COMMUNITY PLANNING & DEVELOPMENT

Energy Investments for Disaster Resilience

Climate Resilience Webinar Series

U.S. Department of Housing and Urban Development

Disclaimer

- This presentation is intended to provide communities and states with the tools and information to help in climate resilience planning and activities.
- Information presented in this webinar is independent of the Notice of Funding Availability (NOFA) for the National Disaster Resilience Competition (NDRC). While we expect that this information will be useful to interested communities and eligible applicants, *it should not be construed as the definitive word on any singular approach to resilience*.
- All NOFA NDRC questions should be sent to: resilientrecovery@hud.gov

Presenter

- *USGBC*
  - *Jason Hartke*
- *Clean Energy States Alliance*
  - *Rob Sanders*

Agenda

1. Overview
2. Energy and Resiliency
3. Synergy: Integrating Resiliency
4. Clean Energy Group's Community Resilient Power Work
5. A Baltimore Case Study
6. Finance Options
7. Resilient Power Programs and Projects

The Next Leadership Challenge: Advancing the Resiliency Agenda

A Multi-Layered Engagement

"From the White House to the State Houses, City Halls to community leaders, the private sector to the civil society organizations, we need to set new standards for resilience."

A New Agenda

"The resiliency agenda will require a deep and profound reassessment of our priorities."

A Preparedness Agenda

"We need to be ready, not surprised"

An Action Agenda

"While the human condition can never be free of risk, if we are to have regrets, let us not regret our inaction"

Resilient Buildings, Resilient Cities

Our Focus:

- ✓ **Synergy**
- ✓ **Connectivity**
- ✓ **Capacity**

August 2013

U.S. GREEN BUILDING COUNCIL

RESILIENT BUILDINGS AND CITIES

A MORE RESILIENT SOCIETY

The world is more interconnected, more urbanized, more complex and yet more fragile than ever. In the past year, the United States has suffered through 14 separate billion-dollar disasters. In the last two years alone, the country has lost nearly $200 billion dollars in damages from disasters. In the face of these multidimensional threats, hazards and disasters, we've learned that none of us is immune. We're all vulnerable. Four out of five Americans live in places hit by weather-related disaster since 2006. The number of people affected by climate-related natural disasters is expected to jump by more than 50 percent in just two years. At the same time, the bones of our economy are slipping into disrepair, too often neglected and ignored. In fact, the nation's infrastructure, which supports everything that makes our economy go, is facing an investment gap of $1.6 trillion. The challenge is clear. We need a forward-thinking framework to address the vagaries of a changing climate and this new era of risk and vulnerability. Resilience is the right paradigm to develop the institutional foresight and broad societal understanding and solutions needed to foster a stronger America. To help realize a more fortified future, we are playing our role to create and support a more resilient built environment.

"Being green is one part of being resilient"
-William Craig Fugate, Administrator, FEMA

ADVOCACY AND OUTREACH

Resilient Communities for America

Resilient Communities for America is a national campaign that will mobilize thousands of U.S. mayors and other local elected leaders who pledge to create more resilient cities, towns and counties playing a leadership role in creating a safer, stronger and more sustainable future.

RESILIENT COMMUNITIES FOR AMERICA

Strengthening the Resiliency of Our Nation on the Ground (STRONG) Act of 2012

Most pieces of legislation start with a series of customary "findings." However, the findings section of the Strengthening the Resiliency of Our Nation on the Ground (STRONG) Act of 2012 reads like a biblical warning.

It points out that:

- There have been 130 separate billion-dollar-plus disasters in the U.S. in the past 30 years (14 in 2011 alone).
- Hurricane Sandy led to more than 100 deaths and is projected to have caused more than $50 billion in damages, affecting more than 8.5 million homes.
- Hurricane Katrina led to more than 1,800 deaths and more than $80 billion in losses and a subsequent $120 billion in federal spending.
- 2011 was the worst year on record for damages from natural disasters.
- Extreme weather has hit every region in the U.S. this year.

Interpreting these findings is simple. The strength and resiliency of our country is at risk, and our increasing vulnerability is exposed more and more each year. The goal of the act is to offer new ways to better support state and local governments, as well as the American public, in their short- and long-term preparedness efforts. For example, an

AND URBAN DEVELOPMENT

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How We're Organizing to Meet the Challenge

Advocacy & Outreach

→ A National Campaign: RC4A
→ Leadership Speaker Series
→ Policy Platform

Research & Resources

→ The New Orleans Principles
→ Sustainable Rebuilding Guidelines
→ Green Buildings and Climate Resilience
→ Climate Resiliency Screen Tool

Partnerships & Initiatives

→ Community Resiliency Task Force
→ Resiliency Initiative on Global Urban Readiness (RIGUR)
→ ICLEI, USCM, NLC, C40, BGA, CGI

The Case for Strong Buildings

A First Defense in Safeguarding Our Cities

→ Where we live, work, learn and play

→ Buildings are the focus of commercial activity

→ As assets, they represent huge economic value

→ We spend 90% of our time in buildings (shelters from the storm)

The Art of Being Prepared

Vulnerable to What?

RESILIENT BUILDINGS = ULTIMATE PLACED-BASED VULNERABILITY ASSESSMENT

→ Regional climate sensitivities (i.e., localized threats such as rising seas or floods or droughts)

→ Building connections (i.e., to the grid, transportation systems, water, etc.)

→ Building location adaptive responses

Vulnerable to What?

