buildings. And TENs infrastructure can offer an operating cost savings option to building owners situated along a TEN route. Munis must be thoroughly brought into this conversation—we are generally not doing a good job at integrating muni thinking, econ development, land use planning, construction activity, etc. We need these silos broken down.

16. **How effective are TENs in mild climates?**

- TENs help mitigate extreme outdoor temperatures and subsequent effects on power demand. They work well in climates that experience extreme temperature fluctuations (heat or cold). TENs exist in every climate in the world and will be needed more and more to mitigate electric grid peaking/fluctuations as more renewables come on board and as the weather becomes less predictable.

17. **To what extent can current gas pipes be used for hot water?**

- In some cases, yes. The new gas pipe is the same pipe used in a TEN. In practice, this may be difficult due to the need for particular diameters and phasing around gas transition.

18. **Is there pushback from private actors on passive/thermal capture technologies that may be better for the consumer and the environment but reduce consumption and thus, probably, the ability to financialize energy consumption?**

- Yes, of course. It's the age-old problem. The problem is particularly acute when a company makes its investor returns on deploying more and more infrastructure. Efficiency is typically the enemy of profits, so we need mechanisms to turn that problem on its head (too many mechanisms to discuss here).

19. **Is there a gap between the current worker base and what is needed to implement these decarbonization measures?** I.e. training, skill set, attrition?

- I believe our biggest bottleneck is the mechanical engineering profession. We don't have enough designers and technical consultants who understand heat recovery and thermal energy network technology (and heat pumps in general). We need to borrow some folks from Europe, which we are doing, but it's not enough. We need training training training! We also don't have enough generalists/developers who know how to piece a project together and work with multi-stakeholder groups to create consensus on how to advance a project.

20. **For my friends and neighbors who live in zonal decarbonization areas, how can those folks support utilities with outreach to neighbors?**

- There are a couple of steps they can take such as finding local mechanisms to spread the word, spearheading campaigns, involving municipalities, setting up new organizations that promote these approaches, and anything and everything in terms of education and outreach is helpful.