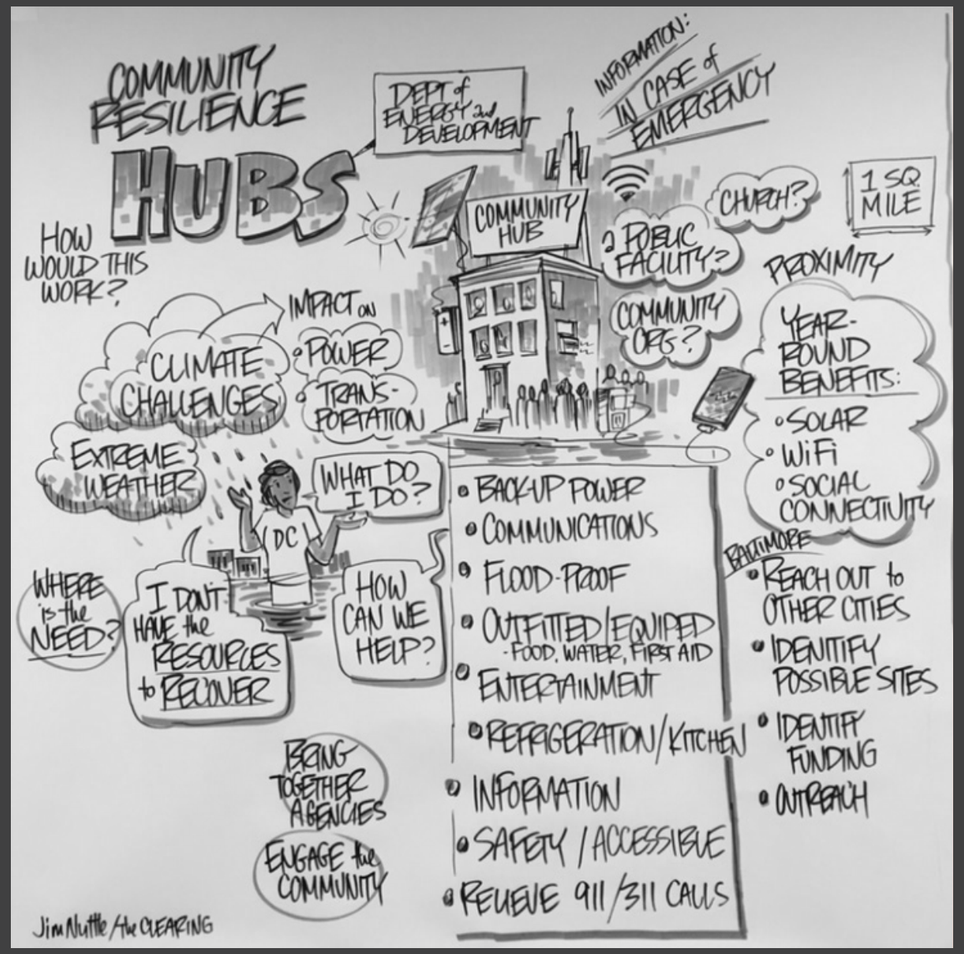

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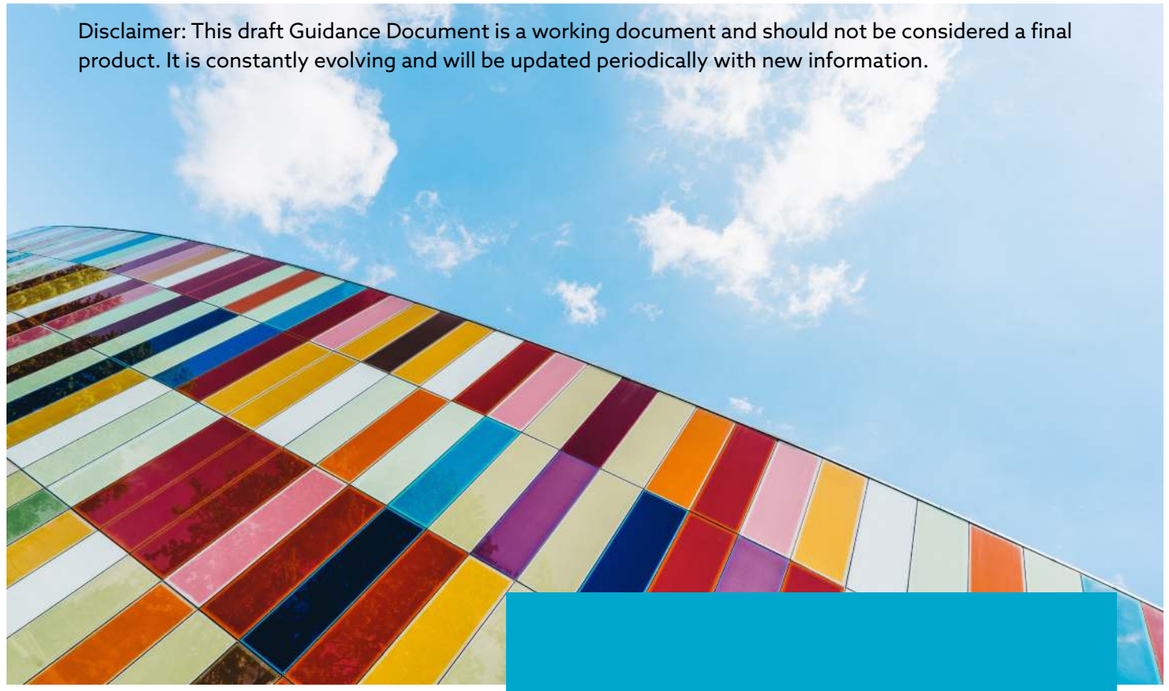

GUIDE TO DEVELOPING RESILIENCE HUBS

Resilience Hubs are community-serving facilities augmented to support residents, coordinate communication, distribute resources, and reduce carbon pollution while enhancing quality of life.

USDN | Urban Sustainability Directors Network

The Urban Sustainability Directors Network (USDN) is a peer-to-peer network of local government professionals from communities across the United States and Canada dedicated to creating a healthier environment, economic prosperity, and increased social equity. Our dynamic network enables sustainability directors and staff to share best practices and accelerate the application of good ideas across North America.

RESILIENCE HUB

2019

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Many people contributed to the development of this draft Guidance Document. We would like to thank all the community members, Community-Based Organizations, USDN Members and USDN partners for participating in workshops and events that helped inform the content of this document.

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INTRODUCTION

Climate change is happening now. According to the National Oceanic and Atmospheric Administration (NOAA), the number of billion-dollar disasters has risen significantly over the last ten years. As the ten warmest years ever recorded have happened since 1998, so have the costliest weather-related disaster events. As the globe continues to warm, extreme weather events will continue to threaten and impact communities, infrastructure, and systems worldwide.

Due to a history of marginalization and disinvestment, people of color, immigrants, refugees, and lower-income populations experience increased exposure and sensitivity to climate hazards and a reduced capacity to adapt. Preparing for climate change provides opportunities to address root causes of disproportionate exposure and sensitivity to climate impacts and enhance these priority communities' capacity to adapt.

RESILIENCE is the ability of people and their communities to anticipate, accommodate and positively adapt to or thrive amidst changing climate conditions and hazard events. Resilient communities enjoy a high quality of life, reliable systems, and economic vitality, and they conserve resources for present and future generations. The term resilience is often used interchangeably with emergency preparedness and response, but these elements only address part of this important concept. For the purposes of this document and for the development of Resilience Hubs, we will use this holistic and comprehensive definition of resilience.

The way we experience resilience differs by setting, facility and community. For example, a temporary power outage in an apartment building may be little more than a nuisance for some residents, but can be life threatening for others who rely on breathing machines or home dialysis equipment. Impacts from a power outage can also disrupt entire systems such as a data center where mere seconds can significantly impact capabilities and potentially create hazardous conditions for thousands of people. Establishing networks of community-run Resilience Hubs represents an efficient and effective way to strengthen communities before, during, and after natural or human-made disasters like hurricanes, extreme heat events, water main breaks, or gas outages while also improving year-round conditions and providing community benefit.

RESILIENCE HUBS

RESILIENCE HUBS use a physical space - a building and its surrounding infrastructure - to meet numerous goals, both physical and social. Resilience hubs are an opportunity to efficiently improve emergency management, reduce climate pollution and enhance community resilience. These spaces also provide opportunities for communities to become more self-determining, socially connected, and successful in the long-term. This document outlines initial thinking about essential elements of a Resilience Hub and how to begin planning for Hub development.

Resilience Hubs are community-serving facilities augmented to support residents, coordinate communication, distribute resources, and reduce carbon pollution while enhancing quality of life. Hubs can meet a myriad of physical and social goals by utilizing a trusted physical space such as a community center, recreation facility, or multi-family housing building as well as the surrounding infrastructure such as a vacant lot, community park, or local business. They provide an opportunity to effectively work at the nexus of community resilience, emergency management, climate change mitigation, and social equity while also providing opportunities for communities to become more self-determining, socially connected, and successful before, during, and after disruptions.

Resilience Hubs serve communities in three operating conditions: Normal (>99% of the time), Disruption and Recovery. To serve as a Resilience Hub, a community-serving facility will generally require a series of upgrades to ensure that the facility meets the daily needs identified by community members while also being able to provide critical services in the event of a disruption, often including:

- Access to electricity, heating and cooling
- Food, tools, resources, and sometimes shelter
- Water
- Information, communication infrastructure, and a trusted set of “Hub managers” to streamline information sharing
- Logistical coordination with partner groups that provide aid and post-disruption support
- Access to basic health and medical supplies

Community facilities typically require enhancements and upgrades that improve their capacity to provide service in all three operating conditions (everyday, disruption, and recovery). Upgrades can range in complexity and cost. Some may be as simple as provisioning additional materials, whereas others may be as sophisticated as installing hybrid resilience power solutions. Upgrades typically fall into five main categories.

While upgrades and services carry additional capital and operating expense for the facility, these investments can generate financial, sustainability, and social returns not only for the facility, but also for the surrounding community.

Resilient Programing and Services

Offering additional services and programs that build relationships, promote community preparedness, and improve residents’ health and well-being.

Resilient Structure

Strengthening the resilience of the facility to ensure that it meets operational goals in all conditions.

Resilient Power

Ensuring reliable backup power to the facility during a hazard while also improving the cost-effectiveness and sustainability of operations in all three operating modes.

Resilient Communications

Ensuring the ability to communicate within and outside the service area during disruptions and throughout recovery.

Resilient Operations

Ensuring personnel and processes are in place to operate the facility in all conditions.

PURPOSE OF THIS GUIDE

This Guide is intended to help communities develop new Resilience Hub projects. Most Resilience Hub projects are likely to start by leveraging existing community assets. Some may start with a well-trusted and well-utilized site already identified, while others may start with a strong coalition of community partners. Not all Resilience Hubs will develop in the same order or on the same timeline. Whether starting from designing a community center retrofit, a resilient power solar plus storage installation, or a new emergency shelter, this guide can help identify opportunities to expand beyond a singular goal and meet a wide range of community needs with one project.

Likewise, Resilience Hub projects will each be designed to achieve a custom set of operational, financial, community, sustainability, and other goals. Resilience Hubs achieving best practice across those goals can create powerful community benefits. Projects can also develop more incrementally, ideally in ways that do not preclude deeper achievement of expanded goals in the future. Hub planners will face both common and unique obstacles, and will have many choices to make in the process.
This Guide outlines a vision of how Resilience Hubs can optimally perform across a range of issues and operating modes. Guidance is provided to inspire Hub planners and partners to pursue best practice wherever possible, with the intent that project developers will also find valuable advice for projects that develop more incrementally. Wherever your community is starting from, you can find guidance within this document on:

1. **Making the Case for Resilience Hubs**
2. **Selecting a Project Team**
3. **Assessing Vulnerability & Selecting a Service Area**
4. **Identification of Project Team and Project Goals**
5. **Identifying and Evaluating Sites**
6. **Identifying Resilience Solutions**
7. **Site Development and Solutions Installation**
8. **Site Activation and Operations**
9. **Examples of Resilience Hubs**

This Guide and accompanying Resilience Hub Analysis Tool provide a framework to help communities plan for, implement and operate a community Resilience Hub. It works in concert with existing Resilience frameworks including FEMA's National Disaster Recovery Framework, local All Hazard Mitigation Plans (AHMPs) and municipal Sustainability & Resilience strategies. As such, this Plan leverages tools and techniques from all of these with an eye on streamlining and integrating effectively.

As communities and their partners use this Guide, it is critical to remember that resilience is holistic and is intended to help communities increase adaptive capacity, improve quality of life, and thrive amidst changing climate conditions. Thus, this Guide is a living document that will be periodically updated to reflect promising new practices, address new challenges, and incorporate new data from projects around the country.

KEY DEFINITIONS

Adaptive Capacity – The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Climate Resilience – Climate resilience is the ability of communities to anticipate, accommodate and positively adapt to or thrive amidst changing climate conditions or hazard events and to enhance quality of life, reliable systems, economic vitality, and conservation of resources for present and future generations. Resilience differs by setting, facility and community.

Resilience Hub – Resilience Hubs are community-serving facilities augmented to support residents and coordinate resource distribution and services before, during or after a disruption. They leverage established, trusted, and community-managed facilities that are used year-round as neighborhood centers for community-building activities. Designed well, Resilience Hubs can equitably enhance community resilience while reducing greenhouse gas emissions and improving local quality of life. They have the potential to reduce burden on local emergency response teams, improve access to public health initiatives, foster greater community cohesion, and increase the effectiveness of community-centered institutions and programs. See USDN's Resilience Hubs White Paper for more information.

Resilient Power – The ability not only to provide critical power to essential facilities and services during a power outage, but also to provide economic benefits throughout the year by reducing power bills and generating revenue to utilities and grid operators by generating power onsite and providing services to utilities and grid operators. Solutions typically include multiple forms of power generation and energy storage.

Critical Infrastructure – To operate, community-serving facilities rely on critical infrastructure that typically includes electricity, water, wastewater, heating fuel (natural gas, propane or fuel oil), communications (fixed wire or mobile) and Internet service.

Hybrid Resilience System (HyRS) – Energy systems combining renewable and conventional generation assets as well as energy storage.

MAKING THE **CASE**

CONTEXT

Due to a legacy of discriminatory policies and practices, low-income communities and communities of color often face a range of daily stressors that may make them more vulnerable to impacts from a changing climate. These same communities also suffer disproportionately from disruptions (both natural and anthropogenic) due to limited economic resources, chronic under-investment and lack of support. To date, most community resilience work focuses on identifying and managing vulnerability and risk through government defined assessments and approaches that often fail to meaningfully respond to community-defined needs. With support services strained, infrastructure failing and impacts from extreme weather events continuing to grow, residents and community-based organizations have identified the need for a trusted location within their neighborhood where residents can access resources, materials and support year-round while also increasing community and personal adaptive capacity.

Resilient communities can thrive every day, during disruptions, and as they recover from disruption. A critical component of thriving in day-to-day life is having a community that values your life and a government and institutions that are accountable for supporting your well-being. Developing a Resilience Hub is an opportunity to create both a physical space and also a culture and relationships that support all residents and work to dismantle historic inequities and their root causes.

With support services strained, infrastructure failing and impacts from extreme weather events continuing to grow, residents and community-based organizations have identified the need for a trusted location within their neighborhood where residents can access resources, materials and support year-round while also increasing community and personal adaptive capacity.

Shifting power and capacity to communities through the development of a network of community-driven and supported Resilience Hubs can help reduce stress on systems and infrastructure such as public safety, hospitals and transportation while increasing community adaptive capacity. Resilience Hubs can become community cornerstones where neighbors come together to better understand one another, cooperate toward common goals and bolster the health of their shared community. They can also help expedite and improve logistics for support networks and other relief agencies in the event of a disruption by providing established and well-trusted sites where people can access relief materials and resources easily and efficiently.

Among the many factors challenging community resilience, the impacts from a rapidly changing climate already pose direct impacts to communities, neighborhoods, towns, cities and entire regions. There is a wide range of data, research and documented impacts from extreme weather events to make the case for proactively enhancing community adaptive capacity and strengthening resilience. When making the case for investing in community Resilience Hubs, project teams can utilize hazard and climate data from Appendix E in this document.

COST & FUNDING

From their prior site uses and conditions to their primary goals and functions, no two Resilience Hub projects are exactly alike. The work and costs associated with developing and operating a Hub can thus vary widely. Just as houses span from tiny homes to large mansions, Resilience Hub development and operational needs range in size and sophistication.

Resilience upgrades to a physical structure or surrounding spaces can provide both direct and indirect financial return that may radically impact a facility's bottom line. Take, for example, a resilient power solar + storage solution. The capital cost for a "typically-sized" solution range from $150,000 - $250,000 if the Hub were to purchase and install the components outright. However, that same systems will generate savings on annual utility costs not otherwise available. Some projects are eligible for special financing in which a third party owns the system, monetizes incentives, and sells energy at a discount to the Resilience Hub eliminating nearly all upfront costs for the Hub while generating savings and resilience. This will not always be the case and the cost of any solution, from floodproofing to upgrades in IT infrastructure, vary widely due to a wide range of factors. This Guide emphasizes taking a life-cycle cost approach to Resilience Hub development, analyzing the short-term and ongoing costs, as well as the revenue streams with the intention of helping Resilience Hub teams estimate costs and identify sources of funding.

When one considers the cost to communities and society as a whole from under-investing in resilience, the impact of Resilience Hubs becomes far more profound. This Guide focuses on the costs of designing, implementing and operationalizing a Hub. Although there are certainly economic values to the various non-financial benefits Resilience Hubs offer, this Guide does not attempt to appropriately "price" the benefits of enhanced resilience, sustainability or equity.

Because Resilience Hubs are solving multiple problems, often several sectors are involved, and the projects can benefit from multiple sources of funding. Identifying and securing financial support is an ongoing task. Funding opportunities will be discussed in more depth in Appendix B, however below is a list of sources to research when initially considering development of a Resilience Hub or a network of Hubs.

Another key element to consider when seeking funding is the amount of time required to fulfill grant requirements. Grant fulfillment and administration can be labor- and time-intensive. It is important to have someone on your team with the time and experience to identify sources of funding, follow up on securing funding, and to track spending connected to each phase of the project. The Resilience Hub Analysis Tool provides a list of funding sources by type. Visit the list frequently as we will be updating with new sources.

Sources to Research

TEAM OR CONTRACT WITH NONPROFITS

Often nonprofits for resilience solutions will know how to access various rebates and assistance programs and can help Hub developers navigate these programs as part of their services. For example, Clean Energy Groups (CEG) Resilient Power Project or Solar One in NYC both offer technical assistance support.

FOUNDATIONS

A broad array of foundations from local community foundations to international organizations offer grants in resilience, clean energy and economic development.

LOCAL GOVERNMENT

Several cities have resilience goals and programs through which they can help to leverage funds. The DC Sustainable Energy Utility, for example, provides a range of rebates for energy efficiency solutions that can be incorporated into Resilience Hub projects.

STATE GOVERNMENT

State environmental, emergency management and economic development agencies offer support for aspects of resilience projects. The Maryland Energy Administration, for example, offers a Resiliency Hub grant program to support resilient power.