For example…

→ Analysis defies conventional wisdom
→ Annual electricity up 4-11%
→ Annual NG up 24-36% bc of colder winters

→ Top 3 technologies to adapt:
- ➢ Improved roof insulation
- ➢ Upgrade water chillers
- ➢ Energy recovery ventilation

NASA's Stennis Space Center

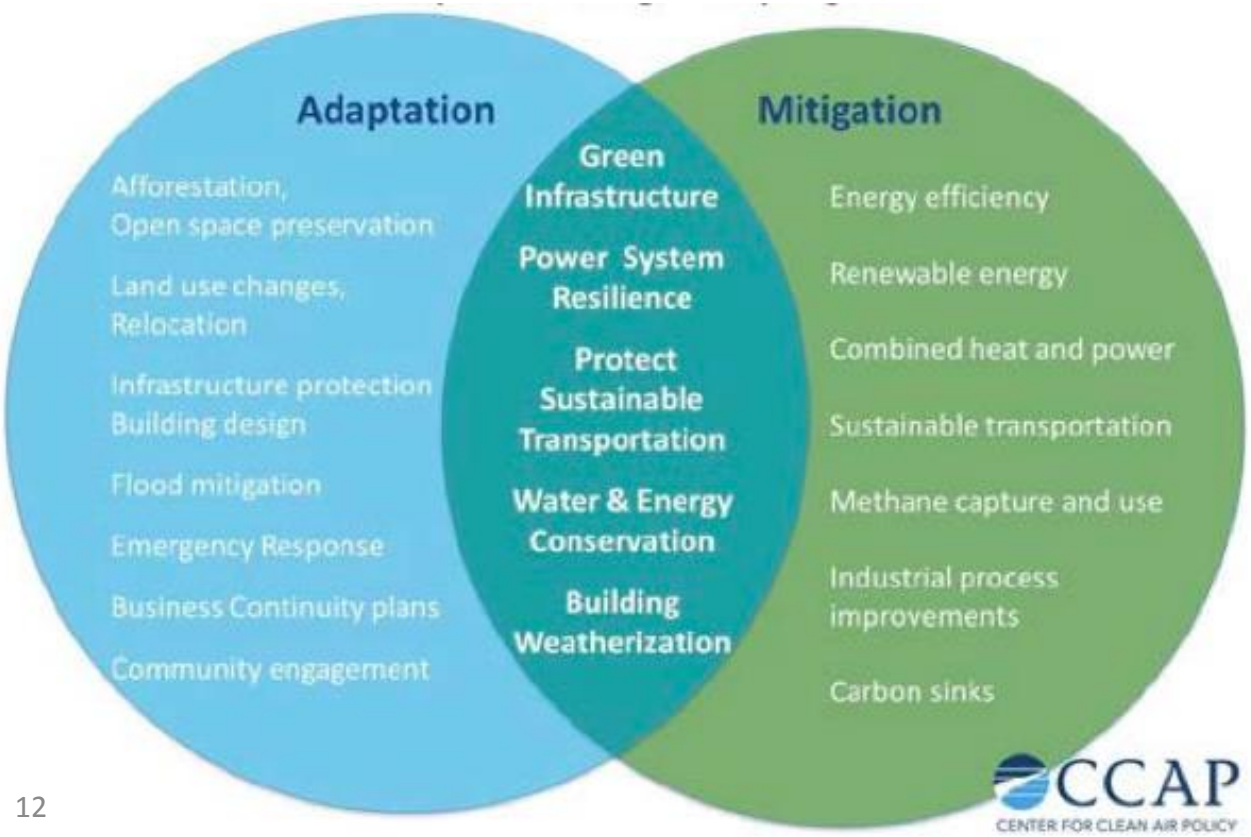
- All scenarios indicated cooler winters.
- One scenario said warmer summers required **lower** cooling loads. (because drier conditions reduced the need for dehumidification)
- Off-the-shelf technologies addressed all adaptations required.
- The danger of averages: conditions in the study location were significantly different than locations even 100 miles away, where a different suite of technologies would be required.

Connecting the Dots

ADAPTATION + MITIGATION SYNERGIES

→ Identify strategies

→ Maximize use



Synergy: Hitting the Ground Running

"Being green is one part of being resilient"

-William Craig Fugate, Administrator, FEMA

Integrating Resilience

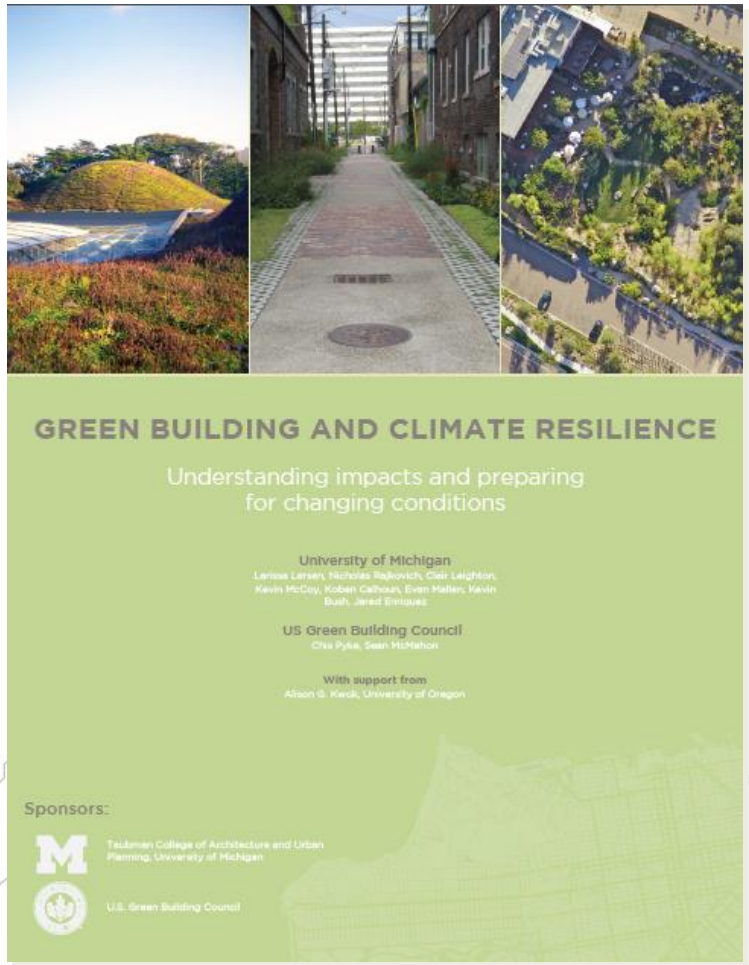
→A new dimension to existing decisions.

