Emerging Public Health Needs for Climate Smart Technology in Connecticut Affordable Housing

Tuesday, October 1, 2024

www.cleanegroup.org

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Speaker bios available in the “Materials” section 

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Climate Resilience and Community Health

Distributed Energy Access and Equity

Energy Storage and Flexible Demand

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Building the foundation for energy resilient communities.

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Rooftop solar installation in Dorchester, MA. Credit: Resonant Energy

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Solar installation in Puerto Rico. Credit: Solar Responders

www.cleanegroup.org/initiatives/technical-assistance-fund

CELEBRATING 10 YEARS TECHNICAL ASSISTANCE FUND

CleanEnergyGroup

TECHNICAL ASSISTANCE FUND

Providing Support to Build Local Resilience

The Resilient Power Project Impact: 2013 - 2023

$1.5 million in Grants Awarded

175 Community Service Partners

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255 Community Facilities

CleanEnergyGroup

AUGUST 2024

Emerging Public Health Needs for Climate Smart Technology in Connecticut Affordable Housing

Operation Fuel, The Yale Schools of Medicine and Public Health
Clean Energy Group, Connecticut Insurance Department,
Connecticut Green Bank

https://www.cleanegroup.org/publication/emerging-public-health-needs-for-climate-smart-technology-in-connecticut-affordable-housing/

Webinar Speakers

Emerging Public Health Needs for Climate Smart Technology in Connecticut Affordable Housing

George Bradner
CT Insurance Dept.

Bryan Garcia
CT Green Bank

Annie Harper, PhD.
Yale University

Darlene Yule, MPH
Operation Fuel

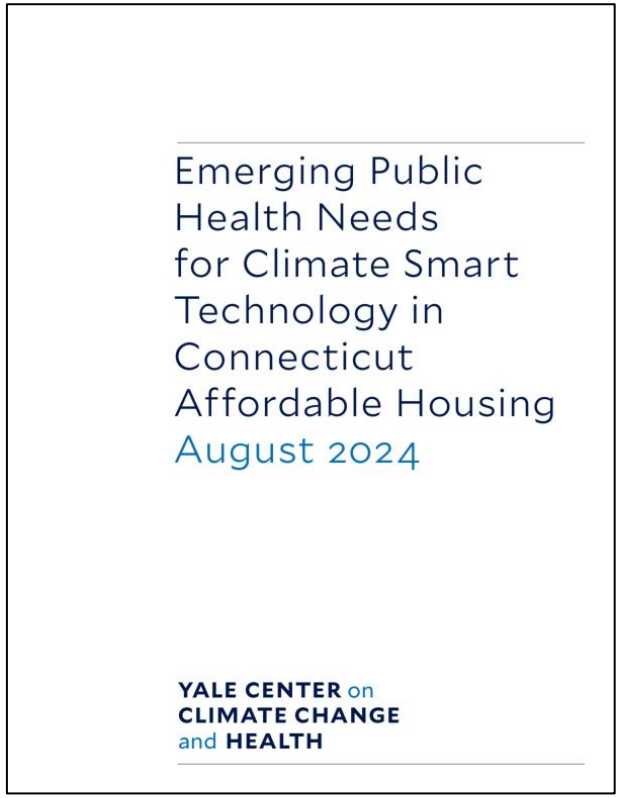
Jesse Wescott
The Towers

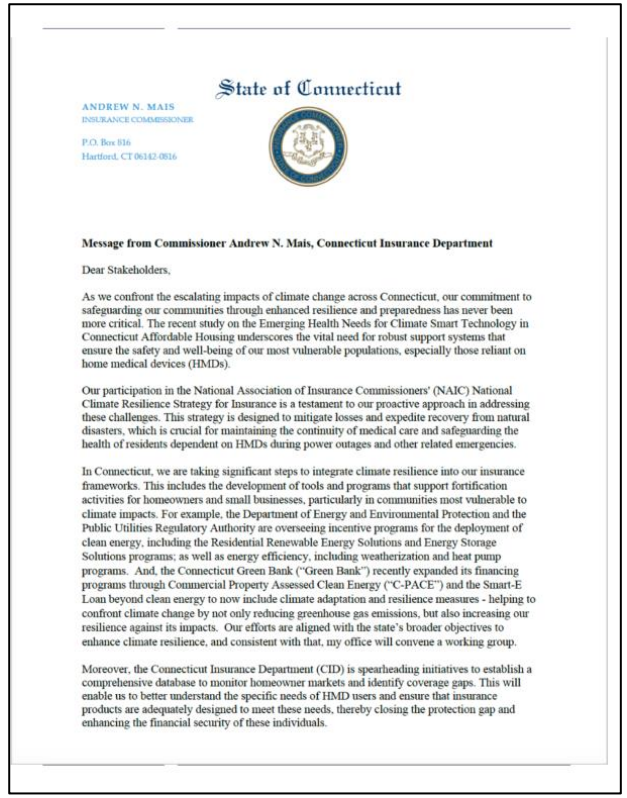
Marriele Mango
Clean Energy Group

Britt'ny Bettis-Allen
Clean Energy Group

Commissioner Andrew Mais

Connecticut Insurance Department





State of Connecticut

ANDREW N. MAIS
INSURANCE COMMISSIONER

P.O. Box 816
Hartford, CT 06142-0816

Message from Commissioner Andrew N. Mais, Connecticut Insurance Department

Dear Stakeholders,

As we confront the escalating impacts of climate change across Connecticut, our commitment to safeguarding our communities through enhanced resilience and preparedness has never been more critical. The recent study on the Emerging Health Needs for Climate Smart Technology in Connecticut Affordable Housing underscores the vital need for robust support systems that ensure the safety and well-being of our most vulnerable populations, especially those reliant on home medical devices (HMDs).

Our participation in the National Association of Insurance Commissioners' (NAIC) National Climate Resilience Strategy for Insurance is a testament to our proactive approach in addressing these challenges. This strategy is designed to mitigate losses and expedite recovery from natural disasters, which is crucial for maintaining the continuity of medical care and safeguarding the health of residents dependent on HMDs during power outages and other related emergencies.

In Connecticut, we are taking significant steps to integrate climate resilience into our insurance frameworks. This includes the development of tools and programs that support fortification activities for homeowners and small businesses, particularly in communities most vulnerable to climate impacts. For example, the Department of Energy and Environmental Protection and the Public Utilities Regulatory Authority are overseeing incentive programs for the deployment of clean energy, including the Residential Renewable Energy Solutions and Energy Storage Solutions programs; as well as energy efficiency, including weatherization and heat pump programs. And, the Connecticut Green Bank ("Green Bank") recently expanded its financing programs through Commercial Property Assessed Clean Energy ("C-PACE") and the Smart-E Loan beyond clean energy to now include climate adaptation and resilience measures - helping to confront climate change by not only reducing greenhouse gas emissions, but also increasing our resilience against its impacts. Our efforts are aligned with the state's broader objectives to enhance climate resilience, and consistent with that, my office will convene a working group.

Moreover, the Connecticut Insurance Department (CID) is spearheading initiatives to establish a comprehensive database to monitor homeowner markets and identify coverage gaps. This will enable us to better understand the specific needs of HMD users and ensure that insurance products are adequately designed to meet these needs, thereby closing the protection gap and enhancing the financial security of these individuals.

Co-Funder

Robert Wood Johnson Foundation

- **Foundation** – RWJF is the largest foundation in America **focused on health equity**. It uses **policy, grants and impact investment** towards a goal of every American having the opportunity to live the healthiest life possible. RWJF is rated Aaa/AAA by Moody's/S&P

- **Focus** – experience has shown that there are a **range of investment opportunities that benefit both low income and BIPOC communities** and are – or have the potential to be – **investment grade assets and/or attractive to insurance companies**. Goal is to match insurance company capital with these opportunities to **drive increased investment flows for purposes such as affordable housing, economic development, and climate resilience**

Proposed Research Projects

Robert Wood Johnson Foundation

Research Funding – grant funding to Center for Insurance Policy and Research (CIPR) of the National Association of Insurance Commissioners (NAIC) to study insurance sector (e.g., **examining barriers keeping insurers from bringing their best capital to community development**). And grants up to $250,000 for workplans lasting up to 24 months – **how climate solution will make community more resilient and healthier**

From Resilient Homes to Systemic Resilience

the project seeks to understand the health impacts on vulnerable communities as a result of climate change (e.g., lack of air conditioning during a heat dome impacting physical health, poor housing conditions following a flood impacting psychological health) in order to discern important investments necessary to improve resilience during and after weather-related climate events.

