

# **Harnessing Energy Efficiency in Community Resilience Planning**

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## **ABSTRACT**

Ensuring that communities increase their resilience so they are ready for diverse challenges has become a focus area for many local governments. Energy systems are a particularly vital component of community resilience because of their relationship to critical systems such as transportation, housing, and business activity. Increasing the efficiency of energy systems can enhance community resilience by not only strengthening energy systems themselves but also strengthening the communities that these systems serve.

Local governments have not coalesced around a specific resilience-planning process, but the interest in resilience planning provides an opportunity to improve the integration of energy efficiency into local resilience planning and implementation programs. Preliminary research has indicated that resilience efforts do not generally recognize the full value of energy efficiency; this research paper is a more detailed attempt to gauge whether that is true. Through outreach and engagement with a selection of local governments that have prioritized resilience, we identified the extent to which energy efficiency was or was not incorporated into their resilience plans. For those that have incorporated energy efficiency we sought to better understand how they have done so by compiling the specific energy efficiency measures included in their resilience planning. Our analysis found that nearly all communities had incorporated energy efficiency into their resilience planning or activities in some way, but the efficiency measures included and the level of energy efficiency's prioritization varied among cities.

## **Introduction**

Many local governments have prioritized resilience to prepare themselves and their residents for varied challenges. These challenges differ from community to community but may include aging infrastructure, extreme weather, and even economic volatility. Energy systems are vital to resilience because of their interactions with critical systems such as transportation, housing, and business activity. Energy efficiency in particular can be used as a core strategy to increase community resilience because it can strengthen local energy systems and deliver more-reliable and affordable energy to households and businesses (Ribeiro et al. 2015).

Energy efficiency's resilience benefits can be organized into three broad categories. First, energy efficiency measures such as combined heat and power (CHP) can help households and businesses recover from some shocks, such as extreme storms and flooding. Second, energy efficiency's socioeconomic benefits strengthen communities so families can better cope with unanticipated events. Third, energy efficiency allows communities to mitigate and adapt to the impacts of climate change. To put these benefits in perspective it is helpful to think through the resilience benefits of energy-efficient buildings. If a power outage occurs, energy-efficient buildings can maintain their temperatures longer than inefficient buildings, which means residents and tenants can shelter in place. Even without the acute stress of a power outage, energy efficiency can reduce customer exposure to energy-price volatility. More stable bills

means families can better prepare for the future. Energy-efficient buildings also waste less power, which translates to reduced greenhouse gas emissions.<sup>1</sup>

Although interest in resilience is widespread and still growing, ACEEE's past research indicates that local governments have not coalesced around a specific planning process. Some jurisdictions like Boston, New York, and San Francisco have developed resilience plans through their own locally driven planning processes. Others have leveraged federal programs, like the Sustainable Communities Initiative or Rebuild by Design, to increase resilience. Communities can also use other existing tools, like energy assurance planning and hazard mitigation planning, to address aspects of resilience. Because so many options are in the resilience toolbox we had difficulty identifying commonalities in jurisdictions' resilience-planning processes. This in turn made it difficult to truly ascertain how communities were incorporating energy efficiency into their resilience activities. It appeared that communities were including energy efficiency as a secondary strategy to help achieve other resilience goals, if they included it at all (Ribeiro et al. 2015).

The impetus for this paper is this uncertainty in communities' approaches to resilience planning and their treatment of efficiency in those approaches. With this paper we seek to better understand the concrete activities that a selection of communities have used or have planned to use to increase their resilience. After better understanding the concrete activities undertaken to improve resilience, we cataloged the ways in which these communities' activities incorporated energy efficiency measures. While we looked at only a selection of communities this research will be beneficial to peer communities that are interested in resilience and seeking examples from forward-thinking communities that have been considering resilience for some time.

## **Methodology**

To gain a better understanding of how local governments are incorporating energy efficiency into community resilience activities, we analyzed the resilience-planning processes of several US cities and counties. In choosing jurisdictions for our sample we aimed to focus on a short list of cities that had prioritized resilience in some way. Rather than randomly selecting jurisdictions through independent research, we chose cities and counties named as finalists in the US Department of Housing and Urban Development (HUD)'s National Disaster Resilience Competition (NDRC). The NDRC is an effort to encourage states, counties, and cities to become more resilient.<sup>2</sup> Jurisdictions were eligible to apply to the competition if they had unmet needs from a prior disaster.