→An opportunity to prepare for future conditions.

→An opportunity to enhance and sustain performance.

Synergy: Green *and* Resilient

1. Analyzed the climate change effects on the built environment.
2. Linked resilient and adaptive building strategies to green building.
3. Identified specific strategies and gaps.
4. Developed a tool to maximize resiliency best practices



‘No Regret’ & Resilient Strategies

	No Regrets	Resilient
Envelope	7	17
Siting and Landscaping	12	8
Heating, Cooling, & Lighting	11	1
Water and Waste	6	3
Equipment	3	6
Process & Operations	4	3

CLIMATE MITIGATION & ADAPTATION CO-BENEFITS

ENERGY EFFICIENCY (EE)

MITIGATION

→Energy savings

→Reduced Emissions

ADAPTATION

→Reduces a building's dependence on centralized energy grid

→Reduces risk of power disruptions

Building Performance

Buildings are designed based on historic conditions

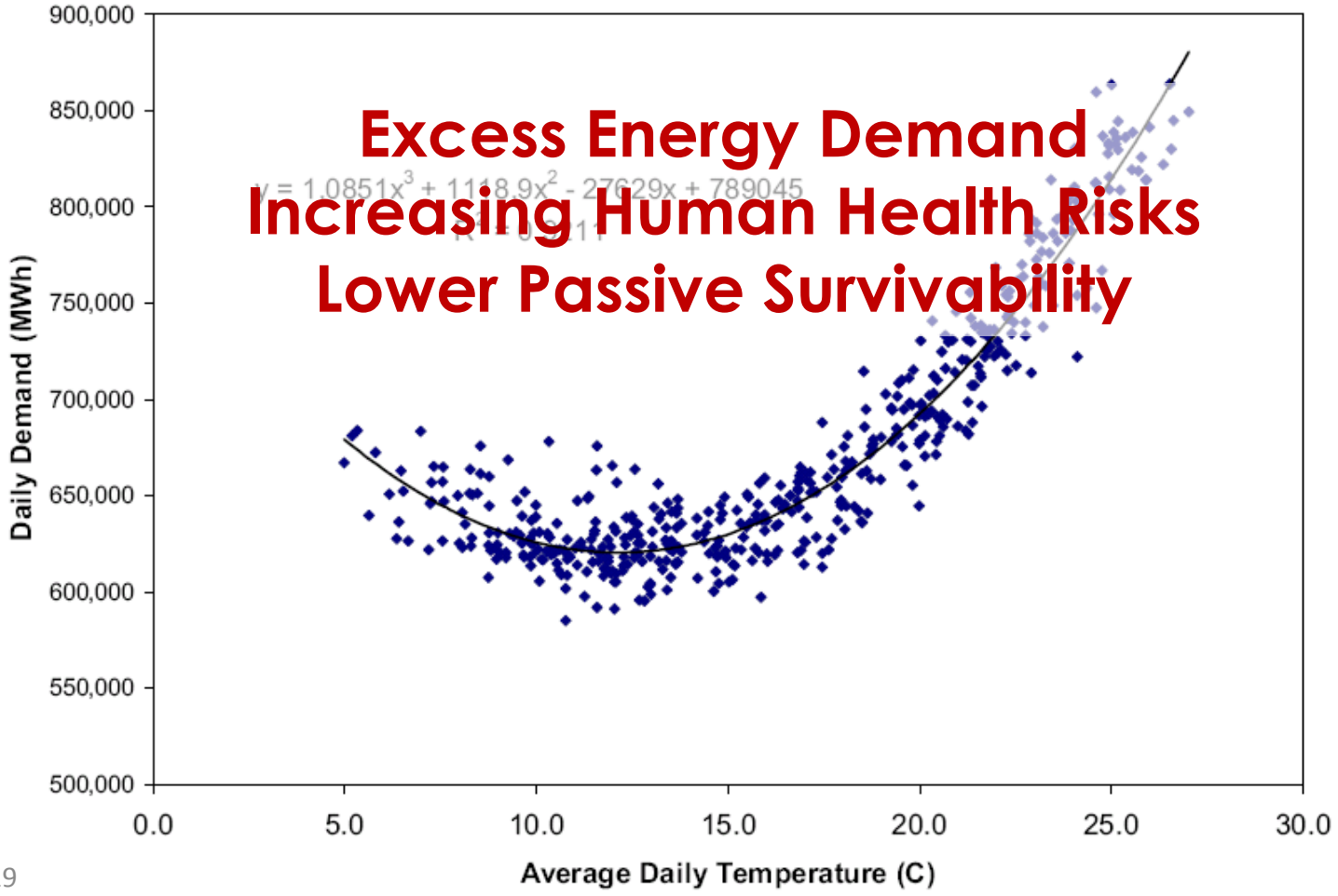
e.g., Typical Meteorological Year

Future conditions are unlikely to match historic assumptions

e.g., *minimum* rise of 1.5˚ C by 2020; potential for >5˚ C

Building Performance

Preparing for Future Conditions

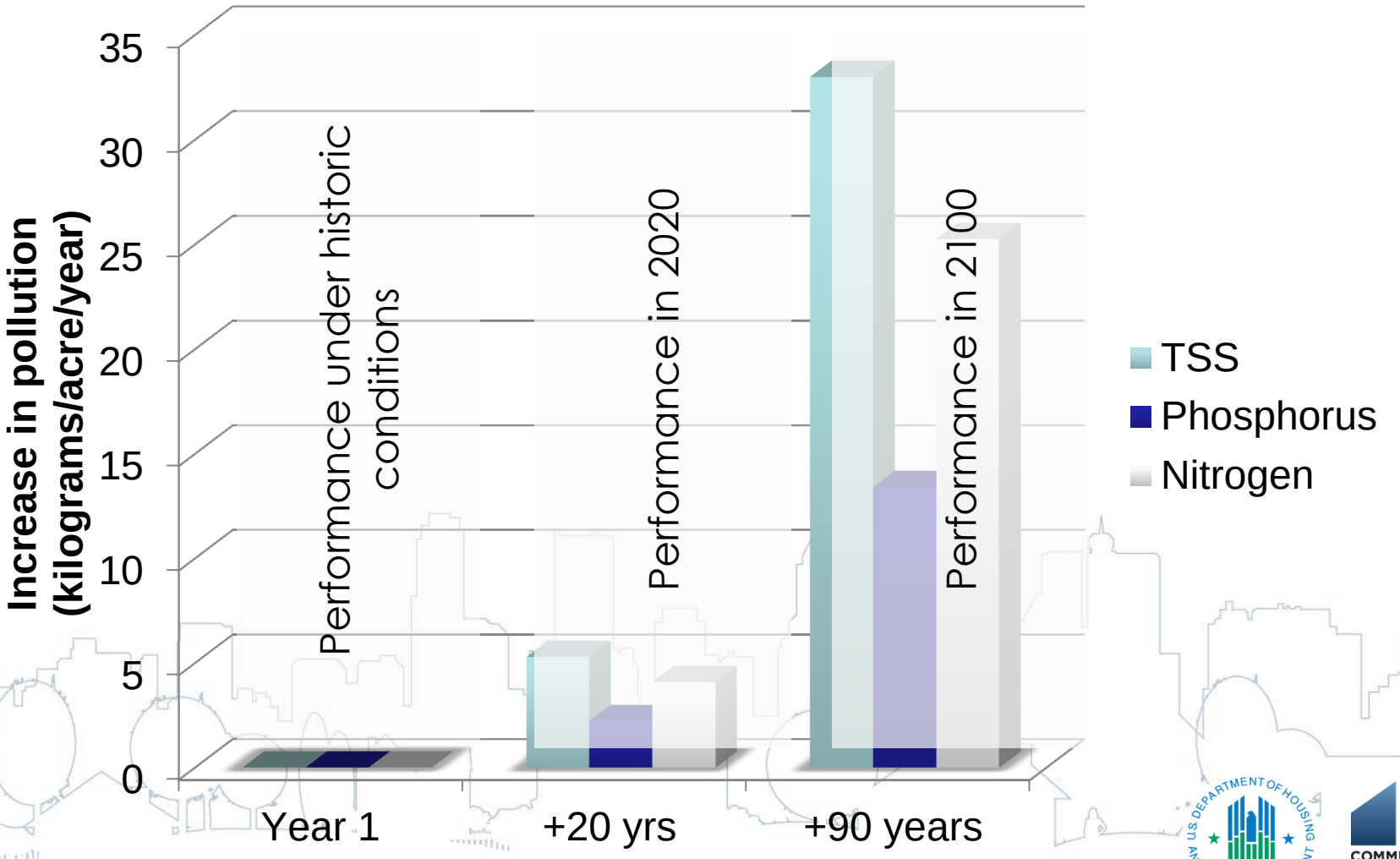


Stormwater Management

Stormwater control strategies are based on historic design storms
e.g., storm intensity, frequency