Affordable Housing and Home Medical Devices

the project seeks to understand the investment needed in back-up power (e.g., solar power and battery back-up, fuel cells) for people residing in affordable housing that have home medical devices, and providing technical assistance, including engagement of tenants within the affordable housing, to discern the level of investment needed in clean energy infrastructure to improve the resilience of tenants with such conditions.

From Brownfields to Greenfields and Park Rx

the project seeks to enable investment by insurance and healthcare companies in the modernization of green space infrastructure to provide places to improve public health and reduce healthcare costs, while also serving to improve the resilience of a community from the impacts of climate change (e.g., flood control).

3

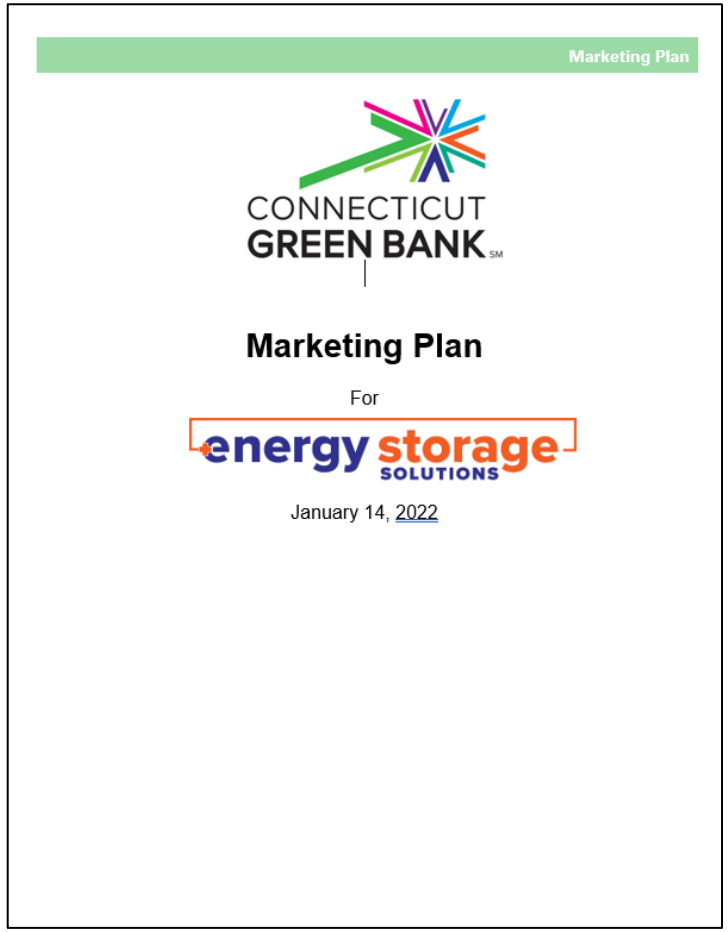
Co-Funder Match

Connecticut Green Bank (through Energy Storage Solutions)

Background – PURA determined (i.e., through the Equitable Modern Grid Initiative) that Green Bank and EDCs administrator Energy Storage Solutions (ESS) program to deploy 580 MW of BTM battery storage by 2030 for (1) peak demand reduction, and (2) resilience for participants. 40% of projects in low-income, distressed communities (and affordable housing)

Marketing Plan (Order 9) – identifies medical hardship customers – about 30,000 with 90% with life-threatening conditions identified by EDCs – with home medical devices as target market

Partners – plan identified several partners to provide technical (e.g., CEG) and marketing (e.g., Operation Fuel, Yale, AccessHealthCT) assistance



Project Overview

Title – Climate Smart Technology (CST) and Home Medical Devices (HMD) for Affordable Housing

Goal – seeks to understand the investment needed in CST, including back-up power (e.g., solar power, battery storage) and stable indoor temperature (e.g., efficient heating and cooling, weatherization), to enable deployment of technologies to increase resilience of tenants reliant on HMDs for their health.

Partners:

Project Activities

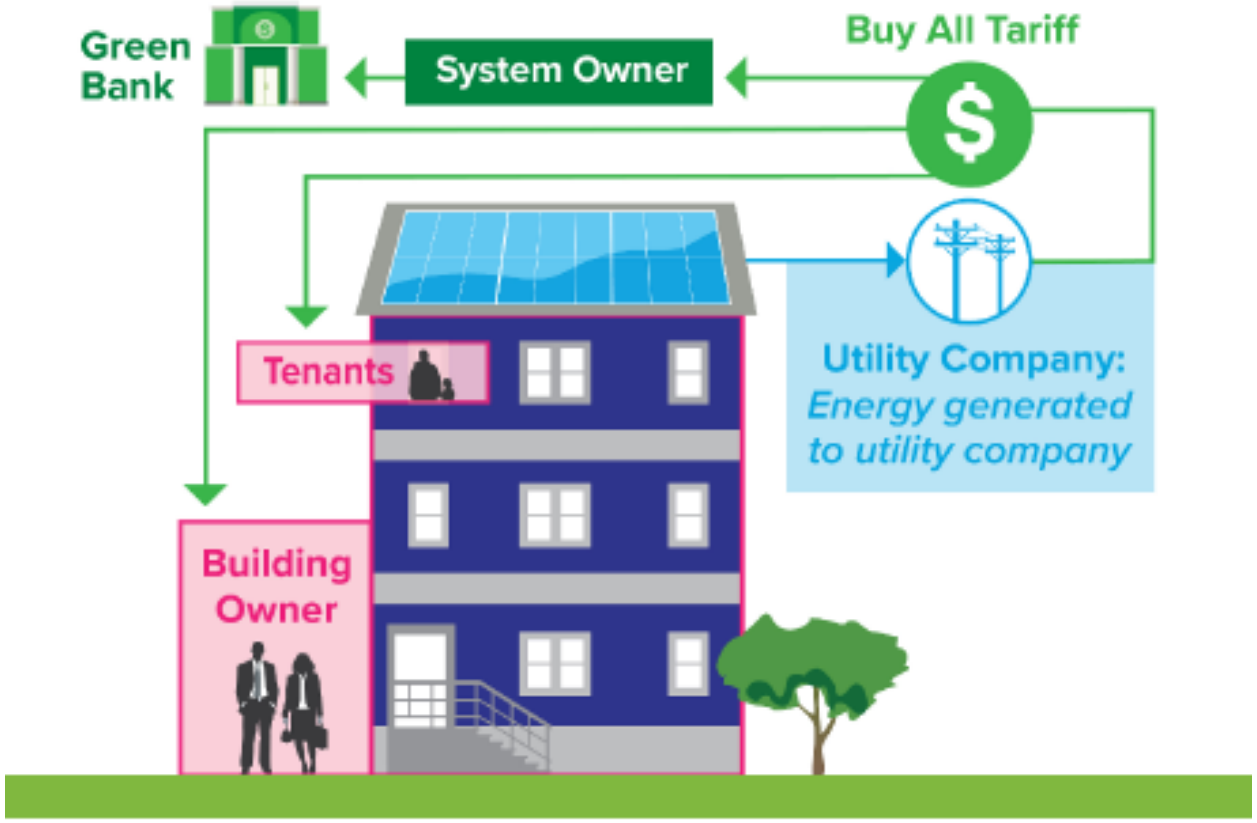
CST and HMD for Affordable Housing

1. **Community Engagement** – Operation Fuel working with Yale, **reach between 75-150 residents requiring HMDs** in **no less than three (3) vulnerable communities** that **reside in no less than fifteen (15) affordable housing properties** to use focus groups to **understand how resilience can be improved** in varying adverse conditions cause by climate change (e.g., extreme weather, loss of power), especially for those reliant on HMDs.

2. **Technical Assistance** – through engineering studies by the Clean Energy Group, **no less than fifteen (15) affordable housing properties** will be assessed in **participating vulnerable communities** in terms of **technical and economic potential for the deployment of CST**. The project will seek to understand various "use cases" given differing conditions of affordable housing (e.g., location on the grid edge).