FEDERAL GOVERNMENT

Typically channeled through state and local government, these sources provide a range of technical and financial support for community resilience. The Federal Emergency Management Agency (FEMA), U.S. Department of Housing & Urban Development, U.S. Department of Energy and U.S. Department of Homeland Security are among the many federal agencies that have programs to offer this type of support.

TEAM WITH RESEARCHERS

Research teams and institutional partners can provide value in many ways. First, they can assist with providing downscaled data and support when assessing vulnerability. Second, they can assist with identifying solutions that enhance resilience based on unique characteristics at each site. Third, they can provide ongoing support to sites through living laboratories and/or citizen science opportunities.

IMPACT INVESTMENT FUNDS

Increasingly, social impact investment funds are bridging the gap between private sector funding and public sector goals. The Global Impact Investing Network defines impact investments as, "investments made into companies, organizations, and funds with the intention to generate social and environmental impact alongside a financial return." Generate Capital, for example, invests in energy efficiency and clean energy for small projects that are often passed by conventional sources of funding.

UTILITY INCENTIVES

A wide-array of incentives, from utility-funded rebates to tax credits, are available to facilitate investment in resilience enhancements. Check your utilities' websites or state public utility commission for sources. The appendix includes many of these sources, but a great place to start is the resilience or sustainability pages of your city's website, state environmental and emergency management agencies, or websites that compile lists of sources like www.dsireusa.org or www.adaptationclearinghouse.org

RETURN ON INVESTMENT

When optimally designed, Resilience Hubs provide services that strengthen community resilience not simply in the face of disruption, but on a daily basis. Resilience Hubs are like snowflakes, each is unique based on its location, set of needs and history. Although one size does not fit all, the benefits of a Resilience Hub listed below are tangible and measurable and include:

Public Health and Safety

Resilience Hubs can help improve public health and well-being by streamlining health programming and resources at a community-trusted site (in addition to existing health delivery sites). In the event of disruption, Hubs can provide access to basic medical supplies and also act as centers for medical deliveries and support.

Community Energy Costs Savings

Resilient power upgrades to an existing facility can help to reduce utility costs by offsetting both the amount of electricity purchased from the grid, reducing additional demand charges for the peak amount of electricity consumed during each month, and by leveraging rebates and incentives. The amount of that savings will vary by location, the local price of electricity, amount of space available to install solutions, available incentives and rebates as well as other factors. Using special finance tools to allow a third-party to own the system can shift capital costs away from the Resilience Hub and over to the system owner.

Environmental Sustainability

Resilience Hubs contribute to sustainability by offsetting grid-supplied power from solar and storage systems, developing or protecting natural systems, and reducing carbon emissions.

Economic Stability

By providing resources and tools in normal conditions and working directly with the community through recovery from disruptions, Resilience Hubs can help low-income residents and communities of color reduce financial impacts that occur during and after disruptions.

Social Equity

Resilience Hubs should be developed and managed through processes that shift power from local government to communities and community-based organizations. Sites should be situated in neighborhoods with priority populations and greater exposure to climate hazards, and either entirely managed or co-managed with members of the community. Services, resources, and opportunities available at Hubs should meet the needs identified by community members and focus on addressing disproportionate access to opportunities and resources.

Community Cohesion

Resilience Hubs act as a safe space for community members to build and strengthen relationships, collaborate on projects, participate in decision-making, and foster a sense of place and inclusiveness year-round. For example, Hubs can be gathering places for block parties, special events, and new community projects.

Some Hubs, depending on the services provided, can also provide these benefits:

Municipal Cost Savings

Both in their contribution to preparation and their ability to provide services during the recovery phase of a disaster, Resilience Hubs reduce the need for services from other entities including public safety, hospitals, and relief organizations. According to National Institute of Building Sciences, a dollar spent on increasing resilience for local governments and communities has a four- to six-fold return on investment . Localized resilience measures can lower risk mitigation costs and increase creditworthiness for cities.

Community Energy Costs Savings

Resilient power upgrades to an existing facility can help to reduce utility costs by offsetting both the amount of electricity purchased from the grid, reducing additional demand charges for the peak amount of electricity consumed during each month, and by leveraging rebates and incentives. The amount of that savings will vary by location, the local price of electricity, amount of space available to install solutions, available incentives and rebates as well as other factors. Using special finance tools to allow a third-party to own the system can shift capital costs away from the Resilience Hub and over to the system owner.

Job Training and Opportunities

Resilience Hubs can provide a space for workforce partners to host job fairs and deliver job training services. The development of a Resilience Hub also provides opportunities for community members to learn about resilient power systems, general contracting, and green landscaping. Operating a Hub can also create local management, communications, fundraising, and clean energy jobs.

Resources and Materials

Hubs are centers for community resources and tools. If space allows, sites can act as resource centers for lawn and yard tools, snow removal tools, and more. Funneling resources through Hubs can save community members money and time.

DISRUPTION AND DISASTER RESPONSE

Although Resilience Hubs will function at "normal mode" most of the time, they are intended to also act as centers for preparedness, response, and recovery. The most successful disaster response is to invest in preparedness of individuals, community-based organizations, and neighborhoods before a disruption. Resilience Hubs should be utilized as locations to bring together community members, block leaders, local business owners, and anchor organizations around different preparedness opportunities such as:

1. Individual Preparedness Initiatives
2. Resilience Workshops and Table Top Exercises
3. Climate and Response Trainings
4. Asset and Shortcomings Mapping and Needs Assessments
5. Communications and Outreach

In the event of a disruption, Hubs will switch from Normal Mode into reacting and responding to the disruption and will enhance operations to better support immediate community needs. With enhanced systems and capacity, Hubs can ideally help reduce the need of emergency services and better connect residents and businesses with supplies, information and support during a disruption. More detail on how to operationalize a Hub is provided in Phase 6 of this Guide.

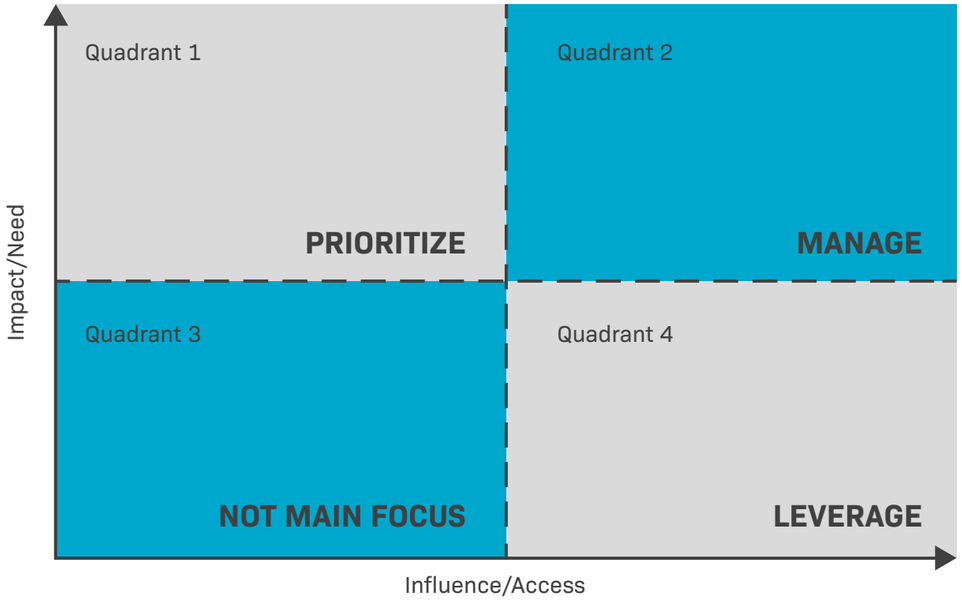
After disruption, Hubs are ideally intended to switch into Recovery Mode. The same inequities frontline communities experience before and during a disaster tend to impact their ability to recover, let alone thrive, after a disruption. Hubs can act as centers for resource deliveries and distribution, access to support and assistance for complicated processes such as filling out relief or insurance forms, locations to access support services for trauma and can even be locations where Community Benefits Agreements are generated. Hubs can also be central locations for external partners to gather and support recovery services such as conducting needs assessments, damage assessments, interviews with residents, and collecting data.

GETTING **STARTED**

Resilience Hubs are intended shift power to neighborhoods and residents. At a minimum, Resilience Hubs should be co-developed and co-managed by members of the community and/or community-based organizations. Before establishing a Resilience Hub, project leads should understand the history of the community in which they are working. What risks have residents faced historically, and what are their root causes? Are community members wary of government officials and/or public safety institutions? If so, why?

To help answer these questions, project leads can complete a stakeholder power analysis to identify relevant stakeholders, understand power dynamics between stakeholders, and determine how these dynamics should inform the process of Hub development.

Resilience Hubs Stakeholder Power Analysis



Project leads should prioritize communities, organizations, and populations with little influence and access, but which have high need and will be impacted by the Resilience Hub (quadrant 1). Project leads will need to proactively organize and manage the people and groups that hold a lot of power in the process and who are high need and will be impacted by the Hub (quadrant 2). Project leads should minimize time spent with stakeholders who have little power over the process but also little need or relationship to the project. And, lastly, project leads should identify ways to leverage the power of people and organizations that can influence the Hubs process but that are not the communities and organizations who will be served by the Hub.

Once project leads understand the history and context of the neighborhood and the relative power of stakeholders, they should identify a core project team.

SELECT A PROJECT TEAM

Although a project team will evolve and change over time, developing a Resilience Hub requires a core group of committed people. The Resilience Hub project team should include community members, community-based organizations, residents, and experts in the areas where a Resilience Hub supports municipal and community functions before, during, and after a hazard event. Project team members will need to work together to ensure community needs are prioritized and community voices guide the entire Hub development process.

Each Resilience Hub team will include many stakeholders and require various skills and capacities to meet their goals. Prioritize recruiting partners to fill roles from the Resilience Hub service area, or recruit stakeholders from beyond the service area in partnership with the host community. Below is a list of potential team members and some reasons why they might choose to join a Resilience Hub Team.

A Community Leaders, Champions, and Residents

- Organizing a Resilience Hub in your community can bring services to your community, connect you to your neighbors on a daily basis, and also help you weather any disruptions and bounce back quickly.
- The process of developing a Hub can help shift power from local government and institutions to community members and can create a joint understanding of the root causes of historic inequities and ways to resolve those problems.
- A Resilience Hub can provide physical spaces and programs to improve employment in your neighborhood. It can host job training and job fairs. It can include community members in its design and construction work and teach community members new skills such as installing resilient power systems and green stormwater infrastructure.
- A Resilience Hub will become a local employer with jobs ranging from management, to communications, and fundraising to energy engineering.
- A Hub can be a place for you to build and maintain community bonds.
- During disruptions a Hub can be a source of information, shelter, food and water, medical supplies, and solidarity.
- As your community recovers from any disruptions, a Hub can help you understand your opportunities and get the resources you need.

B Local Community-Based Organizations & Institutions

- Making one of your facilities into a Resilience Hub can increase your ability to be a community asset every day, during disruptions, and when your community is recovering from disruption.

C Local Business Representatives

D Decision-makers: Mayors, City Councilors, Sustainability Directors, and Chief Resilience Officers

- Resilience Hubs are an opportunity to provide excellent constituent services while at the same time lowering the cost of doing business.

E Local Government Staff: Public Safety, Public Works, and Building and Flood Code Departments

- Hubs can ease operating burdens for local governments and help them create and nurture relationships with community members.

F Utility Liaison

G Local Foundations

H State Energy Office Representative

The Resilience Hub Action Tool provides a Project Team Checklist to assist in this process.

Resilience Hub Project Team Example

Role	Responsibilities	Skill Set	Source
TeamLead	Charter Project, Manage Team, Manage Deliverables	Project Management	Local Government Staff or NGO or CBO
Program Manager	Develop Specifications, Produce RFPs, Design & Engineer Solutions, Manage Procurement, Manage Installation	Design & Engineering, Project Management, operations	In-house Staff or Consultant
Community Based Organizations	Bring Local Knowledge, Facilitate Community Input/Engagement	Relationship Building, Facilitation, Communications	Local Neighborhood
Neighborhood Leaders	Ensure Community Needs are Valued and Understood. Local Perspectives, Experience and Knowledge	Neighborhood Knowledge, Relationships, Support	Neighborhood
Finance	Identify Opportunities and Seek Funding, Coordinate with Site Leads & Other Stakeholders	Financial Analysis Accounting Project Finance	CFO (staff, board or both)
Programming	Coordinate Year-Round Community Benefits with Site Leaders and Community, Emergency Operations Processes	Emergency Mgmt., Health, & Planning, Sustainability	Local Government Staff
Equity	Coach and Support Project Team. Ensure Community Needs are Prioritized. Assist with additional community research.	Race, Equity and Inclusion Expertise	DEI Consultant
Local Business Representatives	Identify Business Community Needs, Ensure Local Business Input is valued	Business Case for Resilience	Chamber of Commerce, Neighborhood

THIS GUIDE

This document provides step-by-step guidance for establishing a Resilience Hub. Each Resilience Hub is unique and carries its own set of particular challenges and opportunities. This Guide provides guidance for local governments, CBO's and partners to plan for and establish Resilience Hubs in their communities, and reflects the experiences of USDN members and other communities currently developing Hubs. Implementing a Resilience Hub follows this six-phase process.

Phase 1: Assess Vulnerability & Select Service Area
Phase 2: Establish Team, Partnerships and Goals
Phase 3: Identify & Evaluate Sites
Phase 4: Identify Resilience Solutions
Phase 5: Develop Sites & Install Solutions
Phase 6: Activate & Operate Sites

The Guide includes the USDN Resilience Hub Analysis Tool which provides a set of checklists, resources and templates to help accomplish key steps.

PHASE ONE

ASSESS VULNERABILITY & SELECT SERVICE AREA

Resilience Hubs can help reduce community vulnerability by decreasing exposure to risk, reducing residents' sensitivity to stressors, and increasing a communities' capacity to deal with disruption and long-term changes. A vulnerability assessment inventories spatial and temporal exposure to hazards (both natural and human-made), the sensitivity of residents and businesses to those hazards, and the community's existing capacity to recover from disruption and adapt to long-term changes. The assessment can help Hub project teams better understand where Hubs will be most useful, near concentrations of people and places most likely to experience harm from disruptions and impacts from a changing climate.

Resilience Hub developers without a specific site or neighborhood in mind can conduct a broader vulnerability assessment to help narrow the potential service area of a Hub, while teams working on a Resilience Hub with a selected location can use a vulnerability assessment to validate that there are local needs a Hub can help meet.

To understand vulnerability, Hub teams must understand what stressors or disruptions are present at their potential sites and whether the community is negatively impacted by exposure to them. A stressor requires the attention of the Hub team only if the community or community assets cannot currently handle that stress.

To complete the most accurate and useful assessment possible, Hub developers should seek both top-down and bottom-up sources of information. Many potential sources of existing assessments as well as guidance on how to undertake a comprehensive vulnerability assessment are included in Appendix G. If Hubs teams do not have the resources for a complete assessment, this section includes recommendations about what to assess that will directly influence Hub development. Hubs teams will find community members' on-the-ground knowledge and experience is critical to understanding historic hazards, community assets, and adaptive capacity.

ASSESS EXPOSURE

Hazards	Potential Exposures
Human-Caused	▪ Air pollution ▪ Inadequate wastewater or and solid waste management ▪ Inadequate grid reliability ▪ Dame Failure ▪ Infrastructure Failure/ Collapse ▪ Hazardous Material Spill
Natural Hazards (Human-Influenced)	▪ Extreme Heat ▪ Extreme Precipitation & Flooding ▪ Drought ▪ Sea Level Rise ▪ Vector-borne Illnesses ▪ Windstorm/Tornado ▪ Wildfire ▪ Winter Storm/Ice Storm

Hub Developers should assess exposure of their potential sites to existing and future hazards both human-made, such as infrastructure failure and industrial accidents, and human-influenced, such as increased extreme precipitation or heat waves caused by climate change. Types of exposure that a Resilience Hub may need respond to are listed in the table below.

Information on local hazards can often be found in a municipal or county All Hazards Mitigation Plan, Adaptation Plan and/or vulnerability assessment. If a local source of hazards is not available, Hub planners can use EPA's EJSCREEN, Climate Central's Surging Seas Risk Finder, and the CREAT Climate Scenarios Projection Map to better understand what the Hub may be exposed to. Hub planners can use this information to prioritize sites that are not exposed to major hazards yet close enough to serve populations exposed to disproportionate hazards.

ASSESS SENSITIVITY & ADAPTIVE CAPACITY

To understand the potential consequences of hazard events and disruptions, Resilience Hub Teams must understand how sensitive community members, businesses and neighborhoods are to stressors and shocks and what existing ability they have to recover and adapt. Several factors influence sensitivity including factors such as health, occupation, income, living conditions, age, language barriers, and racism. Many frontline communities, which the NAACP defines as "neighborhoods or populations of people who are directly affected by climate change and inequity in society at higher rates than people who have more power in society," suffer disproportionately from both disruptions and everyday stressors due to historical causes of inequity including discriminatory housing policies, chronic under-investment, and limited influence on bureaucratic processes.

The degree to which an individual is sensitive to disruptions and long-term climate impacts depends largely on a combination of root causes and economic, social, biological and political factors that increase disparity.

Ideally, teams interested in developing Resilience Hubs will complete a thorough community-driven vulnerability assessment or use an existing one. Teams without resources to conduct a full assessment should, at a minimum, consider how the factors in the table below influence individual and community vulnerability and their ability to respond to everyday stressors and occasional shocks. All three Hub modes, normal, disruption and recovery, should be evaluated. The table below includes example questions to consider in categories that correspond to guidance for assessing pre-existing community vulnerabilities and assets found on pages 42 to 44 of In the Eye of the Storm: A People's Guide to Transforming Crisis & Advancing Equity in the Disaster Continuum.

Tools to support conducting a full vulnerability assessment can be found in Appendix G.

Vulnerability Assessment Considerations and Questions

Resilience Hub Functioning Modes			
Category	**Everyday**	**Disruption**	**Recovery**
Demographics	What types of people live in the Hub service area? What types of everyday services do they need?	What languages do communications need to be in? What accessibility needs must any shelter offer?	Which residents qualify for which recovery resources? Do residents need interpretation services to access programs?
Housing Security & Conditions	Do most residents rent or own their homes? Should housing programs be designed for owners, landlords, or both?	How many residents live in homes exposed to potential flooding?	How many homeowners have flood insurance? How many renters have renters insurance?
Food Security	How close is the nearest grocery store? How many residents lack reliable access to a sufficient quantity of affordable, nutritious food?	How many residents have 72 hours of food and water stored at home? Do local grocery stores have continuity of operations (COOP) plans ?	How many residents rely on transit to grocery shop? Are there local food businesses that need help navigating recovery offerings?