To participate in the NDRC communities developed comprehensive applications discussing potential resilience-building activities they would pursue if funded. To develop these specific proposals to increase resilience communities had to launch robust planning processes. Simply being named as finalists in the competition means that these communities have put significant thought into both the concept of resilience and specific steps to improve resilience. This planning and thought leadership is a primary reason why NDRC finalist communities are appropriate for our research. Our analysis of their planning documents and proposals provides a

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<sup>1</sup> For more information on energy efficiency's connection to resilience please see Ribeiro et al. (2015). The report also discusses the resilience benefits of specific energy efficiency measures.

<sup>2</sup> HUD and the Rockefeller Foundation allocated nearly \$1 billion to the states, counties, and cities that were selected as grantees. The competition's finalists were announced in June 2015, and grantees were announced in January 2016.

glimpse into the type of activities forward-thinking communities are considering in their resilience-planning processes, including energy efficiency.

Figure 1 shows the 13 cities and counties named as finalists in the competition.

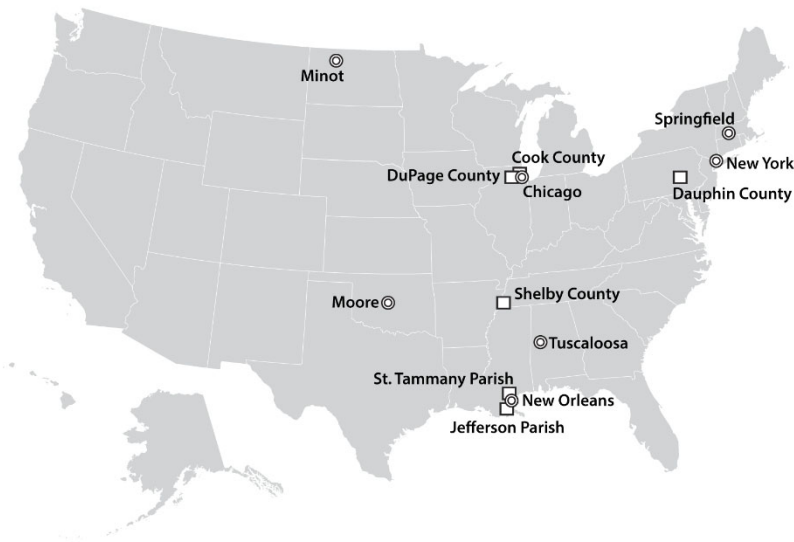


Figure 1. Finalist cities and counties in the NDRC

No cities or counties from the Rocky Mountain West or the West Coast were selected as finalists in the NDRC, which limits the geographic diversity of the sample size. Therefore it is possible that this research omits resilience concerns specific to the western United States. Many states also applied to the NDRC, but their activities are outside the scope of this research.

Our assessment included 12 of the 13 cities and counties named as NDRC finalists.<sup>3</sup> To begin our research we reviewed finalist applications submitted as part of phase 2 of the competition. Reviewing these materials helped us to understand how each viewed resilience, how each approached its planning process, and if/how each incorporated energy efficiency. The applications also included overviews of jurisdictions' unmet needs from their prior disasters. Although the specific disasters varied many took holistic approaches to unmet needs that drew from various aspects of resilience, including the physical and the socioeconomic. Our review focused on three sections of each application: soundness of approach, need/extent of problem, and long-term commitments. If cities had stand-alone resilience plans separate from their NDRC applications, we also reviewed those plans. New York City, New Orleans, and Springfield, Massachusetts, were the only cities with such plans.

We also interviewed local government staff from three finalists to better understand their approach to resilience and thoughts on energy efficiency; these included staff from New Orleans, Springfield, and Shelby County, Tennessee. We targeted these communities because they represent different portions of the country and are diverse in population size. We reached out to other communities as well, but they were not available during our short timeframe for interviews.

<sup>3</sup> We did not include DuPage County, Illinois, in our analysis because the application materials for the county were not available to review.

We also discussed the NDRC with HUD to get the department's views on energy efficiency's role in resilience. During the interviews with local government staff we asked the following questions:

- Why is your city/county interested in resilience? Is there a working definition you are using for the term *resilience*?
- Have resilience-related policies been enacted, or is your city/county still in the planning process?
- Is energy efficiency included in your resilience-planning process? If so, what types of efficiency measures are used?
- How are your resilience strategies funded?
- Why have you chosen resilience-specific strategies/activities?
- Who are the stakeholders involved in the process?