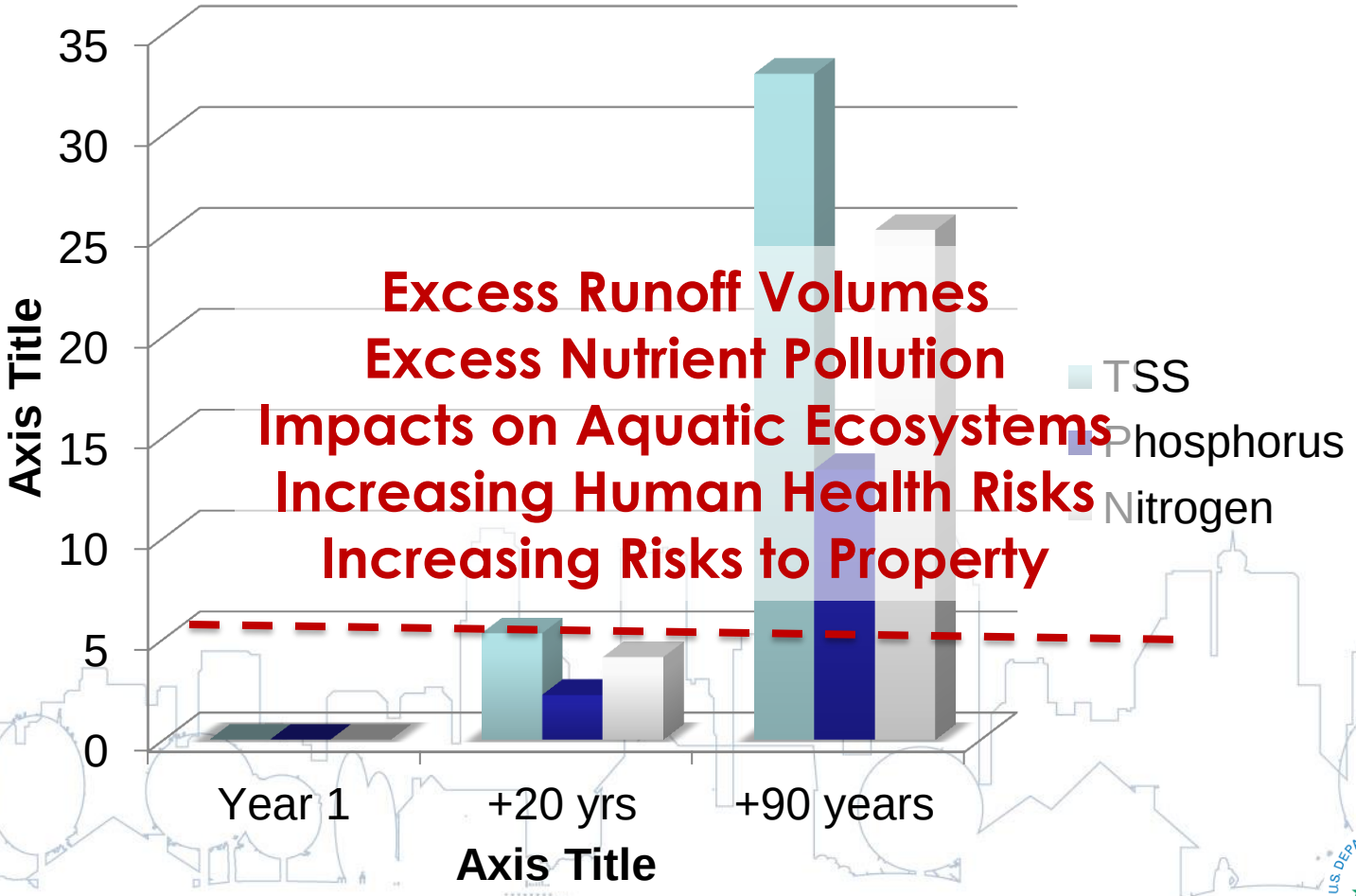
Trends indicate an increased frequency of high-intensity precipitation events
e.g., in New England +28% in 20 years, +127% in 90 years

Change in Runoff



Source: Pyke, Warren, et al. (2011) Assessment of low impact development for managing stormwater due to climate

Changes in Runoff



Source: Pyke, Warren, et al. (2011) Assessment of low impact development for managing stormwater due to climate climate