Resilience Hub Functioning Modes (Continue)			
Category	**Everyday**	**Disruption**	**Recovery**
Mobility	How many residents have access to vehicles and transit options? How walkable is the neighborhood? How far will residents travel to a Hub?	How many residents have access to a mode of transit that they can reliably use to evacuate? Is the Hub close enough to evacuation routes to receive supplies during disruptions?	What services do residents access by transit that a Hub can consider bringing to the area if the transit recovery timeline is long?
Health Status, System, & Services	Do residents have higher rates of asthma and other health conditions? How many residents qualify for insurance benefits but are not enrolled?	How many residents use medications that require refrigeration or medical equipment that requires electricity?	Are there health facilities in the area that may need to place patients in other facilities during recovery? What are their patient populations?
Emergency Services	How many residents have an emergency plan, shelter in place materials, and a go bag?	Are there an adequate number of community shelters and/or emergency shelters in the area?	How many first responders live in the area? What will their mental health needs be during recovery?
Local Economy	How many local businesses have insurance? Flood insurance?	Do local businesses have continuity of operations (COOP) plans?	Which businesses qualify for which recovery resources? Do businesses need interpretation services to access programs?
Utilities	How many households have had utility shut-offs in the last 12 months? How many residents have access to redundant communication options (cell service, landline, and/or internet)?	How many residents and businesses are prepared to function without utilities for 72 hours?	What is the age of local utility infrastructure? Has it failed before, and, if so, how long did repairs take?
Governance	Are decision-makers in meaningful relationship with community members?	Does institutional preparation for disruption value resident needs and local knowledge?	Are recovery programs designed to be accountable to community members?
Community Culture	Are residents socially connected? Does local culture value preparation for disruption?	What cultural practices, such as worshipping or following dietary restrictions, will residents want to continue during disruption?	Is the design of recovery programs culturally appropriate for residents?
Critical Facilities	Does the neighborhood have access to critical services like food, health care, and emergency response?	Do local critical facilities have continuity of operations (COOP) plans?	If critical facilities' recovery timeline is long, what services will the neighborhood lack?

These example questions and the resources identified in this section can assist Resilience Hub teams in developing the most helpful list of assessment topics for their community. Acquiring some of this information may require conducting community surveys and/or interviews since much of this data is not readily available. If capacity is an issue, this is an opportunity to partner with local community-based organizations and institutional partners to assist with gathering information.

SELECT SERVICE AREA

Resilience Hubs are flexible both in their application and design. Sites are as diverse as the communities they serve. When assessing where Resilience Hubs are most needed, utilize community input and expertise in addition to information identified in risk and vulnerability assessments. These combined inputs and resources will help to identify areas most in need. Below is a list of factors and questions to consider when identifying where hubs are most needed and the service area they will support.

- **Community Input** – Community members know their neighborhoods best. It is critical to involve members of the community, local business owners, and community-based organizations when identifying potential areas and sites.

- **Support Network** – Ideally, Resilience Hubs are primarily managed and supported by community-based organizations and/or members of the community. When selecting a site, seek areas with credible, organized, and established community-based organizations including faith-based organizations, community centers, recreation centers, or municipal facilities.

IDENTIFY EXISTING RESILIENCE PLANS AND SUPPPORT TOOLS

Although the vulnerability assessment and community input should be the main priorities when identifying potential service areas, existing resilience and/or climate planning documents also have the potential to assist in identifying potential sites.

- **Existing Plans and Regulations** – Project Teams should inventory resilience plans, preparedness plans, emergency response plans, and/or climate adaptation plans, including documents and projects developed outside of local government that impact the community. In addition, Teams should also become familiar with building codes, land use ordinances and stormwater management regulations, all of which can potentially impact viability of a Resilience Hub.

- **Decision-Making Tools** – There are a wide range of decision-making tools available to support local governments, community-based organizations and community members in enhancing resilience. These tools include social equity and environmental justice tools, flood map and flood vulnerability tools, health impact assessment tools, and energy efficiency tools. A list of support tools can be found in Appendix G.

PHASE TWO

ESTABLISH PROJECT TEAM, BUILD PARTNERSHIPS, AND SET GOALS

BUILD PARTNERSHIPS WITH COMMUNITY MEMBERS & ORGANIZATIONS

Resilience Hubs are a tool to increase community adaptive capacity and enhance quality of life. Residents and local community-based organizations should be partners, and preferably the leaders, from the very beginning of the process to develop and manage a Resilience Hub. This requires local government leads and other partners to actively step back and shift power to community leaders and organizations. Building partnerships and trust is an ongoing process that requires transparent communication, continuous engagement and ensuring all voices are heard and valued. It is important to recruit new team members in partnership with the Hub's host community, and prioritize recruiting partners from the service area to fill those roles.

The quality of collaboration with community partners can have a significant impact on the success of a Resilience Hub project. Effective collaboration requires commitment, skill, and a thoughtful approach. Deeper guidance on how local governments can most effectively collaborate with community partners is available in two recently developed guides:

- **Community-Driven Climate Resilience Planning Framework** developed by the National Association of Climate Resilience Planners (NACRP)

- **Guide to Equitable, Community-Driven Climate Preparedness Planning** developed by a group of USDN members and partners

For the purposes of establishing a Resilience Hubs Project Team, there are key stakeholders that should be included as part of the community-driven process. Steps for identifying and establishing those partnerships include:

Identify organizations that currently serve the community
Community-driven planning and implementation creates more resilient neighborhoods. Organizations that currently serve the community have established relationships, critical information and direct experience that will assist in establishing and maintaining well-utilized Resilience Hubs. Potential partner and/or lead organizations include:

- Neighborhood Associations
- Educational Systems- Local school system, colleges, universities
- Health Systems- Hospitals, medical centers, clinics
- Cultural Institutions- Museums, science centers
- Environmental Organizations- Air pollution, tree canopy, community programming
- Faith-Based Leaders
- Community Development Corporations
- Media- Local newspapers
- Housing Agencies

Identify trusted messengers and community leaders
- Community Organizers
- Local Elected Officials
- Faith Leaders
- Business Owners
- Fire Fighters

SELECT RESILIENCE HUB SITE TEAM

Resilience Hubs require a unique set of stakeholders and implementation partners. Due to the type of enhancements and upgrades Hubs undergo, the project team will need to include partners from several sectors and specialty groups. These team members should be determined based on the specific needs of the community and with community input. The larger project team may include several of the following:

Potential Resilience Hub Site Team Members:

Group	Role	Responsibilities/Goals	Source
Resilient Hub Operator	▪ Operate the facility in disruption and recovery	▪ Minimize operating costs ▪ Coordinate operationalization of Hub	CBO, NGO or Community
Property Owner	▪ Hosts the Resilience Hub and its assets	▪ Satisfied tenant ▪ Enhancement of property value ▪ Healthy neighborhood	Identified by CBO and Community
Neighborhood	▪ Use the Resilience Hub Services ▪ Support Resilience Hub development	▪ Participate in needs inventory ▪ Receive community services (child care, senior care, etc.) ▪ Receive support during disruption ▪ Receive support during recovery	Neighborhood
Local and State Government	▪ Provide resources (logistical, administrative and other) ▪ Potential Funding Support	▪ Maximize impact of over-allocated resources during an event ▪ Expedite and effect a rapid recovery ▪ Support proactive capacity building	Local Agencies State Agencies
First Responders	▪ Provide support during hazard events	▪ Provide services effectively and efficiently during and after disruption ▪ Build trust and relationships year-round with community	Local OEM Local Fire Local Police
Federal Agencies & Relief Organizations	▪ Provide support and resources to communities during events	▪ Efficient access to community members ▪ Provide resources based on community-identified needs	FEMA National Guard
Resilient Power Consultant	▪ Provide renewable energy options and support ▪ Provided energy conservation measure (ECM) options & support ▪ Provide financing support	▪ Produce techno-economic feasibility analyses for energy solutions ▪ Provide energy audits ▪ Identify financing alternatives	Microgrid or Resilient Power Consultant, Solar + Storage vendors, Energy Services Company (ESCO)
Consulting Engineer	▪ Develop Deliverables ▪ Collect Data ▪ Conduct Analyses ▪ Manage Subcontractiors	▪ Design, engineering, construction	Engineering Firm

Facilities Operations	▪ System Operations ▪ System Maintenance ▪ Site Operations	▪ MEP Operations ▪ Familiarity with Site	Community Members, CBO, ESCO
Construction	▪ Design, Engineer, Procure & Construct Project ▪ Manage Subcontractors, Procure Permits & Licenses	▪ Engineering ▪ Construction	EPC Firm
Hospitals & Health Care	▪ Provide resources & basic medical ▪ Provide emergency and community health care	▪ Reduce stress on facilities during hazard events from community members seeking lower-impact health care needs ▪ Consider “adopt-a-hub” and support communities by assigning medical professionals to certain sites	Local Hospital, Health Care Networks
Electric Utility	▪ Provide technical support ▪ Facilitate permitting and interconnection.	▪ Expand the toolbox of resilience assets during events. ▪ Seamlessly integrate distributed generation and other new technologies	Utility
Stormwater Utility	▪ Provide technical support	▪ Make sure the site will not be subject to flooding or has minimal impacts from flooding	Local stormwater association
Soil/Local Food Expert	▪ Provide local food growing options/support	▪ Assess soil conditions ▪ Support local food generation onsite ▪ Organize access and distribution	Local NGO Local CBO Institution
Lawyer or Legal Team	▪ Manage contracts ▪ Guidance on deal structure	▪ Determine optimal legal structure for Resilience Hub ▪ Review all contracts and documents ▪ Review risk management strategies	Community Law Center
Insurance Representative	▪ Provide Risk Management Tools	▪ Assist with insurance considerations related to Hub uses	State Insurance Rep
Accountant/ CFO	▪ Finance guidance ▪ Tax guidance ▪ Financial management	▪ Advise on accounting treatment of various solutions ▪ Evaluate tax implications of various strategies ▪ Optimize capital structure of finance	NGO CBO
Food Service Providers	▪ Assist with food & water needs assessment	▪ Advise on types of food that can be stored or cooked on site versus delivered ▪ Assist with kitchen assessment and food & water storage considerations.	American Red Cross, Local Food Bank

Build Partnerships with the Utility

Utility companies have a vested interest in the safe and reliable operation of their distribution systems. Resilience Hubs can be an important tool for utilities. Engaging the utility in helping to design, optimize and implement resilience solutions will greatly expedite projects. Most utilities have public relations or community relations teams that can help you access the proper resources for support. Be sure to include all of the relevant utilities (electric, natural gas, water, wastewater and telecommunications) in your effort.

SET GOALS WITH RESIDENTS AND COMMUNITY ORGANIZATIONS

After identifying the service area and building a team of partners, it is important to collaborate with residents and community members to identify context-specific goals for the project. Based on the vulnerability assessment and needs assessment, teams will discuss and establish goals for topics such as:

1. The services and activities the hub will support year-round
2. The building’s electricity supply
3. Emergency and recovery services the Hub will provide in the event of disruption.
4. How the hub can support financial stability in the neighborhood

Residents and project partners work together to choose every day, disruption, and recovery mode goals in each category.

As with any project, a community’s Resilience Hub establishes specific goals and the objectives necessary to achieve them. These are the goals and objectives for the various stakeholders within a city that pursue a Resilience Hub strategy. Each community’s Resilience Team should establish systemic goals for Resilience Hubs. While each hub functions organically, during a major event and the recovery, the ability of hubs to interact creates additional strength. Moreover, with scarce resources to allocate to each site, it is more efficient to prioritize sites for development where they will have the maximum return on investment. To help jump start these conversations, the tables below outline example goals ranging from entry-level to high ambition.

The selected goals may necessitate adding additional expertise and capacity to the Project Team. It is recommended that team leaders take time to reassess the skill sets and expertise on the existing project team and identify if new team members are needed after goal setting. It is recommended that teams prioritize recruiting partners from the identified service area (neighborhood) to fill additional roles. An extensive list of potential Project Team partners can be found in Appendix D.

With the basic list of sites selected, conduct site surveys to determine which will make the best candidates. With a relatively short list of sites, this analysis can be fairly straightforward. However, when the portfolio is extensive (more than 5-6 sites) spread over a large area, the team may need some outside help to perform a portfolio analysis.

Example Goals

Community (C), Physical & Building (PB), and Financial (F)

	Normal/Everyday	Disruption	Recovery
Basic	▪ Location is trusted and programming is in consultation with community served (C) ▪ Provide natural system services such as absorbing stormwater, providing shade and reduce surrounding air temperature (PB) ▪ Hub employs local residents and provides job training (F)	▪ Provide community's basic needs (shelter, food, water, communication) for at least first 72 hours (C) ▪ Provide power for necessary services for up to 72 hours (PB) ▪ Educate residents about neighborhood and family emergency preparedness (F)	▪ Provide one-stop connection to necessary recovery resources (C) ▪ Open doors for community gathering immediately following disruption (PB) ▪ Connect residents to information about recovery funds (F)
Mid-Level	▪ Reduce carbon emissions while minimizing operational requirements (PB) ▪ Hub co-located at existing community-trusted service provider and reduces operating costs (F)	▪ Provide 50% of normal power load for up to 72 hours (PB) ▪ Reduce need for residents to buy emergency supplies, pay for shelter, or travel out of neighborhood (F)	▪ Provide core functions immediately following disruption (PB) ▪ Reduce recovery costs for community-trusted service provider (F)
Best Practice	▪ Community owns facility ▪ Hub employs local residents and provides job training; and services, activities, and physical spaces are programed for residents by residents (C) ▪ Produce 100% of electricity demand carbon-free and on-site while minimizing operational requirements and reducing costs or providing revenue for the community (PB) ▪ Hub reduces utility costs and/or provides revenue for the community (F)	▪ Provide 100% of normal power load for up to 72 hours (PB) ▪ Provide community's basic needs (shelter, food, water, communication) for duration of disruption (C) ▪ Island from grid and run continuously, with as little fossil fuel as possible (PB) ▪ Provide access to free individual preparedness materials and emergency supplies (F) ▪ Reduce the need for residents to pay for shelter or travel out of neighborhood (F)	▪ Provide one-stop connection and case management for all necessary recovery resources (C) ▪ Return to everyday functioning immediately following disruption (PB) ▪ Connect residents to all available recovery funds; decrease processing time for funds to reach neighborhood; help residents bulk purchase recovery materials (F)

PHASE **THREE**

IDENTIFY & EVALUATE SITES

With service areas identified, prospective partners aligned and goals established, the next step is to identify site services and prioritize which sites to pursue. This requires an assessment of each site and analysis of potential resilience-building solutions. A proper feasibility analysis will determine whether investing in resilience upgrades to a facility are financially or technically feasible and also assist in selecting the optimal mix of resilience features.

SITE SELECTION

This process evaluates financial, resilience and sustainability criteria, and then sizes and configures solutions appropriate to each site. To start, Project Teams can build a list of prospective sites in each Target Area based on general criteria about the prospective site, its current role in the community and the general condition. Initial criteria can include:

- Trusted and Well-Utilized Sites – Identify sites where community members already go and trust. For example, community centers, health centers, places of worship, or recreation facilities.
- Existing Community Assets – As part of selecting a service area, identify underutilized community assets including emergency shelters, food pantries, and/or soup kitchens.
- Utility Considerations - Have access to grid load information and feasibility for interconnection (detailed more in Phase 4)

A Resilience Hub requires a physical location for community members to gather and access resources and services. The top priority when identifying a potential site is that the Hub needs to be a place that community members trust, find welcoming and can access conveniently. Issues to consider include:

A Site Size and Capacity

Identify organizations with facilities that are large enough to handle both daily programming needs and a surge of activity in the event of a disruption.

B Transportation and Access

Identify facilities that are central enough to be accessed by a large number of residents on foot (*Note that community members and community-based organizations will identify the service area for the Hub which will, in turn, generate the estimated number of residents who will access the site on foot). Ideal facilities are located close to an evacuation route or major road in order to increase accessibility for aid deliveries during and after a disruption.

C Good Building Condition

Ideally, for both fiscal and operations purposes, prioritize facilities that will not require significant investment in upgrades, or sites with planned upgrades that could be leveraged to accommodate Hub needs, over sites that require significant retrofits such as a new roof or electrical system.

D Resilience Capacity

Prioritize sites where the people who work daily under normal operating conditions are empowered and motivated to work in their resilience capacities. Although Resilience Hubs shift operational priorities during and after disruption, they still require ongoing efforts around preparedness and capacity-building.

E Financial & Risk Management

Facilities must have the financial wherewithal to sustain operations in all three modes. This includes not only appropriate risk management tools, but also secure sources of operational funds and sound financial management practices.

F Multiple Options

Consider multiple facilities in each Service Area to ensure that a feasible site will be identified. Not all sites prove feasible and often deficiencies do not show up until long into the development process.

PRIORITIZE & ASSESS SITES

Project Teams can work together to prioritize which sites to pursue first by identifying where the greatest community resilience return exists. The portfolio should include a range of prospective sites in each target area. First and foremost, Project Teams should work with communities to identify a set of services the Hub should deliver.

Site Services

Community members can help Project Teams identify which services (including essential services) the Hub should provide during Normal, Disruption and Recovery modes. Teams can use the Resilience Hub Planning Tool for a printable and editable list of options. Services to consider include:

- ☐ Food Preparation
- ☐ Food Storage
- ☐ Water & Ice
- ☐ Cooling/Heating
- ☐ Child Care
- ☐ Restrooms
- ☐ Showers
- ☐ Briefings & Meeting Space
- ☐ Response Coordination
- ☐ News & Information
- ☐ WiFi Access
- ☐ Basic Medical Care
- ☐ Medical Support
- ☐ Accessibility
- ☐ Logistical Support (first responders) - support for communications, mustering, etc.
- ☐ Transportation
- ☐ Counseling Support
- ☐ Logistical Support (community members) - communication with local, state and federal recovery agencies
- ☐ Sheltering
- ☐ Local Food Access
- ☐ Air Filtration

Prioritization

Resilience Hubs will be established from different starting points and thus, a different set of additional site criteria is necessary for prioritization. Ideally, Project Teams will work with community members to identify additional criteria to guide the prioritization process. A short list to consider include:

- ☐ Ability to meet all desired site services (see above)
- ☐ Identified need (magnitude and severity of impacts)
- ☐ Community interest, capacity and support
- ☐ Availability of site and site owner support
- ☐ Alignment with community goals
- ☐ ADA compliant
- ☐ Ample storage space
- ☐ Accessible space for deliveries
- ☐ Stable roof (for solar)
- ☐ Exterior space for battery backup or HyRS system
- ☐ Open space for food generation or greening opportunities

There are several techniques for building consensus around prioritization ranging from simple voting to more complex prioritization matrices focused on feasibility factors. Project Teams will need to determine which set of criteria are essential, optional and ideal when prioritizing potential Hub sites.

Identify Performance Specifications

The chart below is an example of selected service areas and performance specifications related to each of the three modes (Normal, Disruption, and Recovery) a Resilience Hub serves. This example is intended to help guide Project Teams to prioritize a range of possible services a Hub can provide and set specific performance specifications. Please note, all the services listed are not required in order to for a Hub to function or meet community needs. Project Teams can select and prioritize services based on their vulnerability and needs assessment and with community guidance and input.