3. **(Financial Assistance) Technology Deployment** – where appropriate, investment by the Green Bank in the **deployment of CST through innovative, replicable, and scalable financing mechanisms**, including how to structure an investment fund that invites insurance and health care industries to invest capital into the deployment of CST.

Multifamily Affordable Housing
Green Bank Solar + Storage Lease



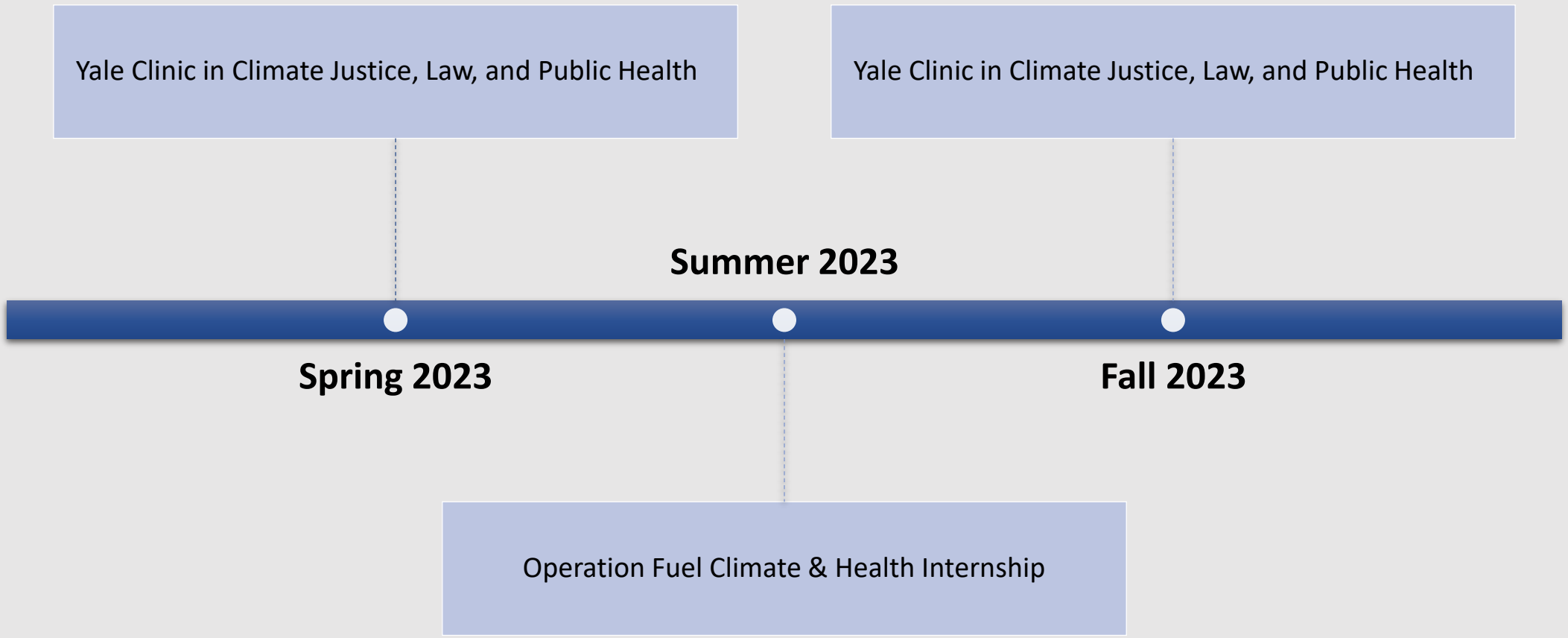
- No capital requirement from property owner
- Tenants receive credits on their electric bill from production (i.e., RRES)
- Can include battery storage to provide resiliency (i.e., ESS)
- Green Bank owns and maintains asset, and bears risk

METHODOLOGY & OUTCOMES

Presented by

Yale SCHOOL OF PUBLIC HEALTH

Research Study Timeline



Methodology: Spring 2023

- Developed the original methodology for the study:
  - Preliminary set of focus group and post-survey questions
  - Early stages of recruitment
  - Rapid Assessment Process (RAP) methodology for qualitative analysis
- IRB approval process
  - Initial definition of Home Medical Devices (HMDs): include life-support equipment and technologies for independent living that require a reliable supply of electricity
- Conducted 1 focus group with residents and 2 interviews with domain experts

Examples of Focus Group & Interview Questions

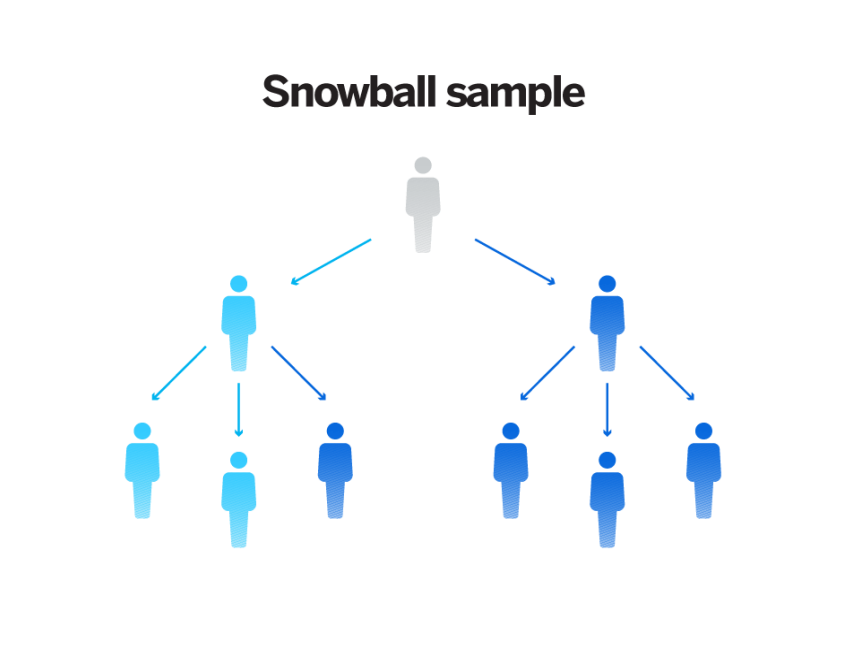
Theme	Sample Question
Existing Needs	In what ways do you rely on electricity for your health, medical, or mobility needs?
Power Outages	How do you currently prepare for power outages?
Potential Opportunities	Thinking about the future, what would you need to take care of your health without leaving your building during a power outage?
Miscellaneous	What experience (if any) do you have with clean energy technologies such as solar panels and backup batteries?

Outreach: Summer 2023

- Continuation of outreach and recruitment
  - Connecting with resident service coordinators and municipal housing authorities
  - Outreach at local farmers' markets and community events
  - Online interest form
- Expanding the scope of perspectives
  - Bilingual accommodations
  - Expanded eligibility criteria to also include:
    - Medical professionals
    - Resident service coordinators (RSCs)
    - Caretakers of HMD users

Outreach: Fall 2023

- Explored new avenues for outreach and recruitment
  - Bridgeport recruitment
  - Medical professional recruitment
  - Snowball sampling strategy
- Participant statistics
  - Focus group: 26
  - Individual interview: 22
  - RSCs or other staff: 4
  - Medical professionals: 4
  - Community Engagement Service Providers: 1