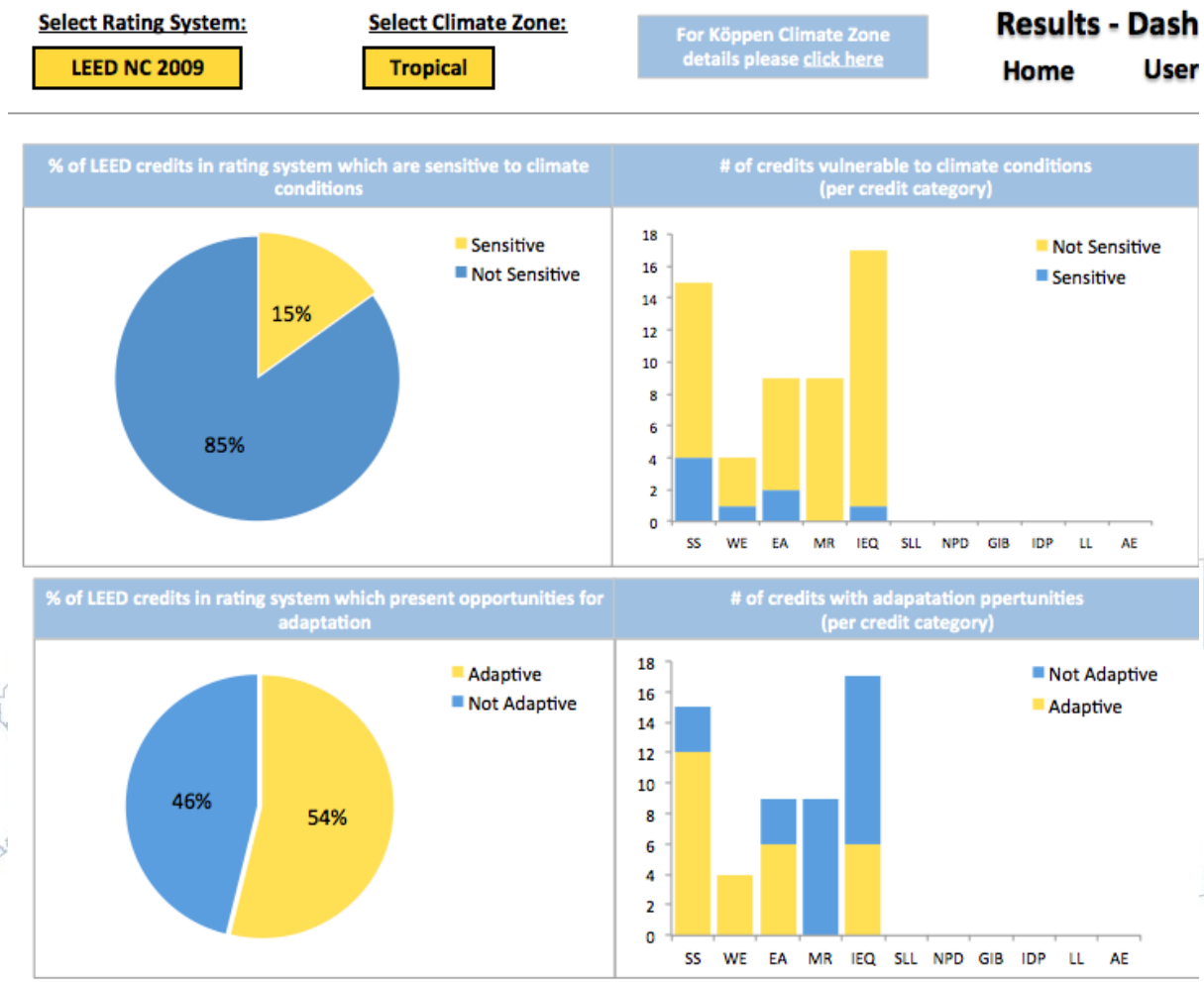
HOW DO WE MAXIMIZE THESE CO-BENEFITS ACROSS CATEGORIES (energy, water, etc)

The LEED Climate Resilience Screening Tool

→Provides **a practical framework** to identify climate sensitivities and prioritize opportunities to promote resilience through green building practice

How do we maximize these co-benefits

The LEED Climate Resilience Screening Tool



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How do we maximize these co-benefits

WHAT THE TOOL TELLS US:

→ A significant number of commonly used green building strategies rely on assumptions about historical climatic conditions.
- Thus, **future conditions will put performance at risk**.

→ A large set of green building strategies help promote climate resilience.
- For example, the LEED ND rating system in temperate climate zone has **40% of its credit outcomes sensitive to changing climate conditions** and **78% of its credits offer resiliency opportunities**.

→ Variations exist in the results among different rating systems.
- The largest variations are found in tropical and coastal climate zones, indicating a high vulnerability to storm surge/sea level rise, extreme heat & humidity.

What's Next?

Insights for key stakeholders

→ **Policymakers** can use the tool to identify which LEED system and credits enhance resilience, providing reference for policy creation and building standards

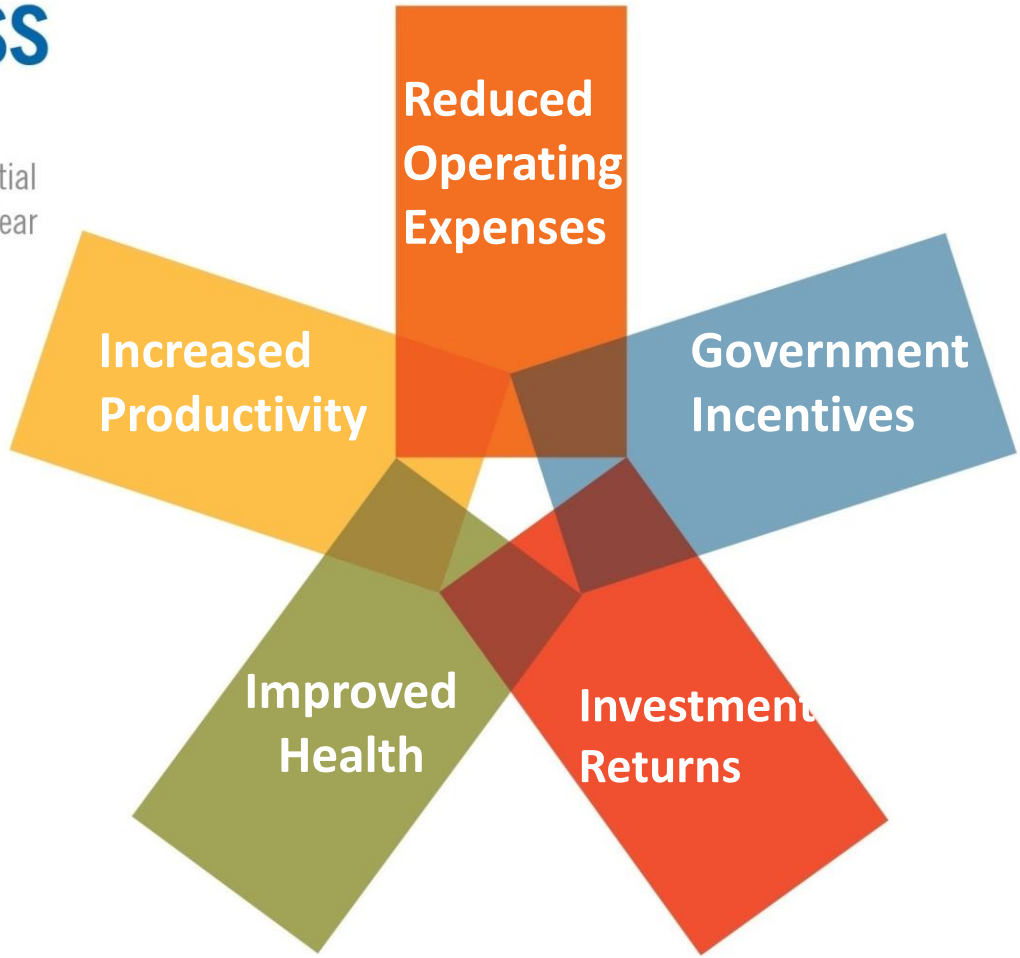
→ **Green building project teams** can apply the framework to identify and target credits that offer the best adaptation opportunities