Example Performance Specification Sheet (3=High Priority, 1=Lower Priority)

Potential Services	Priority (0-3)	Operating Considerations Normal Mode	Operating Considerations Disruption Mode	Operating Considerations Recovery Mode
Food Preparation	3	Feed ~50 seniors per day	Kitchen space and supplies to cook meals for 100 families for 3 days	Kitchen space and supplies to cook meals. Distribution space for dry goods for 100 families (30 days)
Food Storage	3	Ample storage for meals for seniors, youth, etc.	Storage for food or MRE's to support up to 100 families for 3 meals for 3 days	Storage space for food and cooking supplies that can be. used on-site or checked out by residents
Water & Ice	3	Access to clean water- drinking fountains	Clean (filtered) water and/or bottled water for 100+ families	Clean (filtered) water and/ or bottled water for 100+ families for 30 days
Cooling/Heating Relief	3	Sufficient to provide for facility and users	Relief for vulnerable community members and staff	Relief for vulnerable community members, staff and first responders
Child Care	1	Before and after school care for 20-30 children	Additional support for single parents or children with special or additional needs	Additional capacity and staff support for child programming & care for ~40 children
Restrooms	3	Operational restrooms	Operational restrooms	Operational restrooms
Showers	2	For staff and members participating in activities	Limited staff use and some community as outage duration increases	Staff, community, relief workers
Basic Medical Supplies	3	Basic first aid	Basic first aid and basic medical supplies including cots and RTE supplies.	First aid and some community health support to prevent overburdening local hospitals
Medical Support (onsite)	2	Not necessary	Nurse and/or First Responder and Trauma Support	Ongoing support for trauma
Access/Support for low-mobility residents	3	ADA site compliance	ADA site compliance and additional support to help residents access site	ADA site compliance and assistance in accessing resources and recovery for low-mobility residents
Briefings & Meeting Space	2	Location for community members & groups to meet	Communications and coordination space	Central location for post-disaster response and recovery, coordination for aid organizations, and state & federal partners

Other Considerations

- ☐ Counseling and Trauma Support
- ☐ Activation Communications
- ☐ Communications line to Emergency Operations Center
- ☐ Response Coordination
- ☐ WiFi Access
- ☐ Phone Charging Stations
- ☐ Air Filtration
- ☐ Animals/Pet Containment Area & Services
- ☐ Banking Services and Financial Literacy
- ☐ Activities and Programming
- ☐ Logistical Support (first responders)
- ☐ Logistical Support (community members)
- ☐ Resources for Visually Impaired
- ☐ Programming for a Maker-Space and/or Citizen Science Space
- ☐ Waste Disposal
- ☐ Tree Canopy/Shading
- ☐ News & Information
- ☐ Local Food Generation
- ☐ Tool Checkout
- ☐ Transportation
- ☐ Sheltering

ASSESSMENTS

Conducting a range of assessments is important when determining feasibility of a site and potential retrofits needed. When working on assessments with communities, be sure to manage expectations. If contractors show up at a prospective site to take measurements, look at electrical panels, and ask questions, expectations rise quickly. Preliminary site assessments are important to determine feasibility and often, many sites will prove unfeasible for any number of reasons. It's important to be honest, transparent and a good communicator up front to ensure community members are not left feeling abandoned if the site they identified doesn't work as a Resilience Hub.

Kitchen/Food Preparation Assessment

In addition to breathable air, healthy food and clean water are critical elements needed in all three resilience modes. During a disruption, food and waters systems may be impacted and communities may lose access to retailers and/or food assistance programs such as senior meal programs and school meals. Resilience Hubs can improve water and food security for residents disproportionately impacted by disrupted systems. Different water and food service operations may be provided by Resilience Hubs including:

Emergency Meal Service

Meals served and consumed on-site. Meals are usually prepared on-site but may be dropped off by an external organization and distributed by the Hub.

Emergency Pantry

Food stored at a Resilience Hub is distributed to residents for preparation and consumption off-site.

Distribution Center

External organizations may use a Hub as a staging site for food distribution.

Community Sharing

Events where residents bring food to share with others on-site. Ideally, this is limited to service and consumption but potentially includes food storage and preparation.

Each potential Hub should be assessed to determine which water and food service model is appropriate based on community needs and goals established in Phase 2.

Gathering information on a site's existing water and food service operations will help a Hubs team evaluate the current and potential capacity of the kitchen for service before, during, and after a disruption. Hubs with **high food service capacity** will need to be licensed facilities with extensive food service staff, training, and expertise. Typically, sites of this caliber allow staff, but not volunteers in the kitchen. For example, commercial kitchens are well-equipped to safely feed large groups, but are more resource intensive than community kitchens.

Hubs with **mid-level foodservice capacity** will have flexible kitchens that can be altered and adjusted to accommodate increased activity and need in the event of a disruption. Often these sites need upgrades and staff training to support food service in the event of a disruption. For example, community kitchens are versatile and less regulated than commercial kitchens, but may require additional equipment and food service training for staff and volunteers.

Hubs with **entry-level foodservice capacity** are limited as to what they can prepare. Often these sites will store bottled water and Meals Ready to Eat (MRE's) or act as locations for food and water distribution from external organizations. For example, food pantries can require minimal equipment and staffing, but may be more intensive if distributing some perishable foods.

Factors that will influence the level of foodservice a Hub can provide include on the right.

The local Health Department likely reviews foodservice facilities and designates a type of license and status to facilities. The type of license held determines what kind of food can be prepared and served. It also determines what kind of staff can be in the kitchen and what food safety plans must be in place. Inviting a local health department official to join a Resilience Hub Project Team will help the Hub meet its food service goals.

Space/Equipment /Storage

How big is the space? What food preparation equipment is already present? What is needed? What dry and cold storage equipment is available? What is needed?

Staff/Volunteers

Is this site required to employ a food service manager? What training is required for staff? Are volunteers allowed to prepare and serve food?

Food and Water Safety Plans

What food and water safety procedures are in place? What needs to be in place for Health Department compliance?

Access to and Capacity of Water Filtration Devices

Commercial water filters help remove many water contaminants and ensure water security on site. Does the site have adequate space for both the capturing and filtrating of water?

Additional considerations that should be included in the kitchen and food service assessment include:

- ☐ Cleaning considerations/needs
- ☐ Personal hygiene for food prep and distribution
- ☐ Supplies such a globes, hairnets, aprons
- ☐ Basic kitchen supplies (if needed)
- ☐ Practicality and feasibility within licensure anticipated capacity
- ☐ Foodservice tools
- ☐ Water filtration
- ☐ Water access and distribution

Appendix H provides additional resources and tools for conducting kitchen assessments and identifying a list of recommended items for foodservice.

Security Assessment

Creating a baseline assessment of security solutions for the Resilience Hub requires an audit of the facility with a particular eye on what may be needed to protect both people and critical assets in all three operating conditions. Security precautions for a specific Resilience Hub may differ based on the Hub's location and established community goals. At a minimum, community members and people working or volunteering at the Hub should feel safe in and around the site. Different security measures and desires will incur different costs. For examples, installation of strong and secure doors or a high-tech alarm system will cost much more than installation of motion-activated lights or better locks.

Key considerations should be based on community input and include considerations of the Resilience Hub's immediate surroundings, current security systems, building construction, points of potential breach, and facility operations.

The USDN Resilience Hub Analysis Tool includes a Checklist of Security considerations.

Policy & Regulations Assessment

The policy and regulatory framework impacting Resilience Hub projects is a patchwork quilt of overlapping federal, state and local policies, touching some or all of the various solutions impacting a Resilience Hub. The following provides sample policy opportunities and challenges Resilience Hub teams may find in different states. Bear in mind that in the policy arena, much of the attention on resilience focuses on disaster recovery. As a more holistic approach to resilience continues to evolve, the lines between these policies will continue to blur.

Sample policy considerations can be found in Appendix J.

SITE AUDITS

Proper and thorough data collection is critical to an efficient planning process. Along with constructability challenges, missing or inaccurate data can be the greatest source of project delays. Conduct site visits with community partners to help choose among potential sites. To make the most of the site surveys, use a standard survey form to collect basic data. Much of the quantitative data can be collected before you leave your office. Further guidance and a template are available in the Resilience Hub Analysis Tool.

Resilient Audit

Conduct a baseline analysis of the facility's resilience. A great place to start is the Ready to Respond: Strategies for Multifamily Building Resilience guide from Enterprise Community Partners. A collaboration of the D.C. Department of Energy, Enterprise, New Ecology, Inc. (NEI), the National Housing Trust (NHT) and Clean Energy Group (CEG), the guide provides a methodical approach to identify risks, assess vulnerability and determine resilience strategies.

Energy Audit

These audits will identify efficiency and demand reduction opportunities that may be taken before embarking on the solution design. For example, an investment in upgrading aging, inefficiency HVAC systems may result in reducing the size of the generation and storage system to power it. A variety of vendors and non-profit organizations offer these services. However, planners may find that they must consult with an HVAC contractor for audits of the HVAC system, lighting vendors for lighting, etc. Some utilities offer rebates for efficiency upgrades and have special programs for non-profits.

Electric Load Study

For existing facilities, a load study will help to confirm the assumptions used in the modeling as well as to verify the loads, panels and other information available from the as-built drawings. The study may or may not include review and logging of specific load data as noted above. If the drawings are out-of-date or non-existent, an experienced electrical engineer can produce updated load schedules (lists of circuits, panels, and their major loads) as well as an updated single-line drawing of the current electric system. The importance of having this information cannot be stressed enough, and skipping it can create costs and other problems for the planning process.

Structural Review

As part of the design and engineering process, specific analyses of kitchen capacity, ADA compliance, structural and electrical systems, etc. will be performed. For solar and storage systems, as part of the procurement process, installers and EPCs will visit the site to do preliminary analyses. However, experience shows that it is important to have an experienced system installer inspect the site in the feasibility stage for significant issues that might impact the design and construction of the system. This audit may not uncover all of the issues associated with building a system on the site, but will be invaluable for the ones it does pick up.

Evaluate Resilient Power Options

Conditions	Operations	Financial	Sustainability	Community
Normal Mode (99.9% of the time) Business as Usual. All critical infrastructure is available, no hazards are present and the Resilience Hub provides its normal community services.	Support normal operations of facility	Meet budget requirements Reduce operating expense	Achieve net zero operations	Support facility mission and community goals Provide workforce development opportunities
Disruption Mode Disruption to normal function for any duration. While duration can vary from minutes to months, 72 hours serves as a common planning window.	Maintain operations at or above normal levels with onsite or alternative sources of infrastructure	Reduce lifecycle cost to achieve required level of resilience	Minimize carbon impact and stormwater damage while meeting resilience requirement	Reduce stress and strain of community members Reduce impact on recovery efforts
Recovery Mode Returning to Normal. Aftermath of the outage, during which the community works to restore normal conditions. Can last weeks, months or years.	Support normal operations of facility	Meet budget requirements Reduce operating expense	Restore systems that support sustainability	Facilitate fast, efficient recovery

PHASE **FOUR**

IDENTIFY RESILIENCE SOLUTIONS

A Resilience Hub must be resilient itself and provide services before, during, and after an event. Consider solutions in four key areas: structure & site, power, communications, and operations. As the team considers these options, evaluate the relative importance of each measure, the current status of onsite solutions, and foreseeable constraints that may present challenges. Issues of capital cost and operating cost for each solution will be highly localized and variable between Hubs. Below is some general guidance to assist the team in considering these factors. However, you will want to collect local information from service providers, engineers and other expert partners.

RESILIENT STRUCTURE & SITE

Measures to strengthen the resilience of the facility itself to ensure that it meets operational goals in all conditions is critical. Ideally sites identified by the community should be outside of the floodplain and have lower flood risks. In the event that a site is chosen that may have some flood risk, elements to consider include floodproofing, windproofing, stormwater management, energy efficiency and water efficiency. To function without interruption during a hazard event, start with measures to bolster resilience against high probability hazards. Structural solutions will vary by region (hurricanes in the southeast, earthquakes on the west coast, forest fires in the southwest, etc.), but involve many of the same strategies. The Resilience Hub Analysis Tool identifies a range of these solutions.

- **Wet Floodproofing** – Solutions include engineered flood vents, water-resistant building materials, and elevating equipment. Cost: Varies with solution and facility.
- **Dry Floodproofing** – Solutions include flood gates, backflow preventers on drains, sealing openings in walls and foundations, sump pumps and waterproof enclosures.
- **Site Perimeter Floodproofing** – Sand bags, water-inflated tube systems and flood panels.
- **Elevated Equipment** – Relocate mission-critical mechanical and electrical equipment (elevator controls, HVAC, generators, fuel tanks) to the roof or other areas above the flood level.
- **Stormwater Management** – Solutions include permeable pavers, bioswales, green roofs and other techniques to infiltrate stormwater back into the ground.
- **Water Storage** – Solutions range from spare tanks (usually on larger, taller facilities) to spare jugs or cases. Improved efficiency will help stretch water supply, while rainwater storage helps with non-potable uses. The building's resilient power solution should consider supply to water pumps (if used) as part of the critical load panel.
- **Wastewater Contingencies** – Backflow preventers (backwater valves) prevent sewage from backing up into a building when the wastewater system is compromised. These may be required by code and should be inspected.
- **Fuel Supply** – Ensuring an adequate supply of fuel can be a significant challenge and will depend entirely on the facility. A facility that uses natural gas will be reliant on the pipeline. Onsite storage is typically not feasible. Propane (a different and not interchangeable fuel as natural gas) can be stored in tanks but requires re-fueling. Diesel and gasoline must be stored in tanks.
- **Critical Loads** – Properly designed resilient power solutions should ensure that electrically-powered solutions (like sump pumps) function during an outage.

RESILIENT POWER

Ensuring continuous power during an outage is one of the primary drivers in Resilience Hub decision-making and achieving this goal will represent one the larger investment needs. However, in the "what if" conversations about outages, it is easy to overlook that the Resilience Hub will operate in Normal Mode (on average) more than 99.9% of the time. A proper power solution focuses both on resilience during outages and on creating multiple benefits during Normal Mode, where the Resilience Hub can achieve operational savings as well as contribute to sustainability and social goals.

Hybrid Resilience Systems - In most situations a hybrid resilience system that includes solar, batteries, conventional generation and other systems will be the most effective and efficient solution. Hybrid systems create generation diversity, offer value during normal operating conditions, and can be more economically sized to meet full operational requirements. This approach also empowers communities with energy choice and contributes to reductions in carbon emissions over time.

Cost - Varies with size, complexity and current assets. For sites that have been evaluated as potential Resilience Hubs, solutions have ranged from approximately $15,000 to more than $500,000. However, the typical solution for facilities of the size and character of Resilience Hubs is between $150,000-$300,000, a significant portion of which may be offset by incentives, rebates and alternative finance strategies.

Solar PV – Solar arrays (mounted either on the roof, ground or overhead in canopies) can play a very important role for the Resilience Hub. During normal mode, they provide significant economic and sustainability benefits that can reduce utility costs and impact on the grid. During Outage and Recovery modes, they can play a role in providing additional power generation. Be aware that simply having solar panels does not increase resilience. System design, the building's infrastructure, and the utility's rules governing systems have a significant bearing on what the level of resilience may be.

Cost - Varies with the size of a facility. Systems often range in price from $2.50 to $3.50 per watt depending on size, mounting, etc. Some solutions can be significantly more expensive if they require complex mounting and installation. However, incentives such as Federal Incentives (ITC) and third-party ownership options (PPAs, leasing) are available in some states that can reduce capital costs.

Energy Storage – Batteries (the predominant form of storage a Resilience Hub will consider) produce electricity using an electrochemical reaction. The size and complexity of the system will dictate its footprint. However, in Resilience Hub applications, the size of the battery system will generally range from a few suitcase sized boxes to the size of several refrigerators. Larger systems (typically up to the size of a small shipping container occupying a parking spot) are possible. While we intuitively think of batteries from a backup power standpoint, they often have a far more significant impact on a Resilience Hub, and provide far more sustainability benefit, during Normal conditions than in either Outage or Recovery due to bill savings and the ability to generate revenue through the utility. Batteries are what can make solar a resilient power asset.

Cost - 7,000 - $50,000+. A growing number of incentives and rebates create opportunities to reduce (or potentially eliminate) cost to the Resilience Hub, while still providing benefit.

Conventional Generation – Backup or standby generation is usually provided in the form of a gasoline, diesel, propane or natural gas-fired unit that automatically starts in an outage. These systems convert fuel to electricity by using an internal combustion engine to spin a generator that produces electricity. These systems are typically housed outdoors in rectangular boxes. Backup generation and solar & storage options incorporate automatic transfer switches to ensure that they do not feed electricity back onto the utility's distribution lines during a power outage. Diesel, propane and gasoline systems require an external fuel tank while natural gas systems are fueled by the local gas utility's distribution lines. Though a relatively low-cost solution for backup power, most conventional solutions do not offer the incentives and economic or environmental benefits that hybrid solutions do during Normal operations. Generators are not sustainable nor carbon-reduction options and can also have siting issues due to noise and pollutions concerns and user error issues.

Cost - Varies on the size of the system, capital and operating costs. $5,000 to >$100,000

RESILIENT COMMUNICATIONS

Investment in resilient communications systems is critical for ensuring residents understand when the Resilience Hub is operational, what services it is providing, and what materials are available. Access to data and telecommunications is critical both during an event and through the recovery process. Even when Internet service or cell service is available, local traffic (particularly within the Resilience Hub itself) can overwhelm the infrastructure's ability to deliver.

Network Infrastructure – We often take the innocuous colored cables connecting devices for granted, but ensuring that the infrastructure is up to date and in good working order is critical. In most commercial buildings today, systems require more than Cat5e cable. Cat 6 or 6A is a minimum requirement for bandwidth surges and will have a longer lifespan due to their more rigid construction standards.

Cost: ~$350 per port, installed

Technology Exposure Considerations – The best technology systems will be rendered useless if exposed to the environment during a weather event. Some considerations to mitigate that risk are liquid-tight conduit to protect cabling systems, weather-proof enclosures for equipment like wireless access points that are installed throughout the building outside the server room, and raised floors for server rooms.

Cost: Varies

WiFi – A sudden influx of people to the Resilience Hub can instantly bring a WiFi network to a grinding halt. The WiFi that comes with an internet service provider's modem will not be adequate to service larger groups. In addition to installing robust and adequately sized systems, Resilience Hubs should keep spare ones as well. Members of the Resilience Hub team should learn basic troubleshooting for the WiFi system.

Cost: A high-end Wireless Access Point (WAP) is approximately $600

Off-Site Data Storage – Off-site storage is crucial for disaster recovery and should be a standard operating procedure for any facility. Losing accounting records, personnel files, timesheets, and digital photo archives can range from a time-wasting nuisance to a devastating event. Cloud storage services are inexpensive and readily available. Depending on the type of operation, more regimented solutions may be in order.

Cost: Popular cloud backup services for small operations cost ~$50 per month.

Uninterruptible Power Supplies – Power quality is important for electronic devices and sudden voltage changes can do significant damage, whether to a sensitive computer or a simple elevator motor. Uninterruptible Power Supplies (batteries) for mission-critical computers and servers are important. Sizing these to provide sufficient power for all of your critical devices is crucial and should be part of your conversation with your system tech.