Using the data collected from the NDRC applications along with supplemental data from the interviews and existing resilience plans, we categorized each application's themes and determined how far each community had progressed in its planning processes. After better understanding their planning processes, we cataloged the specific energy efficiency measures as well as general treatment of energy efficiency in each application.

### **Resilience Landscape among NDRC Finalists**

In previous research we found fragmented approaches to both resilience planning and the concept of resilience (Ribeiro et al. 2015). The communities profiled in this research took a relatively uniform approach to resilience. In a change from the previous research we found that many communities' planning addressed chronic stressors as opposed to only the acute stressors most typically associated with disasters. Some applicants overlaid social aspects of resilience with physical stressors. New Orleans, for example, acknowledges physical risks like subsidence and coastal flooding, but discusses its extreme social stresses as well including higher rates of concentrated poverty and income inequality than surrounding areas (New Orleans 2015a). Additionally, all finalists proposed improvements to both their natural and their built environments. For example, Jefferson Parish focuses on repairs to housing and infrastructure as well as the rehabilitation of nearby water bodies to buffer against storm surges (Jefferson Parish 2015).

The majority of communities in the sample took the more holistic approach to resilience used by New Orleans. This is reflected in the application themes, detailed in table 1.

Table 1. Resilience planning of NDRC finalists

City/county	Resilience theme			Status of resilience planning
	Physical	Environmental	Socioeconomic	
Chicago	•	•	•	Progressing
Cook County	•	•	•	Early stages
Dauphin County	•	•	•	Early stages
Jefferson Parish	•	•		Progressing
Minot	•	•	•	Progressing
Moore	•	•	•	Progressing
New Orleans	•	•	•	Advanced
New York City	•	•	•	Advanced
Shelby County	•	•		Progressing
Springfield	•	•	•	Advanced
St. Tammany Parish	•	•		Progressing
Tuscaloosa	•	•	•	Progressing

As we reviewed each application we gauged whether it reflected three potential themes, namely, physical, environmental, and socioeconomic. The physical theme focuses on strategies related to the built environment, including housing rehabilitation and infrastructure improvements. The environmental theme focuses on the natural environment including ecological restoration and climate change. The socioeconomic theme includes activities focusing on better serving the low- to moderate-income (LMI) population and supporting the development of local businesses. Because these themes and the general concept of resilience are cross-cutting, the plans for many cities included multiple themes, again as table 1 shows.

Our analysis also shows that jurisdictions are at various stages in their planning processes. As table 1 shows only New Orleans, New York, and Springfield are advanced in their resilience planning. By calling them *advanced* we mean that these cities have been considering resilience for multiple years and have their own stand-alone resilience plans to guide activities. For example, New York City has started implementing policies discussed in the resilience plan it released in mid-2015, OneNYC (New York 2015). Those cities labeled *progressing* have started implementing some resilience-related programs and initiated planning processes related to resilience, but have not yet articulated one unified resilience vision in terms of a comprehensive resilience plan. For example, St. Tammany Parish has a couple of plans dealing with aspects of resilience (the North Slidell Revitalization Plan and the St. Tammany Parish Environmental Corridor Study), but was using the NDRC application as an attempt to consolidate its efforts into a more cohesive plan (St. Tammany 2015). Those in the *early stages* appeared to have used the NDRC application as a springboard to increase resilience activities in their communities.

Our interviews with local government staff indicated that capacity building is ongoing among government staff in the resilience community. The capacity building provided by the Rockefeller Foundation as part of the NDRC application process is a potential reason why the communities in our sample took a more uniform approach to resilience than those assessed in past research. The Rockefeller Foundation offered direct technical assistance to communities and convened resilience academies to strengthen the submitting communities' proposals. We learned that some communities originally approached resilience in a way that was similar to emergency preparedness and hazard mitigation, focusing on responses to acute stresses. However, as the NDRC planning process unfolded and communities engaged with the Rockefeller Foundation, some began to understand resilience differently. The discussions, especially in Shelby County, expanded from emergency preparedness to encompass the more social and environmental aspects of resilience (T. Quagliato, director of disaster recovery and compliance, City of Springfield, pers. comm., February 10, 2016). Similarly our conversations with local government staff in New Orleans indicated that a similar evolution had occurred over a long time frame (D. Lessinger, director of planning and strategy, New Orleans Redevelopment Authority, pers. comm., February 16, 2016).