→ **Rating system developers** can use the tool to evaluate LEED credit performance and help recommend new resilience credits

Making the Business Case

WHAT IS THE BUSINESS CASE?

Green building provides substantial financial benefits, making it a clear triple-bottom line win.



RESILIENT POWER

A Project of Clean Energy Group

Energy Investment for Disaster Resilience in Low Income Communities

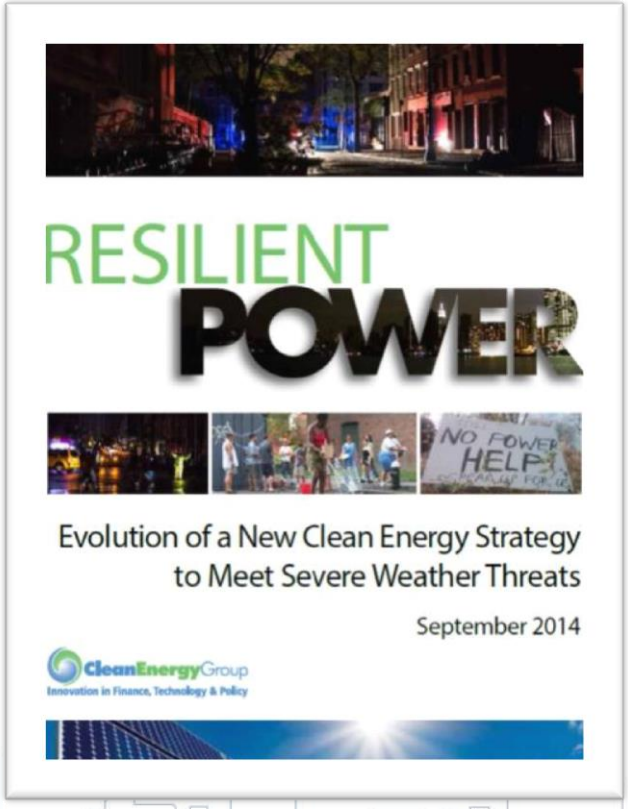
November 21, 2014

Robert Sanders, Clean Energy Group
Senior Finance Director

CleanEnergyGroup
Innovation in Finance, Technology & Policy

U.S. Department of Housing and Urban Development
Community Planning and Development

Who We Are



CleanEnergyGroup
Innovation in Finance, Technology & Policy

Meridian Institute
Connecting People to Solve Problems

CleanEnergy States Alliance

THE JPB FOUNDATION

SURDNA FOUNDATION
Fostering sustainable communities in the United States

THE KRESGE FOUNDATION

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resilient-power.org

cleanegroup.org

History of CEG and Resilient Power

THE NEW YORK TIMES **OP-ED** TUESDAY, JULY 13, 1999

The Lesson Hidden In the Blackout

By Lewis Milford

MONTPELIER, Vt.

Security Managers Institute NEWS

Winter 2003

Distributed Power Generation for Homeland Security:

Proposal for a New Federal and State Partnership

ENERGY SECURITY & EMERGENCY PREPAREDNESS

How Clean Energy Can Deliver More Reliable Power for Critical Infrastructure and Emergency Response Missions

An Overview for Federal, State and Local Officials

Prepared by Clean Energy Group

OCTOBER 2005

CleanEnergyGroup
Innovation in Finance, Technology & Policy

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Home / Blog / Sandy's Power Outages: We Can, And Should, Do Better

Sandys Power Outages: We Can, And Should, Do Better

Latest Blog

CATEGORIES

- Clean Energy Finance
- Clean Energy Innovation
- Clean Energy States Alliance
- Offshore Wind Accelerator Project
- Resilient Power and Climate
- Getting Gas Right: A New Strategy for a No-Carbon Future
- Northeast Wind Resource Center (NWRC)

November 16, 2012 | by Lewis Milford, CEG

Sandy's Power Outages: We Can, And Should, Do Better

Category: Clean Energy Innovation, Resilient Power and Climate 0 Comments

I'm looking in disbelief at images of Sandy's destruction in New York and New Jersey. I grew up near the Jersey Shore, so this is personal. It's bad up there: lines for rationed gasoline, homes and businesses destroyed, and millions of people still without electricity.