Cost: Varies with size and functionality from $200

Operations & Maintenance – O&M and lifecycle management will make the difference between devices that work or fail when needed. Software updates, routine maintenance, rotating devices in and out of use periodically, upgrades, and service contracts are all important tools. Most can be handled at relatively low cost. However, investing in a good maintenance plan will help ensure the system will serve the Hub when needed.

Cost: O&M contracts range from as little as $10 per month to $250 per month, plus the cost of new equipment, software, and licenses when needed.

Monitoring Software – Monitoring software is also important to determine issues with equipment before they fail. It is better to identify potential failures before they happen. These systems often output to smart phones and mobile devices. Software monitoring services are available from companies that specialize in the deployment of monitoring software, monitoring of the equipment, and providing help-desk support.

Cost: $10 per month per system monitored

Switches – The core components of any communications network are the switches that manage network traffic. Network switches will be used minimally most of the time – basic, low bandwidth functionality – for long stretches of time, possibly years. Then suddenly, a crisis will lead to a sudden influx of people and devices causing a surge in bandwidth, placing a significant demand on the switchgear. Therefore, the need for high quality switches is paramount. Redundancy is also important. If one switch fails, you need another switch, already configured, ready to take its place in order to maintain the network. As Resilience Hubs vary in scale and technical sophistication, costs can range from hundreds to thousands for each switch.

Cost: A reliable commercial-grade 24-port switch will typically cost approximately $2,800. A 48-port switch will cost up to $4,000.

Site security – Security measures are important in any operating mode and are highly specific to the facility and its uses. Solutions may be as rudimentary as padlocks and gates or as sophisticated as access control and video monitoring. Typical Resilience Hubs will not need more than basic measures. Solutions include building-mounted exterior IP cameras in weatherproof enclosures, audio monitoring stations, and mechanical combination locks for access control to key facilities. Upgrades can include additional cameras, readers, and various physical security measures.

Cost: $3,000 - >$30,000.

Communications Protocols - Of course, technology is useless without the proper protocols in place to get the people who need information the information they need. Websites (particularly when coordinated with local emergency management operations) provide an easy way to provide accurate and consistent operations when communications infrastructure is functioning. Many communities have begun to use apps to provide a wide range of information of services. The City of Seat Pleasant, Maryland, a low-income community of 4,700 on the Washington DC border, developed the My Seat Pleasant App as part of its Smart City initiative. The app not only provides real-time information, but also is a vehicle for community members to report issues, ask questions, and get help.

RESILIENT OPERATIONS

Resilience Hubs require a capable team ready and willing to support, activate, and maintain the Resilience Hub in all operating conditions. It is simply not enough to have one person who knows how to start the communications equipment, or someone who can create a message board. In an outage, single sources are often points of failure. Resilience Hub Teams will need to consider personnel and process measures that ensure the continued operation of the facility in all operating conditions and ensure each individual has the training necessary to support their role. Steps include:

- Identify Key Personnel
- Identify Roles in all Operating Modes
- Provide and/or Identify Training
- Identify Funding and Support for Key Personnel

This section focuses on key personnel and their role in ensuring resilient operations at all times. Depending on the size and unique characteristics of a site, one person may take on multiple roles or there may be one person for each role. Either way, it is critical to understand what roles are critical to a specific site for all three Resilience Modes and to identify sustainable sources of funding to support those roles. Phase 6 in this Guide builds upon this section and outlines steps for activating a Resilience Hub in the event of a disruption.

Identify Key Staff and Staff Roles

Indicates priority roles if you have limited number of people

Roles	Operating Considerations Normal Mode	Operating Considerations Disruption Mode	Operating Considerations Recovery Mode
Hub Manager	Big picture, Proactive action, Goal identification & alignment	Site management, Site coordination, Team meetings, Open & close site, Determine sheltering	Site management, Site coordination, Oversee staff and support groups
Information Coordinator	Understand hazards, Understand maps, Funnel information to Resilience Hub, Provide programming information	Collect and display info, Monitor situation board, Help prioritize actions based on needs, Manage Hub status reporting	Collect and display information for recovery, Assist with collecting stories and information from residents, Assist with Plan for recovery
Public Information Coordinator	Assist with individual preparedness, Provide information on community gatherings and events	Manage and maintain public info board, Time and date information posted, Connect with media	Maintain central information center, Disseminate resources and materials to aid in recovery
Reception/Door	Not applicable unless for special events or identified uses	Check-in and greeting, Direct people to resources or assistance	Check-in as needed, Direct people to resources or assistance
Medical Coordinator	Ensure basic medical supplies are onsite, Prepare site for medical support in disruption mode, Materials	Coordinate medical service providers, Track all medical issues, Manage volunteers, Trauma support	Coordinate medical service providers, Manage medical volunteers, Connect residents with additional medical & trauma support
Needs Assessment Coordinator	Support needs assessment process, attempt to proactively meet community needs	Identify and prioritize immediate needs, Match-make	Identify and prioritize short-term needs, Identify long-term needs, Work with Team to meet needs
Storage Manager	Set up and label storage spaces and shelves, Inventory	Track items going in & out of storage, Maintain inventory, Identify needs and restock	Track supplies, Maintain inventory, Identify ongoing needs and make requests for supplies
Community Space Manager	Assist with daily programming, manage space when in use	Manage common spaces, Coordinate volunteers to assist with managing specific areas, Provide comfort and support	Manage common spaces, Coordinate volunteers to assist with managing active areas when in use
Check-out/ Rental Coordinator	Tools checkout, Inventory, Tracking	Prioritize tools and resources in high need areas, Track checkouts and inventory, Tool maintenance	Tools checkout, Inventory, Submit requests for additional resources/tools, Maintenance
Facility Maintenance	Basic Facility Maintenance	Manage volunteers to assist with maintenance, Keep area clean & safe, Weatherproof when possible	Facility maintenance, Manage volunteers, Keep areas clean
Security	Basic site security, Identify upgrades needed for other operational modes	Secure entrance points, Ensure safety onsite, Utilize volunteers to secure heavily used areas with supplies	Secure entry points when in use, Ensure secure materials and supplies in off hours, Lock and secure site
Kitchen Manager	Kitchen assessment Meal planning	Meal preparation Meal distribution	Coordinate ongoing meal distribution at specific hours, Manage meal planning and kitchen team
CERT Leaders	Complete CERT training	Community first responders Outreach with less able-bodied residents Search and rescue	Assist community members in most need of immediate support, Assist with short-term recovery needs
Programming	Coordinate programming for daily activates	Coordinate programming for residents potentially using the site (children, elderly, special needs, etc.)	Continued programming support for residents, Possible return to daily programming

Staff Trainings

Proactively training members of the Resilience Hub team and providing open trainings for community members will help increase community adaptive capacity while also ensuring teams are ready for Hub activation. Ideally, most trainings will take place before disruption, but all three operational modes provide different opportunities for training.

Normal Mode (Pre-Disruption)

Most Resilience Hubs will function in normal mode the majority of the time, which means there are several opportunities to provide training to community members, community partners, and Hub teams. Trainings should be specifically designed for (or adapted) for the community. The cookie-cutter approach should be avoided as often as possible. There are many organizations, networks, and partners that provide trainings applicable to Hubs. Resilience Hubs offer the perfect location to host many of these trainings and to ensure materials from the trainings are available in one place. Potential trainings include:

Normal Mode (Pre-Disruption Trainings)

Training Type	Resources for Training	Brief Description
Individual & Family Preparedness	Ready.gov has a range of materials, trainings and resources. Use USDN website to find additional resources from USDN members.	Federal resources are available but should be altered to reflect community context and culture
Introduction to Climate Change & Disruptions	USDN, Local Institutional Partners, NOAA, MetEd	How a changing climate can also lead to changes in extreme weather events on the local scale.
Justice & Equity in Emergency Management	NAACP, Movement Strategy Center, GARE	NAACP 190-page manual prepares frontline communities to be first responders in disasters as well as to serve as monitors for equity in disaster response, and to advance an equitable disaster policy platform.
USDN Resilience Hub Workshop/Training	Urban Sustainability Directors Network (USDN)	Assistance for communities interested in setting up Resilience Hubs in their community
Community Emergency Response Team Training	CERT Training (www.ready.gov)	Educates volunteers about disaster preparedness for the hazards that may impact their area and trains them in basic disaster response skills
Coordinating volunteers post-disruption/ disaster	VOAD, CDC, FEMA	An association of organizations that mitigate and alleviate the impact of disasters, provides a forum promoting cooperation, communication, coordination and collaboration

Disruption Mode

Disruption is not the best time or opportunity to provide trainings for Hub staff, however Hubs will need to provide small “bite-sized” trainings to community members and volunteers who arrive on-site and offer to help. Often these trainings are best coordinated by one staff member, and small training videos can assist in providing background information, safety considerations, and next steps quickly and easily. Potential trainings include:

Disruption Mode (Trainings to Host on-site)

Training Type	Resources for Training	Brief Description
Volunteering in Emergencies	VOAD	
First Aid/CPR	American Heart Association	Topics include CPR and AED, Basic or Advanced Cardiovascular Life Support, Stroke training, and more.
Rapid Needs Assessment	CDC Disaster Preparedness & Response Training Course	Three modules focused on disaster-related rapid needs assessments and surveillance necessary to support responses to disasters.
Natural Disaster Awareness for Community Leaders	UH-NDPTC	Enhance understanding of natural disasters, risk assessment in the context of disaster management and the different vulnerability factors
Continuity of Operations Training	FEMA	The legal basis for continuity planning, the Continuity Program Management Cycle, and essential elements of a viable continuity program.

Recovery Mode (Post-Disruption)

After a disruption, community members may need to access to a range of resources and assistance which require filling out complicated forms to apply for disaster aid and/or find temporary housing. Many of these processes are difficult to navigate without someone who understands the specific system or recovery program. Resilience Hubs can serve as a central point for community members and local businesses to connect with experts, access resources, and undergo their own “training”.

Because disasters and recovery can be very traumatic, Hubs can play an important role working with organizations to facilitate long-term, culturally competent assistance and support that can help meet the mental and physical health needs of individual and families.

FEASIBILITY ANAYSIS OF RESILIENT SOLUTIONS

Feasibility Analysis help determine which resilience upgrades to make. The analyses use models to evaluate the relative value of investments. Too often these are lumped in a "cost-benefit" analysis which overgeneralizes the result. More than a yes or no analysis, a proper feasibility analysis will select the optimal mix of resilience features given each site's goals and assumptions. While the caliber of the model is important, so too is the quality of the data being fed and the experience of the person running the model. The process will likely involve several iterations of increasing precision. In early iterations, the team will take the goals, solutions, and specifications and conduct a preliminary analysis to assess general feasibility and basic solution configuration. Armed with that information, the team will collect more specific data and input more refined assumptions to generate not only a more precise solution, but also a conceptual design that will be used to solicit proposals from vendors.

Lifecycle Cost – The ideal measure of any investment in resilience is to assess the total lifecycle cost of the solution that includes capital costs, operating costs and revenue from incentives and rebates.

Feasibility analyses are often iterative processes that start with general assumptions and data before becoming more precise.

- **Pre-Feasibility Analysis** – Based on a desktop analysis from data provided, the initial feasibility analysis takes the sites prioritized at the portfolio level and the goals, assumptions and constraints, to evaluate the best mix of resilience investments.
- **Feasibility Analysis** – This refines the pre-feasibility analysis and produces a conceptual design and design specification that should be the springboard to request proposals from providers. A proper analysis will require input from experienced professionals (typically an engineer or general contractor) with specific, direct experience in the Resilience Solutions in consideration.

Model Inputs - The success of the model hangs on the data inputs and assumptions.

- **Goals** – These include the specific outcomes a particular resilience solution should be designed to achieve in four areas: Operations, Financial, Sustainability and Community. While the mix of quantitative and qualitative goals creates challenges, it represents that real-world tradeoffs we make when investing in resilience.
- **Constraints** – These include limitations set on the project, usually measured in terms of budget, time, space, people and resources. For example, while a battery solution may be financially feasible, the facility may lack the physical space to locate one.
- **Design Philosophy** – Different people bring different design philosophies or approaches to any project. Some qualitative decisions may override some quantitative decisions. A Resilience Hub may insist, for example, on including battery storage in whichever resilient power solution it selects, even if doing so is not the least-cost solution.
- **Forecasts** – In projects that involve new construction or significant renovations, additional work must be done to properly model how the building will be used and what it will consume in electricity and other resources. The project's engineering team can often provide this data, but some may need to be further modeled by specialists.

Assumptions – To analyze long-term investments in these improvements, the team makes assumptions about certain conditions (inflation, escalating costs of utilities, etc.). As tedious as these may seem, they have a significant impact on the results of the analysis over time.

Capital Cost – These are the upfront costs for the equipment and their installation or replacements later on. In early rounds of the feasibility analysis, the team will use generalized assumptions (typical costs per square foot for similar building types). Some online tools provide these. Be aware that capital costs are highly specific to local conditions. Generalized assumptions can be misleading. In later rounds of the analysis, more precise estimates must be included and will typically require the input of local specialists. The finance specialists on your team will be important to help determine the treatment of capital expenses for your organization.

Operating Cost – These include the ongoing costs of operating and maintaining system (and will include purchase of lower-cost items for which your finance team will set a threshold). As with the capital costs, the analysis will typically rely on general assumptions for these costs that then must be refined to the specific location in subsequent rounds.

Baseline Costs – This is the cost, prior to adding the resilience solution, against which the model will evaluate your results. For electricity, this includes the annual cost of the utility bill prior to adding standby generators, solar PV, etc.

Project Lifetime – The expected operating life of the asset over which the analysis will be measured.

Discount/Hurdle Rate – The financial return that the asset owner (either the Resilience Hub, the property owner or the third-party financier) expects to earn above the money invested.

COLLECT INFORMATION AND DATA

Proper and thorough data collection is one of the most significant ingredients to an efficient process. Along with constructability challenges, missing or inaccurate data can be the greatest source of project delays. Project teams should conduct site visits with community partners to help collect information.

Desktop Analysis – Much of the initial data for a prospective site can be compiled online. Many local governments have databases with information about building performance and utility consumption. Likewise, utilities have data used for billing purposes that will be helpful. Unfortunately, some prospective sites may be too small to be included in these databases and the Resilience Hub teams should allocate time for manual data collection and input. Additionally, Lack of access to detailed energy data is often a significant barrier to battery design assessment.

Site Survey – To compile additional data regarding the site, conduct a site survey to and establish baseline conditions at the site. Gather information about any physical, legal, or policy conditions at the site that are relevant to the hub's goals. During the design phase, Resilience Hubs and their prospective vendors will visit sites on many occasions. Even cursory site audits will often identify issues that desktop analysis and other modeling will miss.

Audits – Site audits may be required to answer specific questions essential to the analysis. These may involve electrical design, structural conditions and other constructability issues. Some vendors can offer these audits (an HVAC vendor may perform an analysis of the current system), while others may require outside specialists (an electrical engineer to conduct a load study, for example).

Plans & Drawings – For existing facilities, a good set of construction drawings "As-Builts" will be important for the design process. Finding these can be difficult. Missing or out-of-date single line drawings are a common problem. The project may need to commission an engineer to produce some of the drawings necessary to design, engineer and submit for permits. Plans may be on file with the local building department and may be accessed through a public records process. Resilience Hub teams may want to invest in updating as-built drawings and digitizing copies for easy access and use.

Forecasts & Loggers – In projects that involve new construction or renovation, work must be done to properly model how the building will be used and what it will consume in electricity and other resources. Typically, engineers will provide forecasts, but it takes experienced program managers to ensure those are accurate. While there are many online tools that can be used to approximate these forecasts, an inexperienced eye will miss inconsistencies or generalities that will lead to mis-sized systems. Forecasts involving energy efficiency or resilient power are significantly improved when a data logger is used to track consumption patterns more accurately. Loggers are relatively inexpensive but should be installed by a licensed electrician.

Cost: Low-cost logging tools are available in the $300-$400 range, but analyses that include loggers may add $3,000 to $5,000 to the cost of a project (higher for larger or more complex systems).

Site Specific Hazard Risk Assessment – This Assessment analyzes a range of hazards particular to the Resilience Hub site and steps that should be taken to mitigate them. These can be self-performed but results should be field-verified either by an engineer or a risk-mitigation expert (an insurance underwriter, for example).

As an example, the muGrid Analytics Redcloud model analyzes the feasibility of Resilient Power solutions is designed to minimize Life Cycle Cost (LCC) of energy over analysis period. The model calculates and maximizes Net Present Value (current value of future cash flows) as difference between current case LCC and base case LCC. The Model determines optimal sizing and dispatching of energy assets that maximizes NPV. Other non-financial goals and constraints impact design solutions selected but are not explicitly assigned values in the model.

The analysis evaluated several solutions with different combinations of generation and storage assets:

- Base Case: Run the base case to determine a baseline life cycle cost for the site
- Select Sizing: Determine the optimal battery sizing and dispatching to pair with the designated solar size such that NPV was maximized
- Other Cases: Runs additional cases showing how larger battery sizes would both reduce the financial return, and also increase the resilience
- Resilience: Calculate the hours of resiliency that each of the solar + storage systems would provide
- Results: Reports the results of each.

A feasibility study will output at least three sets of results: financial feasibility (usually in the form of a forecasted financial performance over the life of the project), technical feasibility (a description of the proposed solution accompanied by a conceptual design) and performance against the Resilience Hub Team's goals.

Feasibility Analysis Process

As an example, the muGrid Analytics Redcloud model analyzes the feasibility of Resilient Power solutions is designed to minimize Life Cycle Cost (LCC) of energy over analysis period. The model calculates and maximizes Net Present Value (current value of future cash flows) as difference between current case LCC and base case LCC. The Model determines optimal sizing and dispatching of energy assets that maximizes NPV. Other non-financial goals and constraints impact design solutions selected but are not explicitly assigned values in the model. A free, first-pass analysis options is NREL's REopt Lite tool (https://reopt.nrel.gov/tool).

The analysis evaluated several solutions with different combinations of generation and storage assets:

1. Base Case: Run the base case to determine a baseline life cycle cost for the site
2. Select Sizing: Determine the optimal battery sizing and dispatching to pair with the designated solar size such that NPV was maximized
3. Other Cases: Runs additional cases showing how larger battery sizes would both reduce the financial return, and also increase the resilience
4. Resilience: Calculate the hours of resiliency that each of the solar + storage systems would provide
5. Results: Reports the results of each.

Feasibility Model Outputs

A feasibility study will output at least three sets of results: financial feasibility (usually in the form of a forecasted financial performance over the life of the project), technical feasibility (a description of the proposed solution accompanied by a conceptual design) and performance against the Resilience Hub Team's goals.

Financing Feasibility Assessments

Clean Energy Group (CEG) offers in-house and grant support for predevelopment technical and financial feasibility assessments for projects serving disadvantaged communities. This is done through the CEG Resilient Power Project (http://www.resilient-power.org).

CEG also has a capacity building grant program called the Resilient Power Leadership Initiative. That program provides funding to nonprofit CBOs to build internal capacity around solar and battery storage for resilience.