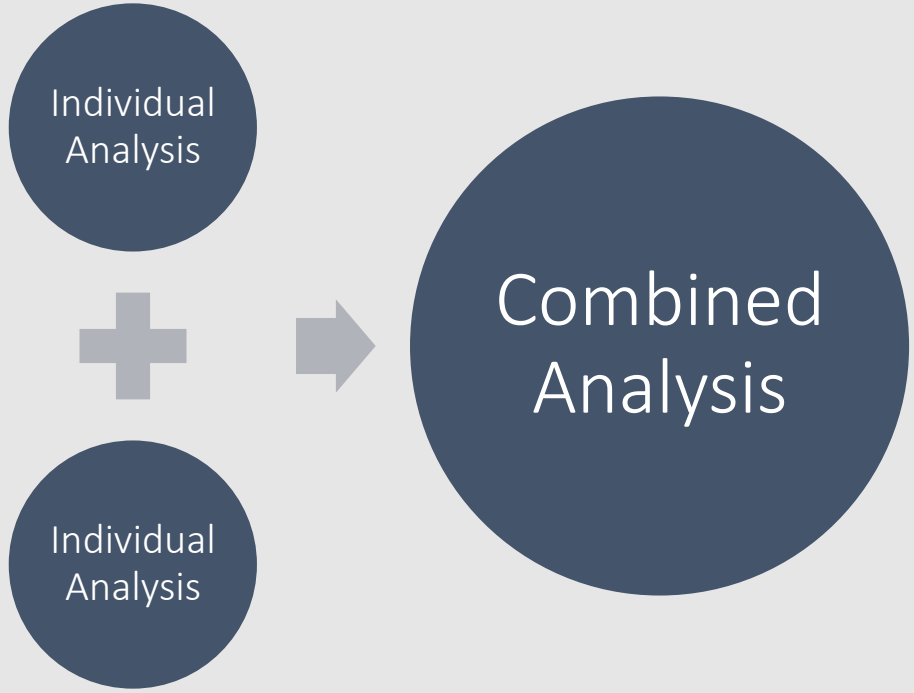
Data Collection & Analysis

Data Collection

- Conducting focus groups and individual interviews
- Participant post-surveys

Qualitative Analysis

- Three phase process to identify key findings and representative quotes, within respective domains, and guide recommendations
  - First and second phases: two project team members assigned to analyze each transcript
  - Third phase: merged both summary tables for a particular transcript into a single, combined summary table



Participant Demographics

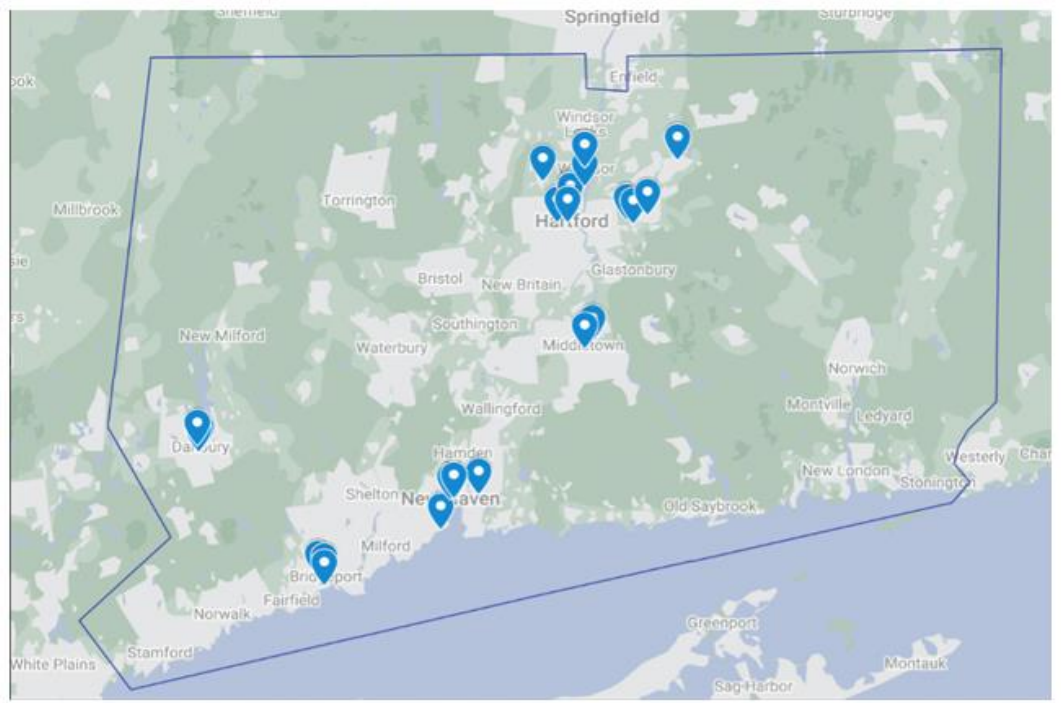


FIGURE 1: *Map of Building Locations*

- Demographics of sampled participants were diverse but also shared many similarities
  - 94 total participants across the state
    - 33 in-depth interviews and 9 focus groups with 45 HMD users = total of **78 HMD users**
  - Majority of the 23 study sites were situated in overburdened/underserved census tracts or distressed municipalities
  - Overlapping socioeconomic factors

Research Challenges

- Initial recruitment (Spring 2023) through property managers proved to be unsuccessful
- Frequent preference for private interviews to discuss potentially sensitive information/experiences

Results: Heavy Dependence on Electricity

- More than 2/3 of participants or family members depend on more than one HMD; some need constant power while others can be charged or use batteries.
- Common devices include dialysis machines, ventilators, oxygen concentrators, CPAP machines, electric wheelchairs, and refrigerators for medications.
- More devices we had expected serve as HMDs, such as elevators, cell phones, air conditioners, internet access, medical alert devices, air purifiers, and fans.

"When I check my blood, it goes straight to the doctor's office because I live by myself. 'Cause I got a bad heart, so they want to know what's going on." (resident)

"Well, I do have an electric wheelchair, which I do plug in every night to charge up the wheelchair. I also have an electric lift that I use to transfer back and forth from my wheelchair to my bed. So, I'm pretty heavily reliant on both things for my safety and mobility." (resident)

"It's really hard to live with any really major chronic condition without electricity these days...For some people, it may be the one particular thing, not being able to charge your wheelchair, or your CPAP machine so your oxygen drops while you're sleeping and that can cause problems, or you get dehydrated because of heat. But more likely, it's all these things." (MD)

Recommendation: Expand definition of HMDs to include devices for health monitoring, communication with caregivers, and air quality maintenance.

Results: Health impact of and Fears about Power Outages

- Inability to use HMDs can result in severe health consequences, even death, as well as serious financial consequences (eg: disrupted oxygen, spoiled food and medications, over-heating, immobility).
- High levels of anxiety about the possibility of losing power and not having back-up.

"It is a matter of life and death with that machine that I have." (resident)

"We lost everything like refrigerator stuff with the food, with insulin and everything." (resident)

"If we had a power outage, I doubt the elevators would be running... I actually have a device that I use to open my door, a remote control...I don't even know if I could exit without any electricity because...it runs off electricity for the door to open and close." (resident)

"If the lights go out and everything, if it's the summertime, and there is no air coming into me, I'm going to have asthma attacks." (resident)

"It's very dangerous to get overheated and dehydrated as a person with diabetes." (MD)

Recommendation: Address Anxiety and Stress: Incorporate psychological aspects in emergency planning and communication.

Results: Past Experiences during Power Outages

Strategies used to shelter in place when there is no back up power in the building:

- Sign up for utility alerts
- Stock up on food and water
- Charge devices
- Make ice to keep food and medications cold

"You put water in some Zip-Lock bags and put them in the freezer with your food in that situation where it could be an outage." (resident)

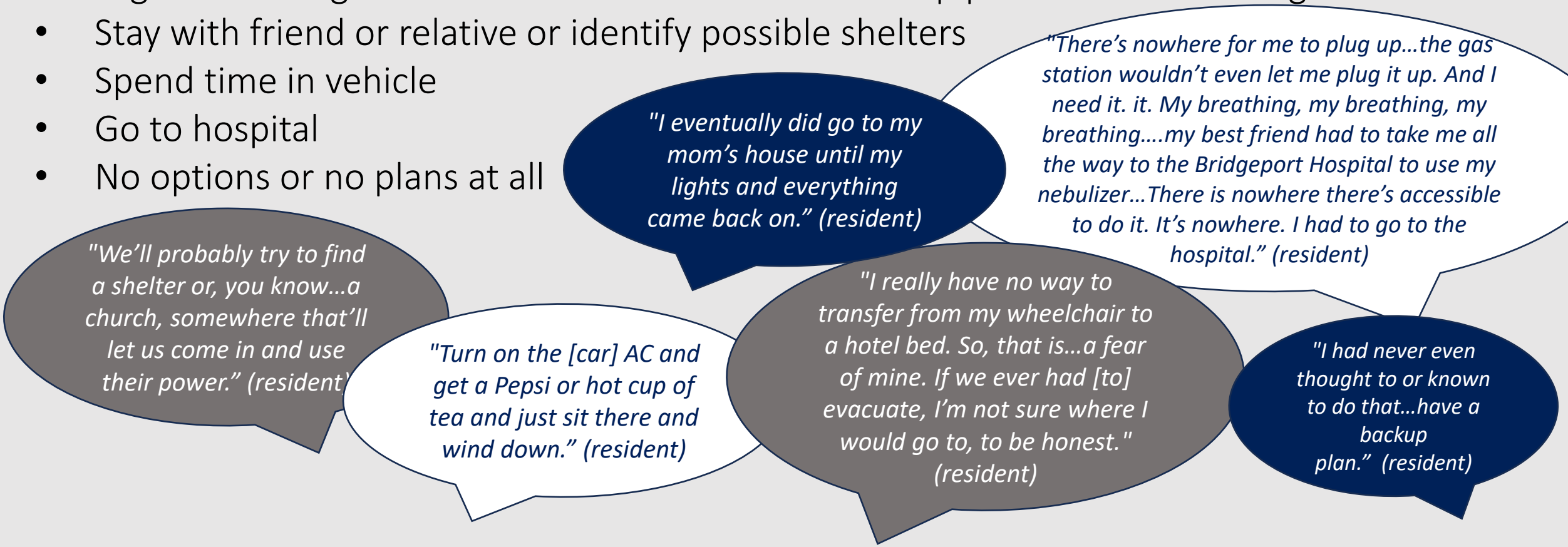
"The light company... will call and let you know that they're –it's gonna be a bad weather and it might cause the lights or anything to go out. So they prepare me for that, which is really excellent…I try to keep my cell phone charged when I know that bad weather is coming and they're looking for the lights to go out." (resident)