We also found from interviews that resilience has come to be a framework for strategic planning in communities. Resilience plans have the opportunity to be more than an additional plan released by a city; they can be a comprehensive vision that incorporates several other plans including sustainability plans and economic development plans. However, because the concept of resilience is cross-cutting and can be nebulous at times, defining a city's resilience activities can be difficult. Rather than pursuing new activities solely for resilience purposes, a city's resilience activities may include initiatives they are already pursuing, like energy efficiency.

## **Energy Efficiency in Resilience Activities**

Our analysis shows mixed results for the recognition of energy efficiency as a core resilience resource. As table 2 shows, two cities in our sample, New York and New Orleans, prioritized energy efficiency. We consider a community to have prioritized energy efficiency if it was explicitly mentioned in the planning documents and underpinned several of a jurisdiction's strategies. For example, New York prioritizes energy efficiency in the "Our Sustainable City" vision of OneNYC. Energy efficiency both in buildings and in the transportation system is discussed as a way to achieve the city's 2050 climate goal (New York 2015). It is important to note that both New Orleans and New York prioritized energy efficiency in their stand-alone resilience plans; they did not prioritize energy efficiency in their NDRC applications (New York 2015; New Orleans 2015b). As said earlier New York, New Orleans, and Springfield were also the only cities in our sample that had their own resilience plans. Therefore no city prioritized energy efficiency in its NDRC application even though many (as we further discuss below) listed energy efficiency measures among their planned activities. Communities that applied to the NDRC had to connect their planned activities to unmet needs from the disaster that made them eligible to apply for the competition in the first place. Even though HUD did not take a stance on the validity of resilience measures like energy efficiency, it is possible that some communities omitted efficiency from their plans because they did not feel they could easily tie it to their unmet needs.

Table 2. Treatment of energy efficiency in planning documents

Community	Energy efficiency prioritized in planning?
Chicago	
Cook County	
Dauphin County	
Jefferson Parish	
Minot	
Moore	
New Orleans	•
New York City	•
Shelby County	
Springfield	
St. Tammany Parish	
Tuscaloosa	

While only 2 of the 12 assessed communities prioritized energy efficiency, this finding is more encouraging than those from past reports, in which it was unclear that any community substantially recognized efficiency in its plans (Ribeiro et al. 2015). It is also encouraging that the cities that prioritized energy efficiency are two of the communities that are in advanced planning stages, as table 1 shows. This could bode well for the inclusion of energy efficiency in other plans as other communities further develop their resilience plans and ramp up activities.

Our interviews with local government staff also indicated that energy efficiency may gain more recognition in resilience activities over time. For example, Shelby County did not prioritize energy efficiency in its NDRC application. However energy efficiency will be emphasized to a greater extent in future resilience planning even though it is too early to know which specific measures the county will pursue (J. Zeanah, administrator, Memphis–Shelby County Office of Sustainability, pers. comm., February 3, 2016). Likewise, even though its application did not heavily reference its intentions, Springfield is committed to expanding the use of energy efficiency in its resilience efforts (T. Quagliato, director of disaster recovery and compliance, City of Springfield, pers. comm., February 10, 2016). This indicates that defining and operationalizing resilience is still an ongoing process and that some jurisdictions that have not formally recognized energy efficiency’s resilience value may do so in the future.

In addition to determining whether communities had prioritized energy efficiency, we also cataloged the specific energy efficiency activities included in their planning documents. Cities sometimes included these activities in their plans because of their energy-savings benefits; housing retrofits are one example of this. However, in other cases, cities planned to pursue what we would consider energy efficiency activities for their non-energy-savings benefits. For example, Minot proposed to build greenways with pedestrian and bike trails (Minot 2015). Its primary goal in doing so was to increase neighborhood connectivity and provide more transit options to the city’s vulnerable populations; its goal was not to save energy by encouraging multimodal transportation. In cataloging these activities we wanted to gauge whether jurisdictions planned to pursue activities that would lead to less energy consumption, as opposed to gauging whether cities planned to pursue activities specifically because they would lead to less energy consumption.