PHASE **FIVE**

DEVELOP SITE & INSTALL SOLUTIONS

Once a feasibility analysis is complete and the organization has moved forward with a decision to pursue the project, Resilience Hub planners will convert the preliminary design into a fully engineered system. Procurement processes will vary with each organization's policies, a detailed discussion of which is outside of the scope here. The process will begin with finding the right team to take your preliminary designs and convert them into a buildable, fully-engineered and permitted project. Finding the right expert team here is critical. Depending on your procurement practices, Resilience Hub planners may select a partner through a normal bidding process or may seek a sole source provider. One good way to get a sense of the options out there is to research projects similar in size, scale and mission to your own by using the USDN Resilience Hubs website.

PROJECT MANAGEMENT

While most of the technical considerations will be handled by professionals, the Resilience Team should have a strong project manager who will oversee execution of the key stages.

- **Project Plan** – The Project Plan maps how the resilience hub features will be financed, procured and installed. Plans can be rudimentary or extremely complex. We recommend a simple and consistent format with a basic set of planning tools (budgets, timelines, procurement strategies). The Resilience Hub Analysis Tool provides a simple model for the key phases and deliverables.

- **Procurement Strategy** – Depending on the solution, the Resilience Hub team may prefer a turnkey project (one in which a third-party is engaged to handle all aspects of design, engineering, installation and commissioning). For a turnkey project, a vendor will provide a complete solution that includes not only the materials and installation, but also the final design, engineering and permitting. Some vendors will offer finance as part of the package either directly through captive finance programs, or by helping the Resilience Hub team put together a package of sources that may include equity, debt and grants.

- **Design & Engineering** – Specialists should be engaged for the technical aspects of the Resilience Hub and will almost invariably require engineering expertise.

- **Finance** – Proper financial guidance on more expensive and complex elements is key to success. Whether considering a third-party power purchase agreement[6] for the solar solution or an energy service performance contract for a lighting upgrade, guidance on finance is important. Making decisions about entities that own the land, the building and the resilience assets will determine which sources of funding may be available. Tax incentives, for example, can only be used by entities with a tax liability, not churches or 501c3s. Some rebates and incentives are only available to non-profit organizations.

- **Legal** – Resilience Hub solutions typically involve building improvements that trigger legal considerations of ownership, liability and the like. Sound legal guidance, at all stages, is critical. In many cases, financing these projects may require a complex set of ownership entities, financial structures and vendor contracts. The PUSH Buffalo School 77 project, for example, included multiple sources, each with its own set of documents.

- **Installation & Commissioning** – After all the planning, process, permitting, design and engineering, the actual installation and commissioning can seem to go by in a blink. The quality of the workmanship, however, will linger a long time. Having the right project management team is critical.

PROJECT MANAGEMENT

Resilience Hub candidates typically include community or publicly owned facilities managed and operated by non-profit or government agencies. As such, the economic drivers will be different than a private, for profit commercial building. That said, many non-profit organizations have developed innovative finance tools to utilize savings and revenue streams from their facilities to benefit their "customers." For Example, the Homeowner's Rehab (Cambridge, MA), develops low-income housing and has an internal revolving loan fund to leverage savings from one facility to help offset costs of others. Another example is the 2LifeCommunities (Brighton, MA), which runs a portfolio of income-assisted senior living facilities and achieves significant benefit from the operating cost savings that improved energy efficiency has to offer.

Project Management

Phase	Stage	Tasks	Deliverables
Development	**Launch**	▪ Establish project goals ▪ Select project team ▪ Conduct research, audits & data collection ▪ Produce schedule, budgets, finance, construction & operations strategies	▪ Project Team Roster ▪ Project Goals & Constraints ▪ Project Plan & Timeline (Preliminary)
	Feasibility & Modelling	▪ Complete research ▪ Produce technical feasibility analysis ▪ Produce financial feasibility analysis	▪ Project Design (Final) ▪ Project Plan & Timeline (Final)
	Energy Efficiency & Demand Reduction	▪ Optimize retail energy procurement ▪ Identify & Install energy efficiency measures ▪ Identify & Install Demand Reduction measures	▪ Energy Supply Contracts ▪ Load Study ▪ Energy Audit ▪ Energy Efficiency Upgrades ▪ Demand Reduction Upgrades
	Finance & Contracting	▪ Produce finance, construction, procurement & logistics strategies, execute contracts	▪ Finance Package ▪ Executed Contracts
Milestone: Financial Close & Notice to Proceed (NTP)			
Construction	**Design & Engineering**	▪ Design & engineer generation, distribution, gas supply and all related civil and MEP	▪ Design & Engineering Package ▪ Permits & Licenses
	Construction & Commissioning	▪ Provide construction management, site preparation, full installation, construction, commissioning	▪ Installed System ▪ Utility Interconnection
Milestone: Commercial Operation Date (COD)			
Operations & Maintenance	**Operations & Maintenance**	▪ Fuel supply ▪ System monitoring ▪ Service & maintenance ▪ Capital improvements	▪ Annual Operating & Capital Budget ▪ Online reporting & performance tool
	Evaluation	▪ Performance review ▪ Production verification	▪ Annual Report
	Training	▪ Training & Drills	▪ Training & Certifications

GREEN INFRASTRUCTURE

A Resilience Hub site can be an opportunity to manage stormwater. Green infrastructure intercepts stormwater instead of allowing it to run off-site, where it can overwhelm sewer systems or cause surface flooding. Green infrastructure retrofits can infiltrate stormwater into the ground, evaporate it into the air, or release it slowly after a storm event.

In addition to managing stormwater, green infrastructure can also provide community benefits including reduced air temperature, increased energy efficiency, cleaner water supplies, and improved recreational facilities.

Types of green infrastructure that a Hub could install include:

- **Bioretention**: Shallow, vegetated depressions used to promote absorption and infiltration of stormwater runoff. Stormwater flows into the bioretention area, ponds on the surface, infiltrates into the soil bed, and is used by the plants and trees.
- **Planter Box**: A vegetated, contained system used to retain stormwater runoff. Stormwater flows into the Planter Box, ponds on the surface, is retained by the soil bed, and is used by the plants and trees.
- **Swale/Bioswale**: An open channel, vegetated with a combination of grasses and other herbaceous plants, shrubs, and trees.
- **Tree Trench**: A system that provides opportunity for stormwater management within the same surface footprint as previously landscaped areas.
- **Porous Pavement**: A surface that provides similar load bearing support to that of conventional pavement but allows stormwater to drain directly through the surface.
- **Green Roof**: A green roof system is composed of multiple layers, including waterproofing, a drainage layer, engineered planting media, and specially selected plants.
- **Subsurface Infiltration**: Systems that are typically stone filled trenches beneath landscaped or paved areas.
- **Cistern**: A storage device designed to intercept and store runoff from rooftops typically used for water reuse purposes.
- **Dry Extended Detention**: Basins whose outlets have been designed to detain stormwater runoff for a minimum amount of time.

Hubs teams interested in incorporating green infrastructure into their site will find useful guidance in the Planning and Process and Design Guidance and Details sections of the Stormwater Retrofit Guidance Manual created by the Philadelphia Water Department. This is just one example of a manual that has worked well for east coast cities. It is important to consider different watershed criteria and soil types when working on green infrastructure. The Green Infrastructure Leadership Exchange is building a practical playbook for implementing green stormwater infrastructure that any city can adopt. Visit https://giexchange.org/ for more information.

ENERGY EFFICIENCY UPGRADES

Ensuring a building is operating as efficiently as possible helps to right-size, and may potentially allow for down-sizing, of energy generation and storage systems.

Most buildings will benefit from building envelope improvements such as insulation, air sealing, and windows; upgrades to more efficient lighting including lighting sensors; and programmable thermostats and heating and cooling scheduling. If budget allows, a professional energy auditor can identify and recommend specific opportunities for a building.

Select an energy auditor. A professional commercial building energy auditor can review all building systems and identify opportunities to improve efficiency in both building operations and capital upgrades. Seeking expertise from a profession with building science expertise can help ensure a review of all building systems with an understanding of the interactions between them. For example, if investing in building envelope improvements (insulation, windows, and air sealing), it may be possible to downsize when replacing a heating or cooling system, which in turn may allow for downsizing energy generating and storage requirements. When scoping the energy audit, ensure the auditor understands your goals or plans for on-site generation and storage.

Identify pathways for energy savings and establish energy savings goals. Goals may focus on load reduction, return on investment, passive survivability, and/or other values. An energy auditor can orient their assessment and recommendations to those goals, and may uncover energy savings opportunities through multiple pathways, including:

- **Operational Changes:** Retro-commissioning or tuning-up building operations can reduce energy consumption by 10-30%. Changes to building operations may include adjustments to lighting sensors, schedules and temperature settings for HVAC equipment, and identifying equipment maintenance issues. Energy savings that result from building retro-commissioning or tune-ups are often no- or low-cost actions. However, because these improvements can be gained through operational choices, the energy savings can decrease over time if operations are not regularly reviewed and tuned.
- **Capital Projects:** A comprehensive energy audit can identify opportunities for increasing energy efficiency throughout a building, and highlight relationships between various building systems, and provide cost and savings estimates for conducting the improvements. There are a variety of national energy audit standards that can guide decisions about what type of audit meets the project needs. Capital improvements can include easy projects with a short cost-recovery period, such as many lighting replacement projects or air-sealing a drafty building, as well as larger projects such as equipment replacements or window replacements. A helpful energy audit tool can be found here.
- **Implement Recommendations and Verify Installation.** Energy efficiency solutions can be completed by qualified contractor. Quality assurance testing may be available from the contractor or a third-party energy auditor.

Common existing building retrofit components include the following (summarized from Rocky Mountain Institute's Retrofit Depot):

1. Building envelope improvements: insulation, windows, and air tightness sealing
2. Lighting improvements: fixture upgrades, lighting controls, and lighting redesign
3. Heating, ventilation, and air conditioning improvements: equipment replacements and system control upgrades or retro-commissioning
4. Water heating: temperature settings or equipment replacement
5. Plug load management: efficient equipment purchases and controls (e.g. automatic shut-offs)
6. Passive design or redesign elements: daylighting and natural ventilation opportunities

ORDERING SUPPLIES

PHASE SIX

ACTIVATE SITE AND OPERATIONS

Resilience Hub managers should have clear plans in place for activating the hub in the event of a disruption, and ongoing operation of the hub in all modes.

ACTIVATION IN THE EVENT OF DISRUPTION

Disruptions come in many different levels of intensity. Some disruptions such as a hurricane or big winter storm tend to provide Resilience Hub Operations Team members with ample warning, allowing the team to conduct proactive outreach, prep the site for use, and ensure that plans and capacity are in place to handle the disruption. Other disruptions can occur suddenly and unexpectedly. It is important that Resilience Hubs be managed and maintained to always be ready for full activation in the event of a disruption.

Resilience Hubs should be equipped with an operating guide describing how to manage the hub in all operating modes, and hub managers and key community partners should be trained on how to operate the hub, especially in the event of a disruption. Hubs should contain a series of checklists to support community members in playing key roles in operation of the hub, communicating with the Emergency Operations Center and first responders, and in documenting damages and assessing needs. Additionally, it is important to consider backup staff training before a disruption in the case that a critical member of the team is unavailable.

Roles and responsibilities should be clearly assigned for all involved in managing the site and providing services to the community. For example, colored lanyards can be an effective method to help identify role responsibilities. Guidance can be posted at various positions at the site corresponding to lanyard colors to simplify communication.

COMMUNICATING WITH COMMUNITY MEMBERS

Resilience Hubs provide a home base for residents, businesses, and organizations to gather for workshops, events, and training opportunities that benefit a range of community needs, including resilience. Site leaders, community members, local organizations, and community leaders can use the Hub to increase the effectiveness of their communications in all three operational modes - normal, disruption and recovery.

Normal Mode

The Hub can deliver preparedness messaging to the communities the Hub serves. Site leaders can work with trusted community leaders to disseminate information and facilitate stronger community ties before a disruption. Possible actions include:

- Host workshops and trainings for Community Emergency Response Team (CERT), VOAD, and community volunteers.
- Conduct individual and community preparedness workshops to help community members make plans and kits.
- Host community workshops to map assets and needs.
- Identify local, state, and regional agencies who work in disaster response and recovery. Proactively set up workshops, information sessions, and feedback sessions to build relationships and to ensure responders understand community needs and characteristics.
- Work with community members to identify existing and trusted channels for communication and establish protocols for communicating with one another during disruption and recovery.
- Assign disruption and recovery roles and responsibilities for community members and partners.
- Consider establishing a ‘buddy system’ that pairs able-bodied residents with those requiring additional assistance (i.e.- elderly, disabled) or who live alone.
- Consider development of a Neighborhood Ambassador Program or Block Champion Program.
- Conduct table top exercises and practice site activation at least twice a year.
- Develop a basic list of contacts for media and press, introduce the Resilience Hub, and provide regular updates.
- Establish the Resilience Hub as a family meeting location or reconnection location.

Disruption Mode

A community’s Resilience Hub can be the central point for gathering, assessing impact, sharing stories, assembling information, accessing resources, and spearheading response. Ideally, residents, businesses, and organizations will collectively manage the Hub including both internal and external communications. Internal (site) communications will be detailed in the Physical Site section below. For external communications Hub teams can consider the following strategies:

- Alert residents that the Resilience Hub is operational and the times it will remain open via Text message/text alerts
  - Apps or websites (NextDoor)
  - Email distribution list
  - Community discussion board
  - Door-to-door
  - Alert systems (sirens)
- Alert residents as to which services are currently available (using methods above)
  - For example, will the Hub allow pets onsite? Will local health codes allow pets to be onsite if food preparation is taking place? This is important information for community members to know before coming to the Hub.

- Use CERT leaders and volunteers to conduct area sweeps
  - The Community Emergency Response Team (CERT) program is one of five Citizen Corps programs established by the Department of Homeland Security. Local governments sponsor CERT teams to educate volunteers about local hazards, preparedness efforts and ways to provide basic disaster response including fire safety, light search and rescue, team organization, and disaster medical operations. Often CERT training is provided to communities for free by local or state emergency management offices.

- Connect with local media
  - Developing and maintaining a good relationship with local media (print, radio, TV, online) is valuable to the Hub in all conditions. During a disruption event, journalists will typically be eager for contact with people whom they know and trust to provide accurate and timely information. Ideally, Resilience Hubs will have a communications and/or media relations lead but even without that position, and at least two people should be familiar with the media and briefed on the message.
  - During disruption events, Hubs should have a single, consistent message, that avoids speculation and is delivered by the appointed media relations lead or organization principal. Inconsistent messaging can create confusion during an event.

- Assist residents who may be unable to access the Resilience Hub
  - A simple way to communicate with people in their homes who may not have access to media or phone is to use Help/Safe signs. Residents can place a sign in their window to indicate if they are 'Safe' or place the 'Help' sign in the window to indicate to other community members or first responders that they are in need of assistance. Help/Safe signs have been used in communities in Seattle and in Baltimore.
  - Resilience Hub teams can utilize volunteers or Hub members to go door-to-door to check-in on residents. This is only recommended if door knockers can work in pairs and at no additional risk to their personal safely.

- Connect with Emergency Support Functions (ESF). Both government and non-governmental organizations have ESF roles and abilities. A list of ESF resources can be found in Appendix A.
  - ESF teams can assist residents with preliminary damage assessments

Recovery Mode

Resilience Hubs can play a critical role in post-disruption recovery and ongoing communications needs. For resilient communications, the site can remain a central point for gathering, sharing information, and accessing resources. Hubs can also provide space for additional experts, aid organizations, volunteers, and support networks to gather and better understand and help meet community needs. Hubs teams can consider the following communications strategies:

Short-term immediate post-disruption needs:
- Outreach to community members with updated Hub hours, resources, and opportunities
- Volunteer coordination and support
- Conduct outreach to experts in insurance, banking, federal assistance program, workers protection, etc. for assistance
- Discussion Board and Site to post lost and found items
- Location to gather community needs and input for faster pairing and support
- Coordinate communication of available disaster assistance for individuals and families.

Long-term Use the Hub as a central point to design and implement a strategy to address root causes of vulnerability and help the community thrive.

PLAN IN MOTION

RESILIENCE HUB ENERGY EXAMPLES

Understood within their context as operating in normal, outage and recovery conditions, the business case for a Resilience Hub is a matter of the most efficient way to achieve the facility's goals in all three conditions. The following two cases are hypothetical and the facilities are based on amalgamations of facilities that may be tasked as Resilience Hubs. Project economics are highly dependent on state-specific policies and incentives as well as local costs and conditions.

For these examples, we have used several common assumptions which include:

Analysis Period: 25 years
Discount Rate/Rate of return: 6% (real)
Utility Rate Escalation: 3%

EXAMPLE SCENARIO 1 - COMMUNITY CENTER

Background: The City identified Resilience Hubs as one of the resilience strategies it seeks to pursue under its new Resilient City initiative. The Resilient Hub Program Team selected four Target Areas including an established community near the river. The team identified six viable sites and prioritized a community-run recreation center with plenty of space. They engaged the community organization running the facility in a discussion about the Resilience Hub program and provided background data on the various hazards facing the community (most predominantly flooding, rain and snow events and the potential of a terrorist attack to cause outages). The community decided to explore the opportunity further and, working with the city, commissioned a feasibility analysis of upgrading the 15-year old, reinforced masonry building. The building is well-used seven days a week and includes a gym, several community rooms, bathrooms with showers, a kitchen with commercial-grade natural gas stove and commercial grade cold storage. The facility hosts programs for toddlers to seniors run by a small staff of seven (one executive director, four staff members, and a two-person maintenance crew).

Goals: The Resilience Hub Site adopted a consistent set of goals for the facility under normal, outage and recovery conditions.

Critical Load: 100% of normal load
Outage Duration: 72 hours

Project Management

Service	Priority	Normal	Outage	Recovery
Food Preparation & Storage	High	~25 seniors, 2 meals daily	Feed 100+ families 3x per day	Feed 100+ families 3x per day
Water & Ice	High	Staff & facility uses	~100+ families per day	~100+ families per day
Cooling/Heating Relief	High	Staff & facility uses	~25 seniors per day	~100+ families per day
Child Care	Medium	~20 kids per day	None	Activities for up to 200 children
Restrooms & Showers	Low	Staff & facility uses	Limited	~100+ families per day
Briefings & Meeting Space	High	Staff & facility uses	Staff & Responders	

Solutions & Costs

Option 1: Resilience Hub self-finances Resilience Upgrades and has ability to monetize rebates and other incentives. (Note: Finance issues are properly addressed independently of capital and operating expense, but they are combined here for illustration purposes).

Option 2: Third-Party owns and operates the Hybrid Resilient Power system. Resilience Hub has no expenses and enjoys some reduction in utility cost.