Recommendation: Utility Weather Alerts: Ensure residents are signed up for notifications to prepare for bad weather.

Results: Past Experiences during Power Outages

Strategies used to go elsewhere when there is no back up power in the building:

- Stay with friend or relative or identify possible shelters
- Spend time in vehicle
- Go to hospital
- No options or no plans at all



Recommendation: Ensure that people have access to back power, either in their apartments or in a safe, convenient space elsewhere.

Recommendation: Financial Considerations: Recognize the cost savings for emergency services and healthcare facilities when resilient housing reduces evacuations.

Results: Past Experiences during Power Outages

Experiences of being in a building with backup power during a power outage:

"Myself, I use an electric scooter because of my injury…And when the power goes out, we rely on that little red box in the hallway." (resident)

"Well, my brother uses it 'cause of the oxygen that he's on and he's bedridden. So, I have to try to push everything towards the door in order to run that cord out." (resident)

"If the – the power should go out, it will blink out for a little while and come back on 'cause they gave me a generator. But when we didn't have a generator here, that was bad. No heat, no refrigerator, and no, um, stove to cook on. That's pretty bad." (resident)

Recommendation: Ensure that people have access to back power, either in their apartments or in a safe, convenient space elsewhere.

Results: Building Communications

Importance of effective communication between building management and residents, as well as among housing providers:

"[Staff] also call and check up on us, and make sure we're all right every morning." (resident)

"We can cool the downstairs. So oftentimes what we would do is we would use our dining room, it's huge. And the kitchen is backed up by generators. So during those 72 hours, we can pump out meals, we can deliver meals... People can come downstairs. So, for 72 hours, I think we're fairly self-sufficient. I feel very confident that we could take care of our folks. And in those 72 hours, I think that's also enough time for our leadership team to partner with our care team to say, "All right, who's the highest priority? Who do we need to get out of here first?" (building management)

"We keep a list of who utilizes what so that in an emergency situation we can make sure that that person is getting what they need immediately." (building management)

Recommendation: Mandatory Emergency Plans: Require housing providers to develop and communicate detailed emergency plans tailored to individual needs.

Recommendation: Facilitate Learning Among Housing Providers: Encourage sharing of best practices and plans across different housing facilities.

Results: Cross-cutting Socio-economic issues

"I owed so much money from running the machines, because my son had to be on partial oxygen...and my bill went astronomical." (resident)

"I never got [AC] because I couldn't afford it." (resident)

"We ensure that they have an ice pack and a cooler so that they can put their insulin in there as needed," the nurse explained. "And a lot of these patients just don't have the funding to go out and buy those things for themselves." (nurse)

"That's what my patients are worried about, is being shut off by the electric company, not an accidental shut off or weather-related shut off." (MD)

Recommendation: Ensure that everyone who needs it has Medical Protection to avoid disconnection due to non-payment of electricity bill.

Recommendation: Engage Home Health Aides and Nurses: Utilize their expertise in advisory roles for planning and building code development.

Results: Resident Perspectives on Solutions

Communal space – should be accessible and comfortable, but won't work for everyone:

"[we need] one spot that those people in that general area could get to for lifesaving measures, like if they had to bring their oxygen, they could have an oxygen cannula taken there or to even charge their phones if you got a generator going on or plug in a nebulizer. You know what I'm saying? And these are things that there's the difference of them having quality life as well and to keep them from having to go to hospital." (resident)

"You want it spacious, and you want air to move around, and you want to make sure that [residents are] comfortable." (resident)

"If I try sleeping anywhere else besides my own home, I can't sleep." (resident)

Recommendation: Create Accessible Common Spaces: Establish safe, equipped communal areas for short-term shelter during outages.

Results: Resident Perspectives on Solutions

Back-up Power – essential but who will pay?

"Make sure it's free" (resident)

"I wouldn't expect anybody to voluntarily do this unless there was some financial support from HUD or whoever else." (Building management)

"It would've been nice if they had somebody, like a company that came in and said, 'Okay, if the electricity went off, we could supply generators through Medicare or your insurance company." (resident)

Recommendation: Clarify payment expectations from the start; costs must not be passed on to residents.

The Towers at Tower Lane – A Case Study for the Need/Use of Green Energy in Affordable Senior Housing

Jesse Wescott
Vice President

The Towers at Tower Lane
18 Tower Lane
New Haven, CT 06519

www.towerlane.org

THE TOWERS
AT TOWER LANE

Our Community

Residents

- Average Age of our residents is 78 years old
- 73% require rental subsidy
- Average income under $1,900 per month
- Not all Resident are on our Kosher Meal Plans
- HUD funds Service Coordination but NOT Programs or Events for Residents

Buildings

- Located in New Haven, CT – 328 Apartments
- 50+ Year Old Building
- Mixed Funding – HUD (Pre-1974) 202 & Project Based Section 8 Vouchers
- Tower One offers some Market Rate Housing

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AT TOWER LANE

Challenges That Led Us to Explore Green Energy and Resiliency

- It has become an ongoing challenge in HUD Affordable Senior Housing to keep a meal plan program running (most have closed their programs)
- A 2018 internal study discovered our residents were frequenting food pantries and soup kitchens
  - Residents were eating pre-made, high sodium meals
- Needed a funding source for volunteer coordination and in-house programming and events (both fitness/wellness and social programs)
- Need to address risks with power outages and create systems related to safety for our seniors.

Where Do We Start……?

What About Solar Panels?

- Solar is great! Everyone is saving money with Solar!
  - If you have the roof space…

- Our buildings have minimal roof top areas
  - Many HVAC & Elevator related mechanicals would block out panels
  - Tower One creates shade on Tower East roof
  - Concept for a third tower negated solar structures on campus land

- If not Solar, is there another energy saving alternative**?!**
- **Cogeneration…..what is Cogeneration?!**

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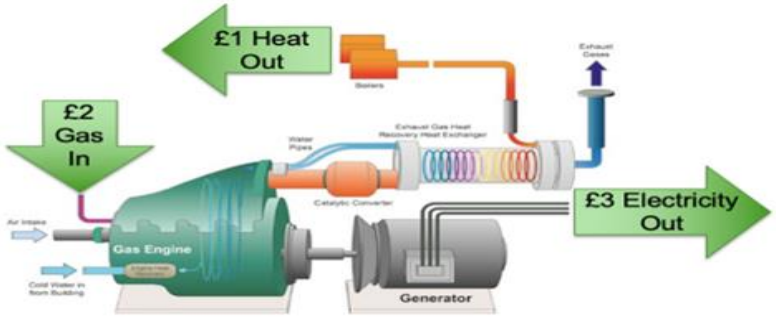
Defining Cogeneration

- **Cogeneration Boiler or CHP Boiler – Stands for Combined Heat and Power Boiler**



- **The Process**
  - **Natural Gas is Burned**
  - **Electricity (kWh) is Generated for Building**
  - **Heat (Terms) is Captured from Generator and Transferred to Building**