Table 3 documents the types of energy efficiency or energy efficiency–related strategies proposed in resilience-planning materials. We grouped these energy efficiency activities into seven broad categories, namely:

- *Energy efficiency in private buildings.* These are initiatives, such as building retrofit programs, that lead to reduced energy use in residential or commercial buildings.
- *Energy efficiency in public buildings.* These are any initiatives that lead to reduced energy use in local government buildings. An example would be retrofitting public schools.
- *Green infrastructure.* These are stormwater-management techniques using permeable surfaces to allow for increased infiltration where rain falls. Examples include bioswales and green spaces.<sup>4</sup>
- *Energy efficiency in water services.* These are initiatives, like pump replacement programs, to increase energy efficiency in drinking water and wastewater treatment facilities.
- *Transportation efficiency.* These are efforts to increase connectivity and encourage access to multiple modes of transportation. Specific initiatives include building bike lanes and pedestrian paths.
- *Transit-system improvements.* These initiatives improve the transit system, which is a more energy-efficient transportation option than driving. While it dovetails with transportation efficiency, listed above, this focuses solely on public transit and excludes initiatives related to bike use or walkability.
- *Combined heat and power (CHP).* This is any initiative to increase the penetration of CHP.

Table 3. Energy efficiency in resilience efforts

City/county	EE in private buildings	EE in public buildings	Green infrastructure	EE in water services	Transit-system improvements	Transportation efficiency	CHP
Chicago			•			•	
Cook County			•				
Dauphin County							
Jefferson Parish			•	•			
Minot	•		•			•	
Moore							
New Orleans	•		•		•		
New York City	•	•	•	•	•	•	•

<sup>4</sup> Local governments or water utilities typically install green infrastructure for its stormwater-treatment benefits. However its co-benefits include reducing urban heat islands and in some cases reducing demand and potentially energy use at wastewater treatment plants. Because these co-benefits can reduce energy use, we have treated green infrastructure as having energy-efficient properties in past research, including Hewitt (2014).



City/county	EE in private buildings	EE in public buildings	Green infrastructure	EE in water services	Transit-system improvements	Transportation efficiency	CHP
Shelby County			•			•	
Springfield	•	•	•	•			•
St. Tammany Parish			•			•	
Tuscaloosa			•		•	•	
Total with activities	4	2	10	3	3	6	2

Notes: For more detail on the impacts on community resilience of each of these activities, please see Ribeiro et al. (2015). *Source*: NDRC Phase II applications.

As table 3 shows, different communities incorporated different aspects of energy efficiency into their plans. Surprisingly however all finalist communities with the exception of Dauphin County and Moore included references to a form of energy efficiency. As stated earlier our previous research indicated that communities had largely not embraced energy efficiency in resilience activities. The fact that most cities assessed in this research made at least one reference to energy efficiency is further recognition of energy efficiency’s role in resilience.

New York City was the only jurisdiction that discussed all of the energy efficiency activities we cataloged. Springfield planned to pursue the second-most energy efficiency activities, five overall. Even though it planned to pursue several efficiency activities, we did not recognize Springfield as prioritizing energy efficiency because its planning documents did not emphasize the concept of energy efficiency. Several jurisdictions, namely Minot, New Orleans, and Tuscaloosa, discussed three of the activities in their planning materials.

In terms of the activities themselves green infrastructure to manage stormwater was by far the most mentioned energy efficiency–related activity in plans, with 10 of the 12 assessed communities having proposals for green infrastructure. For example, New Orleans proposed to develop green infrastructure as part of its Urban Water Project (New Orleans 2015a). It calls for the installation of blue-green parkland and green corridors with bioswales in medians, permeable sidewalks, and an increased tree canopy. Similarly Chicago proposed to build out its green infrastructure in specific sewersheds that profoundly impact stormwater management (Chicago 2015). The measures the city is considering include bioretention and infiltration, permeable pavement, urban agriculture, and vegetated roofs. Although green infrastructure can reduce the urban heat island effect in communities and potentially reduce energy demand at wastewater treatment plants, few communities acknowledged this connection between energy and green infrastructure in their proposals. Even though some cities are not formally recognizing this connection, implementing green infrastructure should still save communities energy.<sup>5</sup>

The next most acknowledged activity was transportation efficiency. Half of the communities we analyzed proposed measures that would shift transportation from less efficient modes like driving to more-efficient modes. Several jurisdictions included this activity due to the

<sup>5</sup> For more information on the modeled energy savings that will accrue from planned green infrastructure installations in a selection of cities, see the appendix in Foster et al. (2011).