		Capital Expense	Operating Expense	Constraints
Resilient Power	Hybrid Resilient Power Solution	Option 1: $131,173 Option 2: $0	Option 1: $912 (Y1) Option 2: $0	▪ Roof feasibility confirmed ▪ Appropriate space in mechanical room
Resilient Communications	Upgraded WiFi	New WAP $600	$0	Included in IT Service Contract
	Upgraded IT infrastructure	Misc. Upgrades $3,500	Service Fee $1,200	Legacy equipment limited upgrade capacity
Operations	Staff Training	$0	CPR/AED + BLS $2,500	
Total Y1 Investment – Option 1		**$135,273**	**$4,612**	
Total Y1 Investment – Option 2		**$4,100**	**$912**	

Feasibility Analysis Results for Option 1

	Hybrid Resilient Power Solution
Total Solar PV (kWp)	105
Battery sizing (kW/kWh)	60/120
Generator sizing (kW)	80
Resilience Hours (avg.)	72
Ann. Solar Production (kWh)	12,800
Solar Penetration (% of annual load offset)	21.3%
Est. Capital Cost (ROM)	$117,760
Upfront Capital Cost (after incentive)	$64,000
Lifecycle NPV@6%	$98,106
Lifecycle IRR	17.1%
Simple Payback (years)	<4
Annual Demand Savings (Expected)	$876
Avoided Energy Charge	$4,679
Total Utility Bill Savings (Year 1)	$5,555

Operational Goals: While both the solar and Resilient Power solutions evaluated met operational goals in all conditions, the storage option contributes some additional resilience.

Financial Goals: The City's aggressive Renewable Portfolio Standard and SREC valuation, as well as and the federal tax incentives make both Resilient Power options feasible. The savings on the utility costs will help to offset increases in operating costs for other measures like the IT services contract.

Sustainability Goals: The Resilient Power system achieves et Zero for the facility across the period of a year. The battery contributes to reducing the facility's demand from the grid at the times of its peak usage.

Social Goals: The system meets not only the goals of serving the community during and after an outage, but also provides an opportunity to be used as a demonstration to community members who want to develop solar and storage installation skills through one of the many available training programs that can be hosted at the facility.

Possible Decision: With the information above this team could chose to pursue a third-party financed Resilient Power Solution and invest in the Resilient Communications upgrades both to improve day-to-day operations but also to ensure a higher level of service during Outage and Recovery.

EXAMPLE SCENARIO 2 - SENIOR HOUSING

Background: The facility is a multi-story, multi-family housing project in currently being gutted for a complete retrofit. The facility is a non-profit organization dedicated to providing low-income housing. Appreciating the challenges that their largely older and not mobile community faces, they seek to create a Resilience Hub. Committed to achieving or surpassing the City's carbon-reduction goals, the building owners included a wide range of energy efficiency and demand response measures. With a vulnerable and not particularly mobile community of seniors, the developer wants to enhance the facility's resilience during outages. While serving a critical load at 100% is not feasible for the multi-story facility with individually metered tenant units, the building owner sought instead to adopt a shelter-in place strategy of using the common areas. Moreover, the building owners liked the idea of using the facility as a resource for the neighboring community. The facility includes the required life-safety rated natural gas generator.

Goals: The Resilience Hub Site adopted a consistent set of goals for the facility under normal, outage and recovery conditions.

Critical Load: 15% of normal load
Outage Duration: 72 hours

Services & Requirements

Service	Priority	Normal	Outage	Recovery
Food Preparation & Storage	High	~100+ seniors, 2 meals daily	~100+ seniors, 2 meals daily	~100+ seniors, 2 meals daily
Water & Ice	High	~100+ seniors, Staff & facility uses	~100+ seniors, Staff & facility uses, neighbors	~100+ seniors, Staff & facility uses, neighbors
Cooling/Heating Relief	High	~100+ seniors, Staff & facility uses	~100+ seniors, Staff & facility uses, neighbors	~100+ seniors, Staff & facility uses, neighbors
Child Care	Low	None	None	None
Restrooms & Showers	Medium	~100+ seniors, Staff & facility uses	~100+ seniors, Staff & facility uses, neighbors	~100+ seniors, Staff & facility uses, neighbors
Briefings & Meeting Space	Medium	~100+ seniors, Staff & facility uses	Staff & Responders, ~100+ seniors, staff & facility uses, neighbors	Staff & Responders, ~100+ seniors, staff & facility uses, neighbors

Solutions & Costs

Option 1: Resilience Hub self-finances resilience upgrades and has ability to monetize rebates and other incentives. Given the non-profit status, the facility would not be eligible for certain tax incentives that would increase capital costs to ~$400,000. However, the state incentives are available

Option 2: Third-Party owns and operates the Hybrid Resilient Power system. Resilience Hub has no expenses and enjoys some reduction in utility cost. The facility will not likely see as significant a reduction in utility costs, but will not have the associated finance costs and capital outlays.

		Capital Expense	Operating Expense	Constraints
Resilient Power	Hybrid Resilient Power Solution	Option 1: $61,406 (after rebates & incentives) Option 2: $0	Option 1: $2,500 Option 2: $0	▪ Limited Space ▪ Payback<10 years
Resilient Communications	Expanded WiFi	2 x WAP $1,200		As a new facility, most systems are already upgraded and an IT service contract is already in the Operating Budget
Security	Additional cameras & security enhancements	$1,500		Additional hardware falls under existing service & monitoring contract
Operations	Staff Training	$0	$2,500	
Total Y1 Investment – Option 1		**$64,106**	**$5,000**	
Total Y1 Investment – Option 2		**$2,700**	**$2,500**	

Feasibility Analysis Results

	Hybrid Resilient Power (Option 1)	Hybrid Resilient Power (Option 1)
Total Solar PV (kWp)	105	105
Battery sizing (kW/kWh)	60/120	60/120
Generator sizing (kW)	80	80
Resilience Hours (avg.)	72	72
Ann. Solar Production (kWh)	120,800	120,800
Solar Penetration (% of annual load offset)	21.3%	21.3%
Est. Capital Cost (ROM)	$402,196	$0
Upfront Capital Cost (after incentive)	$61,406	$0
Lifecycle NPV@6%	$100,059	Varies depending on utility discount from Third-Party owner
Lifecycle IRR	10.6%	
Simple Payback (years)	7.4	Immediate
Total Utility Bill Savings (Year 1)	$17,221	Varies depending on utility discount from Third-Party owner

Operational Goals

While both the solar and Resilient Power solutions meet operational goals in all conditions, the storage option can contribute some additional resilience as well. This facility is challenged to push Critical Load above 15% without a significant addition in generation. The resilience strategy calls for sheltering in place in the common areas. Additional resilience, however, can power valuable community resources like ice & water and enhanced communications.

Financial Goals

The recently launched state incentive program adds value to a Resilient Power solution for a facility such as this by rewarding how and where solutions are located and for the population being served. The savings on the utility costs will help to offset increases in operating costs for other measures like the IT services contract.

Sustainability Goals

The Resilient Power system achieves significant carbon reductions for the facility. However, as is typical with many multi-story buildings, available roofs pace is not sufficient to produce enough electricity to offset all of the load. The additional efficiencies gained through sustainable building practices, however, significantly reduce net emissions. The battery contributes to reducing the facility's demand from the grid at the times of its peak usage.

Social Goals

The Resilience Upgrades allow this facility not only to serve a vulnerable population, but also to support the surrounding community during Outage and Recovery conditions.

Possible Decision

With the information above this team could chose to pursue a third-party financed Hybrid Resilient Power Solution and invest in the other Resilient upgrades. A self-financed solution can offer favorable return, but the payback period is outside of the organization's target.

APPENDIX A

ADDITIONAL RESOURCES

Assessment Data Resources
EPA EJSCREEN
Climate Central's Surging Seas Risk Finder
CREAT Climate Scenarios Projection Map
FHWA Climate Change Adaptation Tools

Community-Driven Resilience Resources
USDN Resilience Hubs White Paper
USDN Guide to Equitable Community-Driven Climate Preparedness Planning
NACRP Community-Driven Climate Resilience Planning: A Framework
In the Eye of the Storm: A People's Guide to Transforming Crisis & Advancing Equity in the Disaster Continuum
Rooted in Resilience Community Resilience Toolkit 2.0
Climate Adaptation and Resiliency Enhancement Program
Energy Democracy in Boston
Social Emergency Response Center

Emergency Preparedness Resources
Community Preparedness Toolkit
Red Cross How to Prepare for Emergencies
FEMA Community Emergency Response Team
FEMA Emergency Support Function Annexes Introduction
FEMA Emergency Support Function Annexes
Make a Plan: People with Disabilities

Finance & Budgeting Resources
National Working Waterfront Network Finance Tools Database
Social Venture Fund
Money for Resilient Infrastructure: How to Finance America's Climate Changed Future

Resilience Planning Resources
U.S. Climate Resilience Toolkit
NIST Community Resilience Planning Guide for Buildings & Infrastructure Systems
Adaptation Clearinghouse Powered by the Georgetown Climate Center
A Practical Guide to Building Climate Resilience

Other Resources
How to Prepare for Emergencies
Community Emergency Response Team
Protect Your House of Worship
www.ready.gov/publications
FEMA Community Planning and Capacity Building
FEMA National Disaster Recovery Framework
Community Preparedness Toolkit
Make a Plan: People with Disabilities
Resilient Power Toolkit

APPENDIX B

FUNDING SOURCES

Listed below are some of the currently advertised sources of funding to support Community Resilience and the components of a Resilience Hub. This only scratches the surface of what is available. As a place to start, consult www.dsireusa.org for sources of power and energy solutions and the Adaptation Clearinghouse Powered by the Georgetown Climate Center.

APPENDIX C

GLOSSARY

To Be Added

APPENDIX D

LIST OF POTENTIAL PROJECT TEAM PARTNERS

Project Team

Developing a Resilience Hub requires a core group of committed people. The Resilience Hub Planning Team should include community members, community-based organizations, residents, and experts in the areas where a Resilience Hub supports municipal and community functions before, during, and after a hazard event. Each Resilience Hub team will include many stakeholders and require various skills and capacities to meet their goals. Prioritize recruiting partners to fill roles from the service area, or recruit stakeholders from beyond the resilience hub service area in partnership with host community. Brainstorm potential members below:

Role	Responsibilities	Skill Set	Potential Source	Name(s)
Team Lead	Charter Project, Manage Team, Manage Deliverables	Project Management	Local Government Staff or NGO or CBO Staff	
Program Manager	Develop Specifications, Produce RFPs, Design & Engineer Solutions, Manage Procurement, Manage Installation	Design & Engineering, Project Management, operations	In-house Staff or Consultant	
Community Based Organizations	Bring Local Knowledge, Facilitate Community Input/ Engagement	Relationship Building, Facilitation, Communications	Local Neighborhood	
Neighborhood Leaders	Ensure Community Needs are Valued and Understood. Local Perspectives, Experience and Knowledge	Neighborhood Knowledge, Relationships, Support	Neighborhood	
Finance	Identify Opportunities and Seek Funding, Coordinate with Site Leads & Other Stakeholders	Financial Analysis Accounting Project Finance	CFO (staff, board or both	
Programming	Coordinate Year-Round Community Benefits with Site Leaders and Community, Emergency Operations Processes	Emergency Mgmt., Health, & Planning, Sustainability	Local Government Staff	
Equity	Coach and Support Project Team. Ensure Community Needs are Prioritized. Assist with additional community research.	Race, Equity and Inclusion Expertise	DEI Consultant	
Local Business Representatives	Identify Business Community Needs, Ensure Local Business Input is valued	Business Case for Resilience	Chamber of Commerce, Neighborhood	

Site Team

Resilience Hubs require a unique set of stakeholders and implementation partners. Due to the type of enhancements and upgrades Hubs undergo, the project team will need to include partners from several sectors and specialty groups. These team members should be determined based on the specific needs of the community and with community input. The larger project team may include several of the roles in the table below, which you can use to brainstorm members.

Role	Responsibilities	Skill Set	Potential Source	Name(s)
Resilient Hub Operator	Operate the facility in disruption and recovery	Minimize operating costs Coordinate operationalization of Hub	CBO, NGO or Community	
Property Owner	Hosts the Resilience Hub and its assets	Satisfied tenant Enhancement of property value Healthy neighborhood	Identified by CBO and Community	
Neighborhood	Use the Resilience Hub Services Support Resilience Hub development	Participate in needs inventory Receive community services (child care, senior care, etc.) Receive support during disruption Receive support during recovery	Neighborhood	
Local and State Government	Provide resources (logistical, administrative and other) Potential Funding Support	Maximize impact of over-allocated resources during an event Expedite and effect a rapid recovery Support proactive capacity building	Local Agencies State Agencies	
First Responders	Provide support during hazard events	Provide services effectively and efficiently during and after disruption Build trust and relationships year-round with community	Local OEM Local Fire Local Police	
Federal Agencies & Relief Organizations	Provide support and resources to communities during events	Efficient access to community members Provide resources based on community-identified needs	FEMA National Guard	
Resilient Power Consultant	Provide renewable energy options and support Provided energy conservation measure (ECM) options & support Provide financing support	Produce techno-economic feasibility analyses for energy solutions Provide energy audits Identify financing alternatives	Microgrid or Resilient Power Consultant, Solar + Storage vendors, Energy Services Company (ESCO)	
Consulting Engineer	Develop Deliverables Collect Data Conduct Analyses Manage Subcontractors	Design, engineering, construction	Engineering Firm	
Facilities Operations	System Operations System Maintenance Site Operations	MEP Operations Familiarity with Site	Community Members, CBO Staff	
Construction	Design, Engineer, Procure & Construct Project Manage Subcontractors, Procure Permits & Licenses	Engineering Construction	EPC Firm	
Hospitals & Health Care	Provide resources & basic medical Provide emergency and community health care	Reduce stress on facilities during hazard events from community members seeking lower-impact health care needs Consider “adopt-a-hub” and support communities by assigning medical professionals to certain sites	Local Hospital, Health Care Networks	
Electric Utility	Provide technical support Facilitate permitting and interconnection.	Expand the toolbox of resilience assets during events. Seamlessly integrate distributed generation and other new technologies	Utility	
Stormwater Utility	Provide technical support	Make sure the site will not be subject to flooding or has minimal impacts from flooding	Local stormwater association	
Soil/Local Food Expert	Provide local food growing options/ support	Assess soil conditions Support local food generation onsite Organize access and distribution	Local NGO Local CBO Institution	
Lawyer or Legal Team	Manage contracts Guidance on deal structure	Determine optimal legal structure for Resilience Hub Review all contracts and documents Review risk management strategies	Community Law Center	
Insurance Representative	Provide Risk Management Tools	Assist with insurance considerations related to Hub uses	State Insurance Rep	
Accountant/ CFO	Finance guidance Tax guidance Financial management	Advise on accounting treatment of various solutions Evaluate tax implications of various strategies Optimize capital structure of finance	NGO CBO	

APPENDIX E

RESILIENT SOLUTIONS OPTIONS

A Resilience Hub must be resilient itself and provide services before, during, and after an event. Consider solutions in four key areas: structure & site, power, communications, and operations. As the team considers these options, evaluate the relative importance of each measure, the current status of onsite solutions, order of magnitude cost estimates, and foreseeable constraints that may present challenges.

Resilient Structure & Site	**Measures to strengthen the resilience of the facility itself to ensure that it meets operational goals in all conditions.**				
Floodproofing	**Current**	**Priority**	**Capital Cost**	**Operating Cost**	**Notes**
Wet Floodproofing					Solutions include engineered flood vents, water-resistant building materials, and elevating equipment.
Dry Floodproofing					Solutions include flood gates, backflow preventers on drains, sealing openings in walls and foundations, sump pumps and waterproof enclosures.
Site Perimeter Floodproofing					Sand bags, water-inflated tube systems and flood panels.
Elevated Equipment					Relocate mission-critical mechanical and electrical equipment (elevator controls, HVAC, generators, fuel tanks) to the roof or other areas above the flood level.
Water Storage	**Current**	**Priority**	**Capital Cost**	**Operating Cost**	**Notes**
Water Storage (Potable)					Solutions range from spare tanks (usually on larger, taller facilities) to spare jugs or cases. Improved efficiency will help stretch water supply, while rainwater storage helps with non-potable uses. resilient power solution should consider supply to water pumps (if used) as part of the critical load panel.
Water Storage (non-potable)					
Sanitation	**Current**	**Priority**	**Capital Cost**	**Operating Cost**	**Notes**
Backlow Valves					
Sump Pumps					
Windproofing					

Fuel Supply	**Current**	**Priority**	**Capital Cost**	**Operating Cost**	**Notes**
Vuel Supply (heating oil)					Ensuring an adequate supply of fuel can be a significant challenge and will depend entirely on the facility. A facility that uses natural gas will be reliant on the pipeline. Onsite storage is typically not feasible. Propane (a different and not interchangeable fuel as natural gas) can be stored in tanks but requires re-fueling.
Fuel Supply (diesel)					
Fuel Supply (propane)					
Fuel Supply (gasoline)					
Fuel Supply (natural gas)					
Sormwater Management	**Current**	**Priority**	**Capital Cost**	**Operating Cost**	**Notes**
Energy Efficiency	**Current**	**Priority**	**Capital Cost**	**Operating Cost**	**Notes**
LED Lighting					
HVAC Upgrades					
Insulation					
Windows					
Water Efficiency	**Current**	**Priority**	**Capital Cost**	**Operating Cost**	**Notes**
Security	**Current**	**Priority**	**Capital Cost**	**Operating Cost**	**Notes**
Cameras					
Audio					
Access Control					
Intrusion Detection					
Gates					

Food Storage & Preparation	Current	Priority	Capital Cost	Operating Cost	Notes
Cold Storage					
Dry Storage					
Cooking Capacity					
Preparation Areas					

Resilient Power	Measures not only to ensure uninterrupted power to the facility during a hazard but also to improve the cost-effectiveness and sustainability of operations in all three operating modes.				
	Current	Priority	Capital Cost	Operating Cost	Notes
Hybrid Resilient Power Solution					
Solar PV					Power generated using solar radiation. Installation can be on roof, ground or parking lots.
Energy Storage					
Generator					Conventiona generators using gasoline, diesel, natural gas or propane.

Resilient Communication	Measures to ensure the ability to communicate outside of the hazard area, maintain IT systems and access information.				
	Current	Priority	Capital Cost	Operating Cost	Notes
Network Infrastructure					
Technology Exposure Considerations					
Wifi					
Off-Site Data Storage					
Uninterruptible Power Supplies					
Operations & Maintenance					
Monitoring Software					
Switches					
Communications Protocols					

Resilient Operations	Measures to ensure the continued operation of the facility in all modes				
	Current	Priority	Capital Cost	Operating Cost	Notes
Identify Key Staff and Staff Roles					
Staff Trainings					

APPENDIX F

WORKFORCE TRAINING & OPPORTUNITIES

Resilience Hubs provide excellent opportunities to develop local workforce skills and create local job opportunities.

Workforce Training
Resilience Hubs can provide a space for workforce partners to host job fairs and deliver job training services. A great place to start is the Solar Energy Industry Association (SEIA) and the Solar Foundation Solar Training Network. The Solar Training Network, funded by the U.S. Department of Energy's SunShot Initiative, helps meet the workforce needs of the solar industry through solar training and strategic employment partnerships. The Network provides a connection hub for solar job seekers, solar companies looking for new hires, solar training providers, and workforce development boards.