Purchasing a Cogeneration Boiler

Our Community used several approaches to fund this project without loans

Done Through The Towers Foundation

- ***Why was this important for us?***

- **Grants**
  - US Department of Energy Funds
  - Local Grants
- **Capital Campaign**
  - Towers Foundation Capital Campaign
  - Great Give Donations
- **Tax Discount Programs**
  - In CT non-profits can “sell” tax credits to S-Corp. Businesses

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Cogen Delivery Day

*SOME
ASSEMBLY
REQUIRED

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AT TOWER LANE

Budget & Initial Goals for Cogen

- Initial Investment for engineering, equipment, site work, installation and commissioning of CHP Unit (100 kWh Unit) = $607,000
- Assuming a minimum savings of $78,000 annually for 25 years provides a $1,950,000 return on investment
- Project goal “subsidizing” at two meals per day for any resident receiving subsidy for 25 years *(our meals are big)*
- Goal to serve 50 residents a total of 910,000 meals over a 25 year period with a resident copay of about $178 a month

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2022 Cogen Actuals

Gas	
Gas Used (CCF)	127,260
Gas Cost Per CCF	$1.97
Total Gas Cost	***$250,702***
Electric	
Total Electricity Used (kWh)	1,864,517
Electric Supplied by Cogen (kWh)	808,721
Net Electricity Paid For (kWh)	1,055,796
Impact of Cogen	
Gas Cost	***$250,702***
Electricity Cost w/o Cogen*	***$281,915***
Total Utility Cost w/o Cogen*	***$532,617***

Less Actual Cost Paid to Utilities	***-$383,730***

** Calculated using total kWh x average generation & delivery rates of $0.1512 per kWh*

Actual 2022 Cogen Savings	***$148,887***

What That Means for The Towers Community

- Actual Savings of $148,887
- Less Projected Savings of $78,000
- Cogen provided an extra $70,000 of unrestricted funds in 2022
- That money could be used for:
  - 45 more residents receiving meal subsidy opportunity
  - Money towards programs & activities
  - Salaries of non-HUD paid staff (Volunteer Coordinator)
- What about other Green Energy Measures?

THE TOWERS
AT TOWER LANE

Green Energy Measures Currently In Place as of September 2024

- 100 kWh Cogeneration Boiler – Tower One
- Low Flow Water Measures
- Window Caulking & Basic Air Sealing
- LED Light Conversions
  - Tower East – Common Spaces (Individually Metered Apts.)
  - Tower One – Full Building LED Conversion
  - Parking Lot and Admin Office Spaces
- Tower One Boiler Management System
- HE Washer/Dryer Conversion
- Systematic EnergyStar Appliance Replacement

HUD Green Resilient Retrofit Program Comprehensive Award

- The Towers was awarded $20,000,000.00 in a HUD GRRP Comprehensive Award in 2024
- Closing and Funds Available in 2026 with Project End Date – September 2028

- Currently working with partners on concepts for large scale improvements:
  - Fuel Cell
  - Additional Cogeneration Boiler
  - Solar Measures
  - Geo Thermal

Need to address:

- Lack of Backup Generator for Residents Apartments (current just serves common space and mechanicals/elevators)
- Aging Roof
- Lack of HVAC in Common Spaces
- Aging HVAC & Heating Systems

- Very thankful for our work with RWJF and all the partners on this webinar for these next steps to continue to transform The Towers community and serve this vital need.

THE TOWERS
AT TOWER LANE

Co-Generating Gratitude

Solar array at California Indian Museum and Cultural Center. CIMCC was a TAF awardee.
Credit: CIMCC

Climate Smart Technology and Home Medical Devices for Affordable Housing:

Prioritizing Resident Health in Solar+Storage System Design

Marriele Mango, Project Director

CleanEnergyGroup

Resilient Power: What is Battery Storage?

- Automatically islands from grid during an outage to provide backup power to critical loads
- Does not emit pollutants
- Can deliver electric bill savings
- When combined with solar PV, operational if solar is available
- Fuel shortages not an issue
- Supports continuity of services

SimpliPhi batteries at Maycroft Apartments.
Credit: SimpliPhi Power

AB Ford Park Resilience Hub in Detroit, MI.
Credit: Nate Mills, American Microgrid Solutions

Climate Smart Technology and Home Medical Devices for Affordable Housing

Clean Energy Groups Role: Tailored Technical Assistance

- Project-specific **technical assistance grants** solar+storage feasibility studies at affordable housing
  - **Health-focused**: How do we best support medically vulnerable individuals living here?
  - Specialized rubric
- Additional services: **Weatherization assessment**
- CT Green Bank **financing** opportunities included in report out process
- Incorporated state programs, including **CT Energy Storage Solutions program**
- **One-on-one support** from CEG throughout

Health Considerations: **Identify Critical Loads**

Engineer works with affordable housing provider to **identify electricity-dependent health requirements of residents.**

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Occupant Needs	
Mobility-impaired residents on upper floors?	Yes
Temperature-sensitive medical conditions?	Yes
Temperature-sensitive medications?	Yes
Medically dependent on electricity?	Yes
Alternative arrangements (hours)?	0-24
Building Attributes	
Common area gathering space?	Yes
Common area refrigeration?	Yes
Common corridor space?	Yes
Outlets in corridors?	Yes
Common HVAC supply?	No
Master metered?	Yes

System Design Options:
Red Plug vs. Resilience Hub

Red Plug: **Outlet in Each Unit**	**Resilience Hub:** **Community Space**
Allows residents to stay in their home	Recognizable space in the affordable housing complex but residents must be able to get there
One outlet means limited options	Space has heating, cooling, lights, communications, access to staff, refrigeration (or a kitchen) and charging outlets
May be more suitable for short-term power outages or waiting for emergency support	May be more suitable for sheltering-in-place through longer outages due to access to more basic necessities

Ideal System Design:
Both

Red Plug: **Outlet in Each Unit**	**Resilience Hub:** **Community Space**
Allows residents to stay in their home	Recognizable space in the affordable housing complex but residents must be able to get there
One outlet means limited options	Space has heating, cooling, lights, communications, access to staff, refrigeration (or a kitchen) and charging outlets
May be more suitable for short-term power outages or waiting for emergency support	May be more suitable for sheltering-in-place through longer outages due to access to more basic necessities

Case Study

The Towers at Tower Lane, Senior Independent and Assisted Living

Multi-story building
~320 units, Studio, 1 and 2 bedrooms
1 Tower is master-metered
Eligibility: Income Based, 62+

Additional facility information:

Community space with a kitchen and computer center

The Towers at Tower Lane
Credit: AMS

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Health Rubric Indicates….

Potential for red plug and resilience hub

Health critical loads include elevator, refrigeration, outlets for charging medical equipment.

Complexities in having two different meter structures for each Tower.

Occupant Needs	
Mobility-impaired residents on upper floors?	Yes
Temperature-sensitive medical conditions?	Yes
Temperature-sensitive medications?	Yes
Medically dependent on electricity?	Yes
Alternative arrangements (hours)?	Indefinite
Building Attributes	
Common area gathering space?	Yes
Common area refrigeration?	Yes
Common corridor space?	Yes
Outlets in corridors?	Yes
Common HVAC supply?	Partial
Master metered?	Only Tower One

Health Rubric Indicates….