socioeconomic benefits associated with increased transportation efficiency. This speaks to the holistic view cities took in their approach to resilience as opposed to a more disaster response-related view. For example, Tuscaloosa is planning to build City Walk, which will connect residential areas to businesses and other services (Tuscaloosa 2015). In addition to increasing neighborhood connectivity it will lead to increased economic opportunity. Shelby County proposed to develop more trails for its regional Wolf River Greenway to generate millions of additional cycling and walking trips, providing commuters with alternatives to driving (Shelby County 2015). While this finding was something of a surprise, it was encouraging; by including transportation-efficiency measures for their socioeconomic benefits, some communities are taking steps to address the social stressors that can impact overall resilience.

Finally, we found that 4 of the 12 communities recognized residential-building energy efficiency measures in their plans. Residential-building energy efficiency was the third most mentioned of all the energy efficiency activities. In some cases communities planned to include energy efficiency measures in homes that needed rebuilding or rehabilitation after a disaster. For example, Minot planned to partner with a nonprofit developer to build hundreds of affordable housing units for the LMI community and students. The city's goal is to make sure that these units are built with energy efficiency in mind, allowing LMI residents to retain more of their income, and that affordable units are located within city limits, allowing the LMI residents to remain in Minot (Minot 2015).

While it is encouraging that most communities included at least one energy efficiency activity in their plans, only two of the energy efficiency initiatives had an uptake of 50% or more among the communities we assessed. This suggests that there is a significant opportunity for cities and counties to increase their focus on energy efficiency in their resilience-planning efforts. There were also some noteworthy energy efficiency-related omissions from the proposals. For example, CHP has several resilience benefits including providing backup power when the electric system falters. While some communities acknowledged the need to have more backup power, only two of the communities we assessed directly indicated the opportunity for CHP. Similarly, although table 3 does not mention microgrids, very few communities included plans for microgrids in their future activities. While a microgrid is not an energy efficiency technology, it encourages the use of energy efficiency as well as renewables. In addition, there was little mention of the urban heat island effect and its role in increasing peak electricity demand. Measures like cool roofs, which have resilience benefits and mitigate urban heat islands, were not discussed.

Moving past the uptake discussion of these activities, it is important to acknowledge that some communities recognized the local economic benefits that energy efficiency can have for communities, such as workforce development. For example, New York has committed to upgrading the skills of building staff throughout the city by offering low-cost or no-cost training in energy efficiency best practices (New York 2015). Chicago plans to use Green Corps, a workforce program for adults with barriers to employment, to construct some of the proposed green infrastructure (Chicago 2015). Energy efficiency is a core resilience strategy because it is a system strategy with various nonenergy benefits (Ribeiro et al. 2015). Increased recognition among local governments of energy efficiency's nonenergy benefits could potentially also mean increased recognition of energy efficiency as a resilience strategy.

## Conclusions

Resilience planning is still a relatively new concept to communities, and communities across the country approach it differently. The communities we assessed take a relatively uniform approach that incorporates needs related to the built and natural environments as well as other social stressors. The Rockefeller Foundation's technical assistance throughout the proposal process likely shaped this uniform approach to resilience; the communities' approaches generally align with the Rockefeller Foundation's view of resilience. The communities are at varying stages of their planning processes however; only three of the communities we assessed are in an advanced planning stage.

Our analysis of the use of energy efficiency in resilience planning shows mixed results. Only 2 of the 12 communities prioritized energy efficiency in their planning, although the fact that any community mainstreamed efficiency in its activities was encouraging. In addition, the vast majority of communities acknowledged at least one energy efficiency-related activity in their plans. Although green infrastructure was the activity most often mentioned, several other energy efficiency measures were discussed including energy efficiency in private buildings and energy efficiency in the transportation system. The low penetration of some measures, such as CHP, was particularly notable. This coupled with the fact that only two activities had a 50% uptake suggests that there is plenty of room for improvement in the future.

Future research could include revisiting these communities in a couple of years to observe whether more communities have included energy efficiency in their activities. It would also be helpful to complete this analysis in a different sample of cities to see how their planning processes vary and how that could impact the recognition of energy efficiency. In addition, future research could begin to identify any obstacles communities have encountered when trying to use energy efficiency as a resilience resource, as well as potential solutions to overcome those obstacles.

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