Hubs for Clean Energy Training
The development of a Resilience Hub also provides opportunities for community members to learn resilient power systems, general contracting, and green landscaping job skills. Workforce skills for energy and solar include general contracting, installation, electrical engineering, mechanical engineering, low-voltage electric, medium-voltage electric, economic analysis. and finance. These skills are applicable at Hubs sites but also support career paths including manufacturing, system design, project development, solar installation, and building operations.

Operations and Management
Operating a Hub can create local management, communications, fundraising, maintenance, and clean energy jobs.

APPENDIX G

DECISION-SUPPORT TOOLS

Equity Framing for Resilience

- Equity in Building Resilience in Adaptation Planning is a guide developed by the NAACP to help localities integrate an equity lens as they seek to build resilience in designing adaptation plans.
- The Twin Cities EJ Mapping Tool - provides information about sources of pollution in a community and lets a user compare environmental risks across neighborhoods based on race and income.

Recommended Resilience & Adaptation Planning Documents

- **Community Preparedness Plans** – In many communities, community-based organizations or other local NGO's have taken on the role of supporting neighborhoods or specific areas in the development of their own preparedness or resilience document. These documents are important to integrate into a Resilience Hub planning process.
- **Local Government Plans**
  Hazard Mitigation Plans – The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by the Disaster Mitigation Act of 2000, requires state, tribal, and local governments to develop and adopt FEMA-approved hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance. These plans often can be helpful in the vulnerability assessment process.
  Resilience Plans – Increasingly, cities are developing Resilience Plans with the assistance of foundations or special interest groups. Resilience Hubs can be an important implementation component for those plans.
- **State and Regional plans**

Local Regulatory Documents

- Building Codes and Enforcement
- Land Use Ordinances
- Stormwater Management Regulations
- Open Space Preservation
- Floodplain Code and Enforcement
- (Urban) Forest Management

Local Energy Study Tools

- The Boston Community Energy Study explores the potential for local energy generation, district energy and microgrids. The Study is a collaboration between The Mayor's Office of Environment Energy and Open Spaces, the Boston Planning & Development Agency (BPDA), MIT Sustainable Design Lab and MIT Lincoln Laboratory.
- DC Solar Tool- shows District of Columbia residents, businesses, and property owners how much electricity can be produced on their rooftops from solar photovoltaic (PV) systems, how the financial investment will pay off, and how much pollution will be reduced. Users can also find hundreds of systems already installed throughout the city.
- Strategies for Multifamily Building Resilience was developed by Enterprise Community Partners as a collection of strategies for building owners to make their properties more resilient against the effects of extreme weather events. It provides guidance on determining a property's vulnerability to various hazards, finding which strategies are relevant to a particular building, and getting started with a resilience plan.

Vulnerability Assessment and Risk Assessment Tools

- In the Eye of the Storm, is a toolkit developed by the NAACP to guide committees through the process of building equity into the four phases of emergency management: prevention and mitigation, preparedness and resilience building, response and relief, and recovery and redevelopment.
- Community-Driven Climate Resilience Planning: A Framework, Version 2.0
- Prepared Communities: Implementing the Urban Community Resilience Assessment in Vulnerable Neighborhoods of Three Cities
- Great Lakes Climate Action Network (GLCAN) Vulnerability Assessment Template and Scenario Development
- A Guide to Equitable, Community-Driven Climate Preparedness Planning
- Health Impact Assessment

Federal Planning and Mapping Tools

- Federal Emergency Management Agency's (FEMA) Flood Zone Maps - The maps, also referred to as Flood Insurance Rate Maps (FIRMs), illustrate flood hazards throughout the County and are used when determining flood insurance policy rates. Residents and businesses can view the maps to better understand their potential flood risk to help identify steps they may need to take to protect against property damage and loss.
- All Hazards Mitigation Plan

State Planning and Mapping Tools

A number of mapping tools have been developed to overlay various filters in order to better understand communities. While some are unique to their city, others can be applied more broadly. Here are few relevant examples:

- Alaska Risk Mapping, Assessment and Planning (Risk MAP) Program: The Alaska Risk MAP Program provides communities with flood and other hazard information, risk assessment tools and outreach support to increase local understanding of risk, inform community decisions regarding risk, and ultimately lead to local actions which will reduce risk.
- MyPlan Internet Mapping Tool (IMT) enables city, county, special district, state and tribal user access in assembling and assessing GIS information on natural hazards in California.

APPENDIX H

KITCHEN ASSESSMENT RESOURCES

Gathering information on a site's existing food service operations will help a Hubs team evaluate the current and potential capacity of the kitchen for food service before, during, and after a disruption.

KITCHEN ASSESSMENT: Equipment				Note
Location:				
Commercial Kitchen?	o Yes o No			
Sinks	Handwashing sink	o Yes	o No	
	Two-compartment sink	o Yes	o No	
	Three-compartment sink	o Yes	o No	
	Food Prep Sink	o Yes	o No	
	Other			
Dishwasher	Dishwasher	o Yes	o No	o Commercial
	Other			
Cold Storage	Fridge/Freezer Combo	o Yes	o No	Number:
	Fridge (no freezer)	o Yes	o No	Number:
	Freezer (no fridge)	o Yes	o No	Number:
	Cooler	o Yes	o No	Number:
	Other			
Cooking Equipment	Microwave	o Yes	o No	
	Oven	o Yes	o No	o Commercial
	Stove top/range	o Yes	o No	o Commercial Gas Power
	Exhaust Hood	o Yes	o No	
	Toaster oven	o Yes	o No	o Commercial
	Other			
Food Prep	Food prep table/space	o Yes	o No	
	Food Scale	o Yes	o No	
	Other	o Yes	o No	
Other	Floor Drains	o Yes	o No	
	Other			
	Other			

KITCHEN ASSESSMENT: Non-Equipment				Note
Meal Service	Disposable Plates, Bowls	o Yes	o No	
	Disposable Utensils: forks, knives, spoons	o Yes	o No	
	Napkins	o Yes	o No	
	Disposable cold drink cups	o Yes	o No	
	Disposable hot drink cups	o Yes	o No	
	Other:			
Cookware	Pots	o Yes	o No	
	Pans	o Yes	o No	
	Baking sheets	o Yes	o No	
	Mixing bowls	o Yes	o No	
	Other:			
Thermometers	Thermometers for equipment (oven, fridge, freezer, deep freezer)	o Yes	o No	
	Thermometers for storage room	o Yes	o No	
	Humidity control for dry storage	o Yes	o No	
	Thermometers to check food temperature	o Yes	o No	
	Other:			
Food Prep and Service	Serving bowls and dishes	o Yes	o No	
	Measuring cups and spoons	o Yes	o No	
	Cutting boards	o Yes	o No	
	Knives	o Yes	o No	
	Ladles	o Yes	o No	
	Spatulas	o Yes	o No	
	Whisk	o Yes	o No	
	Spoons	o Yes	o No	
	Tongs	o Yes	o No	
	Other:			
Storage/Shelving	Food storage containers	o Yes	o No	
	Plastic tubs	o Yes	o No	
	Shelves	o Yes	o No	
	Other:			
Cleaning Supplies	Washer/Dryer	o Yes	o No	
	Broom and dustpan	o Yes	o No	
	Mop and mop bucket	o Yes	o No	
	Bleach	o Yes	o No	
	PH strips	o Yes	o No	
	Paper towels and dispenser	o Yes	o No	
	Antibacterial Soap	o Yes	o No	
	Instant hand sanitizer	o Yes	o No	
	Liquid dish soap	o Yes	o No	
	Cleaning cloths/towels	o Yes	o No	
	Disposable gloves, hairnets, aprons	o Yes	o No	

APPENDIX I

DIFFERENT HUB APPROACHES / EXAMPLES

Several local governments have developed Disaster Hubs or Emergency Hubs for communities to utilize in the event of a disruption. As your community sets up their Resilience Hub, these examples can help inform the Disruption Mode and Recovery Mode components of the Hub. However, note that most of these examples do not focus on the holistic vision of resilience and do not address the needs and opportunities in Normal Mode.

Location	Approach	Normal/ Everyday	Disruption	Recovery	Resilience Next Steps
Vancouver, Canada	Disaster Hubs		Disaster support hubs are designated locations where residents can initially gather to coordinate efforts and help other members of the community.	Staff and volunteers provide post-disaster and recovery services such as group lodging and shelter, distribution of food, water, and supplies, recovery information, and support for reuniting families.	1. Move to more holistic vision with year-round programming & community benefits 2. Consider use of Equity Framing and focus on power-shifting to community
San Francisco, CA	Hub Program for Disasters	At the core of this planning process is a cross sector cohort of neighborhood stakeholder organizations who guide their resilience investments and advocate for their program needs.	Craft a culturally competent resilience action plans for the mitigation, preparedness, response and recovery phases of the disaster.		1. Shift from plan development to a more holistic human-centered approach that focuses on “normal mode” over disaster.
Wellington, NZ	Community Emergency Hubs for Earthquake		Pre-identified places for the community to coordinate their efforts to help each other during and after a disaster	Supports members of the community in basic recovery.	1. Integrate considerations for other disruptions beyond earthquakes 2. Potential use of sites for year-round community benefit.
Washington, DC	Resilience Hub Pilot and Equity Advisory Committee in Ward 7	Focus has been on community needs and community benefits.	Resilience Hubs are considering all three ‘modes’		Utilize support from EAG to identify and support Hubs in Ward 7
Miami, FL	Response & Recovery during disruption		Disaster Response Warehouse		Connectivity between partners in the region to provide support and resources year-round
Buffalo, NY	Energy Efficiency and Microgrid.	The site includes 30 energy efficient, affordable apartments, offices, a theatre, and a shared gymnasium with community programming and meeting spaces.	With extensive community input, the 80,000-square-foot former Buffalo Public School was retrofitted and now features affordable senior apartments and a new community center.		
Minneapolis, MN					
Boulder, CO	Resilient Power and Transit for private site and Boulder Housing Partners affordable housing headquarters building		Energy Focused Micro-grid approach with three partners (Via, Boulder County and City of Boulder). Focused on transportation & strengthening the resilient power. Mainly keeps power going for transportation systems to assist with evacuation.		Current site is not connected to a community but there are many microgrid lessons learned that can help with developing sites that assist community members
Baltimore, MD	Community Resilience Hubs				

APPENDIX J

SAMPLE POLICY CONSIDERATIONS

Regardless of what state you are in, Resilience Hubs teams should be aware of the range of state-level laws/policies and programs that may present potential legal barriers or opportunities. Local governments and Community Based Organizations should be aware that state legislatures or agencies often have programs and policies that create better enabling conditions for Resilience Hubs.

Example I - Net Metering

Location - Rhode Island

Resilience Strategy- Resilient Power (Solar + Storage)

Net Metering- Rhode Island allows net metering for systems up to ten megawatts (MW) in capacity that are designed to generate up to 100% of the electricity that a home or other facility uses. The net metered systems size must be sized to produce no more than an average of previous or forecasted three years of annual consumption of the energy at the account. The rate credited for kilowatt-hours (KWh) generated that do not exceed the customer's KWh consumption for that billing period is equal to the utility's retail rate (minus a very small conservation charge per KWh). Any excess KWh generation that exceeds 100% but limited up to 125% of the net-metering customers usage during the billing period will be paid excess renewable net-metering credits which is equal to the utilities avoided cost rate, which is calculated as electric distribution company's standard offer service KWh charge for the rate class and Time of Use billing period, if applicable.

Opportunity

Net Metering creates one of the revenue streams that makes Resilient Power solutions

Challenge

Permitting requirements take time and expertise to navigate.

Example II - Alternative Financing Tools and Catastrophe Bonds

Location - Rhode Island

Resilience Strategy - Resilient Finance

In 2017, Rhode Island Governor Gina M. Raimondo signed an Executive Order appointing a Chief Resilience Officer to drive climate resilience efforts across the state and to develop a statewide Climate Resilience Action Strategy by 2018 [Source: http://climatechange.ri.gov/resiliency/]. Among the many initiatives in the strategy, the focus on innovating resilience funding head-one is particularly compelling. The Strategy outlines six alternative finance tools, primarily for larger scale resilience efforts (environmental impact bonds, stormwater utility, resilience zones, resilience bond, PACE financing and credit trading markets). "Many entities have used Catastrophe Bonds to protect against large-scale disasters by partially shifting risk to private investors," explain the Strategy's authors. "When a Catastrophe Bond is issued, the proceeds of the bond are generally held by a trustee and are only released to the issuer if a predetermined triggering event (e.g., damages from a storm exceeding a certain amount) occurs during the term of the bond. If the triggering event occurs, the issuer gains access to the bond proceeds to cover the losses that were caused by the disaster. If the triggering event does not occur, the proceeds are used to repay investors along with interest."

Opportunity

One recommendation for the Resilience Bond would be to use a portion of the proceeds to fund Resilience enhancements. Resilience Hubs would be an obvious and important tool.

Challenge

Challenge: Bond issuance is complex and requires scale. For a Resilience Hub to leverage this opportunity, it must work closely either state or municipal government.
http://climatechange.ri.gov/documents/resilientrhody18.pdf

Example III - Integrating Resilience Hubs as a top priority in Planning Documents

Location - Los Angeles and Washington DC

Resilience Solution - Resilience Hub Policy

Both DC and LA created Resilience Plans in 2018-2019. These documents address both stresses and shocks. As part of bolstering community adaptive capacity and focusing on equity both cities identified Resilience Hubs as top priorities for implementation. The Resilient DC effort mapped the City's resilience strategies while engaging a broad group of stakeholders with a specific focus on developing pilot Hubs in Ward 7. Los Angeles is looking to develop a network of Hubs citywide.

Opportunity

With community resilience a critical driver in this and related sustainability policy, Resilience Hubs have been identified as a priority strategy.

Challenge

Challenge: Policy is still taking shape here and it will be important for serious Resilience Hub candidates to connect with the Resilient DC leadership.

SAMPLE IV -

Location - Washington DC

Resilience Solution - Resilient Power

Interconnection & Permitting - Washington DC has one of the nation's most aggressive Renewable Portfolio Standards (100% by 2032) and a favorable net metering policy. The Washington DC Department of Consumer & Regulatory Affairs provides a clear and detailed set of steps for the review and approval of solar projects. The permitting sequence includes: Plan Preparation, Permit Application, Plan Review, Installation, Inspections and operations. PEPCO, the local electric utility, has interconnection rules for solar systems as well as net metering provisions. While interconnection and permitting can be costly and time-consuming parts of any project, DCRA's guidelines are easy to follow and DCSEU offers support in identifying solar installers who will handle the regulatory and technical details.

Opportunity

Solar projects are very attractive in Washington DC and may attract third-party owners.

Challenge

Challenge: Many Resilience Hubs may be too small to make the economics attractive enough to third-party investors, but may be helped by a range of tools, support and finance options from sources identified by DCSEU and its partners.

Example V - State support for Resilient Power at Hubs

Location - State of Maryland

Resilient Solution: Resilient Power for Resilience Hubs

Maryland Resiliency Hub Grant Program - The Maryland Energy Administration has identified Resilience Hubs as an important tool in the state's energy playbook and has created a grant program to help with the cost of Resilient Power Solutions. The RPS Program requires electricity suppliers to meet a prescribed minimum portion of their retail electricity sales with various renewable energy sources, which have been classified within the RPS Statute as Tier 1 and Tier 2 renewable sources. The program is implemented through the creation, sale and transfer of Renewable Energy Credits (RECs). The development of renewable energy sources is further promoted by requiring electricity suppliers to pay a financial penalty for failing to acquire sufficient RECs to satisfy the RPS. The penalty is used to support the creation of new Tier 1 renewable sources in the State. Section 7-701 of the Public Utilities Article of the Annotated Code of Maryland provides the framework by which the states eligible to participate in the Maryland RPS Program may be determined. Renewable energy credits must be derived from a source that is located in the PJM Region. Renewable energy credits may come from outside the area described above if the electricity is delivered into the PJM Region. In 2017, Maryland increased the state's renewable portfolio standard from previous 20% to 25% by 2020.

Opportunity

First of its kind grant program specific for Resilience Hub power systems

Challenge

Grant programs have reporting and administrative processes that can stretch the resources of smaller organizations.

Example VI - Sustainable Building Standards for Energy

Location - State of Minnesota

Resilient Solution - Building Codes

Minnesota's B3 Sustainable Building 2030 (SB 2030) Energy Standard targets energy efficiency in commercial, institutional and industrial buildings. The standard ratchets from 60% below average buildings to net zero by 2030. The SB 2030 Energy Standard is required on all projects that receive general obligation bond funding from the State of Minnesota. Data collected is publicly accessible. All Minnesota State bonded projects—both new and substantially renovated—are required to meet the Minnesota Sustainable Building 2030 (SB 2030) 2015-2019 Energy Standard. Projects that begin their Schematic Design phase on or after January 1, 2020 will be subject to the 2020-2024 Standard: achieving an 80% reduction from the Average Building Baseline.

Opportunity

Often sites contemplating the role of a Resilience Hub are in the process of significant renovation or new construction. Enhanced building codes provide the opportunity to achieve operational savings and sustainability targets. Moreover, the data from these projects can be an important planning tool.

Challenge

Compliance with codes and regulations is often time-consuming challenge and are likely to add cost to the project. Experienced project managers who share aligned goals with the Resilience Hub can help communicate the benefits of enhancing energy systems.

Example VII - Net Metering

Location - State of Florida

Resilience Solution - Resilient Power

Solar Finance - While Florida's solar policies have lagged other states (no renewable portfolio standard and does not allow power purchase agreements) [https://www.seia.org/state-solar-policy/florida-solar], net metering provisions among the utilities in the Sunshine State allow customers to earn credits on a portion of their excess generation. Florida Power & Light, for example, offers net metering to customers across most of the Panhandle.

Opportunity

Increase in solar penetration and demand charges in utility rate tariffs, coupled with the reduction in battery prices, creates an increasingly attractive opportunity for Resilient Power Solar and Storage solutions.

Challenge

Florida policy does not allow for power purchase agreements (PPAs) one of the primary tools for third-party financed systems (see, Third-Party Owned on p XX). This limits the ability of Resilience to finance Resilient Power solutions. However, an April, 2018 statement by the Florida Public Service Commission held that a fixed 20-year lease on solar equipment by SunRun did not violate the state's policies. Equipment leases can be an important tool for Resilience Hubs to help finance their Resilient Power Solutions.

Example VIII - Weatherization Assistance Programs

Location - State of Michigan

Resilience Solution - Weatherization

Policy - Michigan, like other states, has a federally-funded, low-income residential energy conservation program that provides free home energy conservation services to low-income homeowners and renters. The program dispatches an energy auditor to inspect the property, perform tests and provide an audit of appropriate measures. According to national studies, households that receive weatherization services can expect heating costs to be reduced 20 to 25 percent.

Opportunity

While Weatherization Assistance Programs are designated for residential customers, facilitating the audits becomes an important community function that may be assigned to community-based organizations. In some states, CBO's and utilities work in concert to deliver these services. Having trained weatherization experts in the community provides both resilience and workforce benefits.

Challenge

Funding is limited to residential properties and program management can be a challenge.