Electric Load Selection
Common area lighting
Common area HVAC
Common area outlets
Elevator
Unit lighting
Unit refrigerator
Unit HVAC
Unit additional outlet(s)

Alternative Resilience Options	Applicability
Individual space heaters	N/a
Individual air circulation fans	N/a
Unit uninterruptible power supply	Yes
Full building backup	Yes

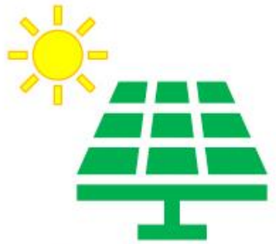
Summary Results

	Tower East	
	Resilient Power$_{1E}$ Solar+Storage	**Resilient Power$_{2E}$** Solar+Storage
Solar	33 kW	138 kW
Battery	500 kW / 1.1 MWh	500 kW / 2.2 MWh
Generator (planned)	400 kW	400 kW
Financial (forecasted)		
Capital Cost	$1,212,300	$2,155,800
Capital Cost After ITC Rebate	$727,400	$1,293,500
Y1 Utility Savings & Incentives	$635,300	$916,200
NPV @6%, 20 years	$224,500	$184,800
Sustainability (forecasted)		
Renewable Generation (kWh)	38,915	128,671
Usage Offset by Renewables	5%	24%
Carbon Offset (metric tons)	28	91
Resilience (forecasted)		
Resilient Load Support (no gen)	11 hours typical 5 hours minimum	26 hours typical 14 hours minimum
Resilient Load Support (w/ gen)	> 7 days	> 7 days

Battery

The battery is selected to provide a baseline level of backup power without the generator

Solar



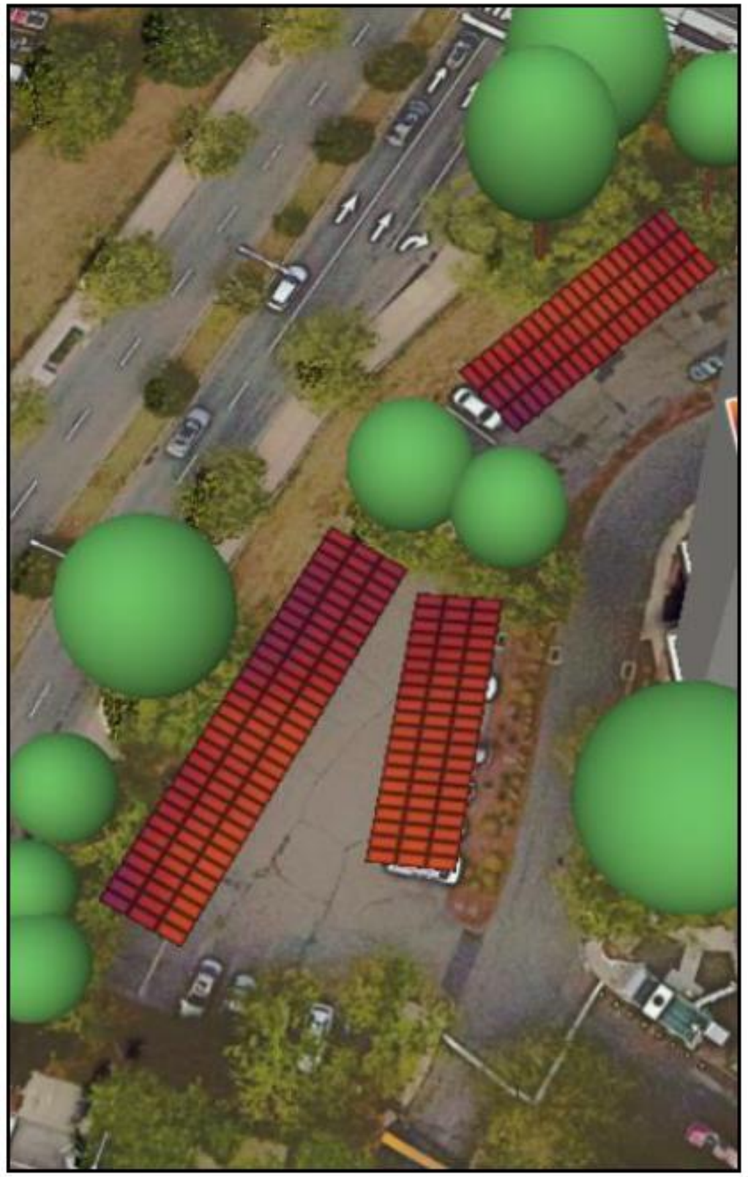
Solar panels supplement the battery's stored energy and extends the duration of backup without the gen.

Generator

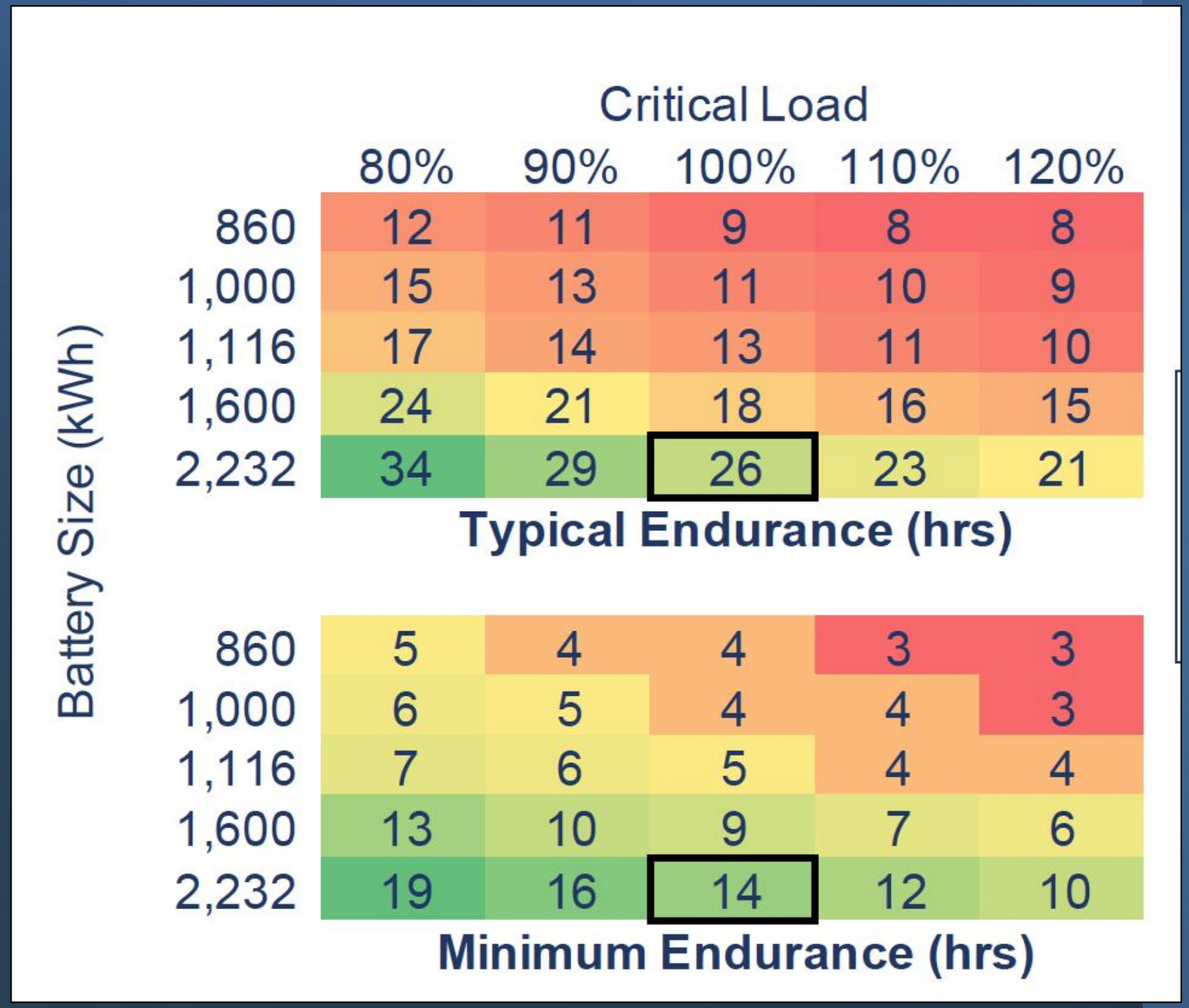
The generator provides backup that is weather-independent.

Solar

Design	Tower East *Resilient Power*$_{1E}$	Tower East *Resilient Power*$_{2E}$
Capacity	33 kW	138 kW
Production (Y1)	38,915 kWh	128,671 kWh
% of annual electric usage	5%	24%
Turnkey Installation Cost	$3.40 / W ($112,250)	$4.34 / W ($599,545)
Operations and Maintenance (O&M)	$830 / year	$1,690 / year
Inverter replacement, year 16 (Note: panel lifespan is 25 years)	$3,960	$16,560
Operating Incentives	Residential Renewable Energy Sol	
Notes	• All designs are preliminary and conceptual • Capacity of roof to host solar must be verified • All references to solar installation size reflect kW_{DC} noted	



Tower East Resilience



Entire Building Resilience

CT Energy Storage Solutions	State program eligible for Eversource and UI customers Provides up-front incentive for battery installation ($600 / kWh for Low-Income Residential Systems, limited at $16,000 per residence) Provides 10 years of operational incentives for batteries that will discharge when called on by the utility during peak demand hours totaling $225 / kW per year in years 1-5 and $130 / kW in years 6-10:
Residential Renewable Energy Solutions (RRES) Program (master metered)	State program provides Eversource and UI residential and multifamily housing customers the opportunity to choose a Buy-All compensation for all on-site solar generation at a value of $0.3189 / kWh as of 2024. Additionally, there are adders available, which increase the total incentive. For these facilities, there is a low-income adder of $0.055 / kWh included bringing the total incentive value up to $0.3739 / kWh. There are different rules for master-metered and individually-metered facilities on how the incentive must be shared with the tenants. • Individually-metered multifamily facilities are required to share the revenue from the program at a 20/80 tenant/facility share. **This makes the effective incentive rate to $0.2991 / kWh for Tower East.** • Master-metered multifamily facilities are required to invest **25% of the NPV of the RRES tariff on building upgrades for in the first year, which is applicable for Tower One.**

Financial Summary Tower East

	Resilient Power$_{1E}$			Resilient Power$_{2E}$		
Solar			33 kW			138 kW
Battery			500 kW / 1,116 kWh			500 kW / 2,232 kWh
Capital Cost			$1,212,300			$2,155,800
ITC			$484,900			$862,300
Capital Cost After ITC			$727,400			$1,293,500
IRR			16.3%			10.7%
NPV @6%, 20 years			$224,500			$184,800
Simple Payback (years)			2.3			4.2
Utility Savings	**First Year**	**Second Year**	**20 Years**	**First Year**	**Second Year**	**20 Years**
Energy Savings	$247	$434	$25,175	$4,094	$4,348	$109,887
Demand Savings	$24,423	$25,342	$619,044	$27,142	$28,824	$766,562
Other Savings	$382	$406	$10,497	$765	$812	$20,994
Revenue & Cash Flow	**First Year**	**Second Year**	**20 Years**	**First Year**	**Second Year**	**20 Years**
Total Utility Savings	$25,053	$26,182	$654,717	$32,000	$33,985	$897,443
Incentive – RRES	$11,640	$11,582	$222,074	$38,488	$38,296	$734,272
Incentive – CT ESS	$597,468	$46,983	$910,400	$841,894	$63,150	$1,262,502
O&M Expenses	($8,294)	($8,460)	($201,522)	($13,618)	($13,890)	($330,882)
Replacement CapEx	$0	$0	($360,820)	$0	$0	($607,780)
Capital Cost After ITC	--	--	($727,361)	--	--	($1,293,455)
Cash flow	**$625,867**	**$76,288**	**$497,487**	**$898,765**	**$121,540**	**$662,101**

Federal Investment Tax Credit (ITC)	**This project qualifies for 30% ITC, 10% energy community adder, plus the 20% residential low-income adder. The 20% residential low-income adder is awarded by lottery and, therefore, not included in this analysis.**

ITC Adder Impact
Tower East

	Resilient Power$_{1E}$			Resilient Power$_{2E}$		
Solar	33 kW			138 kW		
Battery	500 kW / 1,116 kWh			500 kW / 2,232 kWh		
Capital Cost	$1,212,300			$2,155,800		
	40% ITC (Energy Community)	50% ITC (Low-Income)	60% ITC (EC + Residential Low-Income)	40% ITC (Energy Community)	50% ITC (Low-Income)	60% ITC (EC + Residential Low-Income)
ITC Rebate	$484,900	$606,100	$727,400	$862,300	$1,077,900	$1,293,500
Capital Cost After ITC Rebate	$727,400	$606,100	$484,900	$1,293,500	$1,077,900	$862,300
IRR	16.0%	22.1%	29.0%	10.0%	15.1%	21.2%
NPV to Host @6%, 20yrs	$224,500	$332,400	$440,300	$184,800	$376,600	$568,500
SPP	2.3	1.0	0.9	4.2	2.5	1.0
20-year Cash Flow (non-discounted)	$497,487	$618,713	$739,940	$662,101	$877,676	$1,093,252

ENERGY STAR® Statement of Energy Performance Tower One

Score: 31	
Building Characteristics	
Primary Property Type	Multifamily Housing
Gross Floor Area	129,878 ft2
Built	1967
Energy Consumption and Energy Use Intensity (EUI)	
Site EUI	123.7 kBtu/ft2
Source EUI	143.2 kBtu/ft2
Annual Energy by Fuel	
Natural Gas	15,066,422 kBtu (94%)
Electric - Grid	993,788 kBtu (6%)
Fuel Oil	0 kBtu (0%)
National Median Comparison	
National Median Site EUI	109.2 kBtu/ft2
National Median Source EUI	126.5 kBtu/ft2
% Difference from National Median Source EUI	13%
Annual Emissions	
Total GHG Emissions	872 Metric Tons CO2e/year

LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance Tower East

Score: 81	
Building Characteristics	
Primary Property Type	Multifamily Housing
Gross Floor Area	118,264 ft2
Built	1981
Energy Consumption and Energy Use Intensity (EUI)	
Site EUI	57.5 kBtu/ft2
Source EUI	97.4 kBtu/ft2
Annual Energy by Fuel	
Natural Gas	4,304,888 kBtu (63%)
Electric – Grid	2,500,014 kBtu (37%)
Fuel Oil	0 kBtu (0%)
National Median Comparison	
National Median Site EUI	728.8 kBtu/ft2
National Median Source EUI	123.2 kBtu/ft2
% Difference from National Median Source EUI	-21%
Annual Emissions	
Total GHG Emissions	409 Metric Tons CO2e/year

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ENERGY STAR® Statement of Energy Performance

- The ENERGY STAR® score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.
- ENERGY STAR® performance documents summarize important energy information and building characteristics. They can help you to:
  - Satisfy requirements for various green building certification programs, such as LEED, Green Globes, BREEAM, and IREM Certified Sustainable Properties.
  - Document performance in energy service contracts.
  - Communicate energy performance with tenants, owners, potential buyers/renters, and the general public.
  - Provide transparency and accountability to demonstrate strategic use of capital improvement funding.
  - Quickly and accurately demonstrate savings for an individual building.

The National Risk Index is a dataset and online tool that can be used to help illustrate the United States communities most at risk for 18 hazard types

The National Risk Index is intended to help users better understand the natural hazard risk of their communities.

FEMA Resilience Score

Hazard Types		
Avalanche	N/A	N/A
Coastal Flooding	Relatively Moderate	94.6
Cold Wave	Relatively Moderate	57.7
Drought	Relatively Moderate	91.2
Earthquake	Relatively Low	86.6
Hail	Very Low	28.5
Heat Wave	Relatively Low	58.8
Hurricane	Relatively High	96.6
Ice Storm	Relatively High	90.5
Landslide	Relatively Moderate	89.7
Lightning	Relatively High	96.8
Riverine Flooding	Relatively Low	70.3
Strong Wind	Relatively Moderate	87.7
Tornado	Relatively Moderate	85.5
Tsunami	N/A	N/A
Volcanic Activity	N/A	N/A
Wildfire	Very Low	41.6
Winter Weather	Relatively Moderate	67.0

Risk Index: 94.46

- The Risk Index rating is **Relatively Moderate** for New Haven County, CT when compared to the rest of the U.S.
- Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability, and Community Resilience

Expected Annual Loss: 94.68

- In New Haven County, CT, expected loss each year due to natural hazards is **Relatively Moderate** when compared to the rest of the U.S.
- Expected Annual Loss scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios for 18 hazard types

Social Vulnerability: 65.12

- Social groups in New Haven County, CT have a **Relatively High** susceptibility to the adverse impacts of natural hazards when compared to the rest of the U.S.
- Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control (CDC).

Community Resilience: 82.53

- Communities in New Haven County, CT have a **Very High** ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions when compared to the rest of the U.S.
- Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).

Thank You

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Upcoming Webinars

An Assessment of Equity in Massachusetts' Energy Storage Programs (10/8)

Sharing Solar Benefits with Multifamily Renters: A Mississippi Case Study (10/30)

Expanding Clean Energy Access and Benefits: Award-Winning Programs in Connecticut and Maryland (11/19)

Read more and register at www.cleanegroup.org/webinars

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