RESILIENT POWER

A Project of Clean Energy Group

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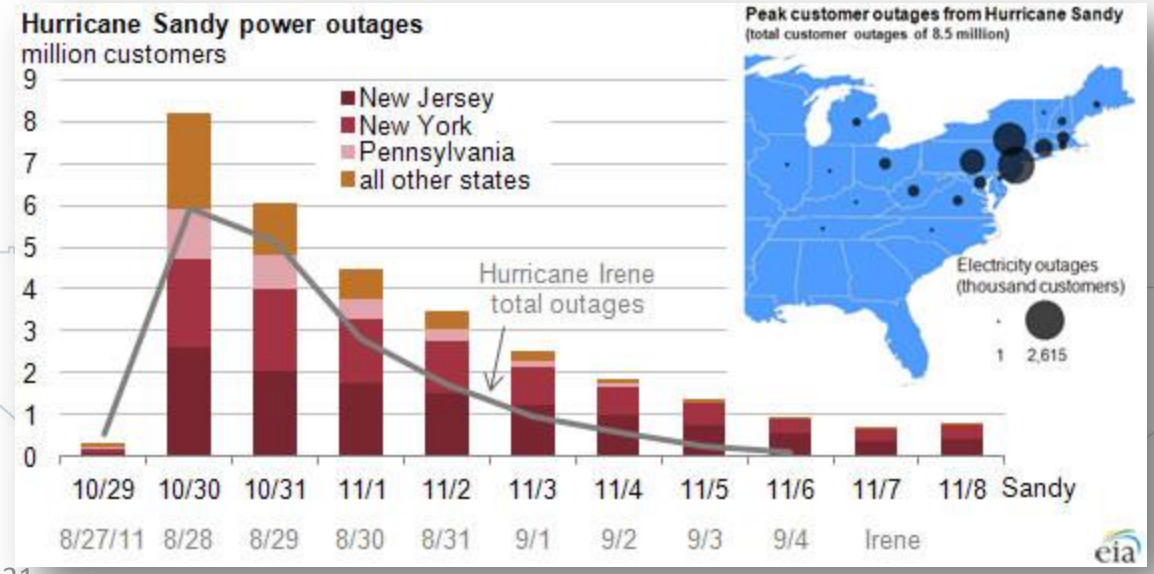
Sandy and Power

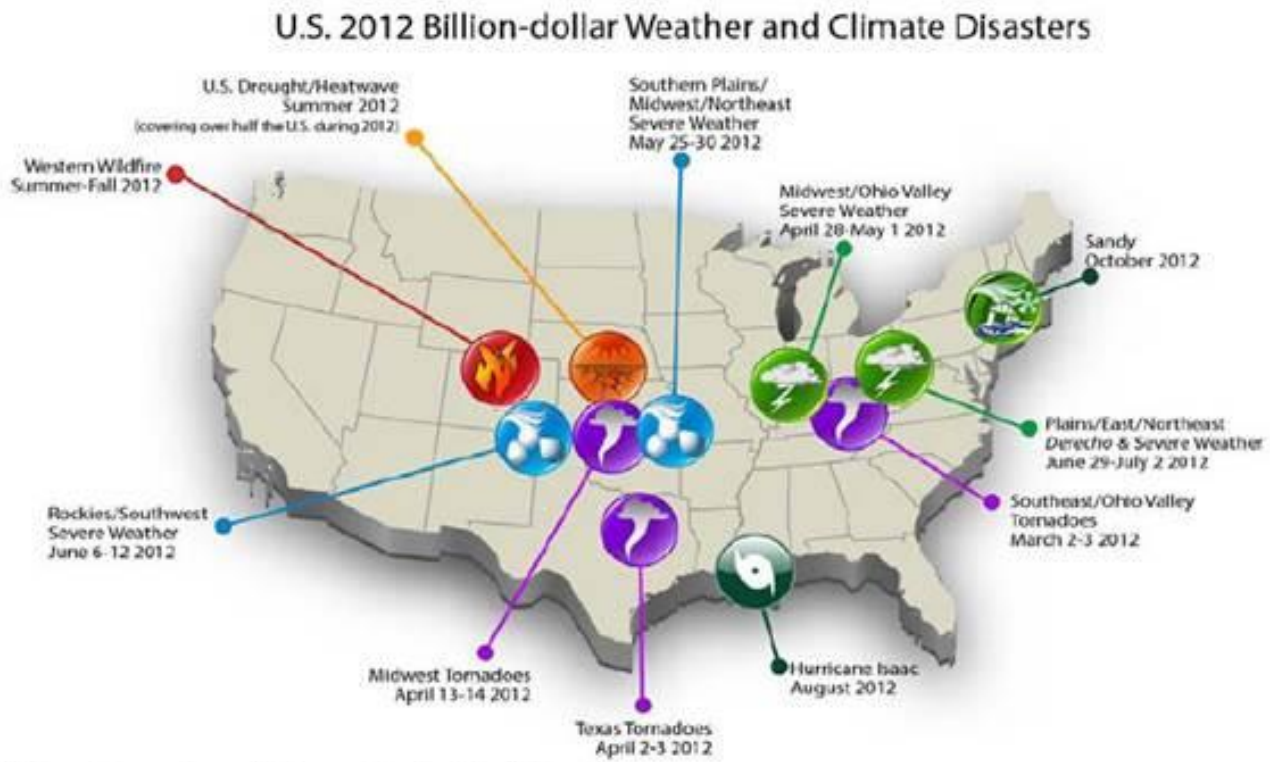
"Extensive power outages during Sandy affected millions of residents and resulted in substantial economic loss to communities. Despite the size and power of Hurricane Sandy, this was not inevitable: resilient energy solutions could have helped limit power outages."

Hurricane Sandy Rebuilding Strategy: Stronger Communities, A Resilient Region (Aug. 2013)



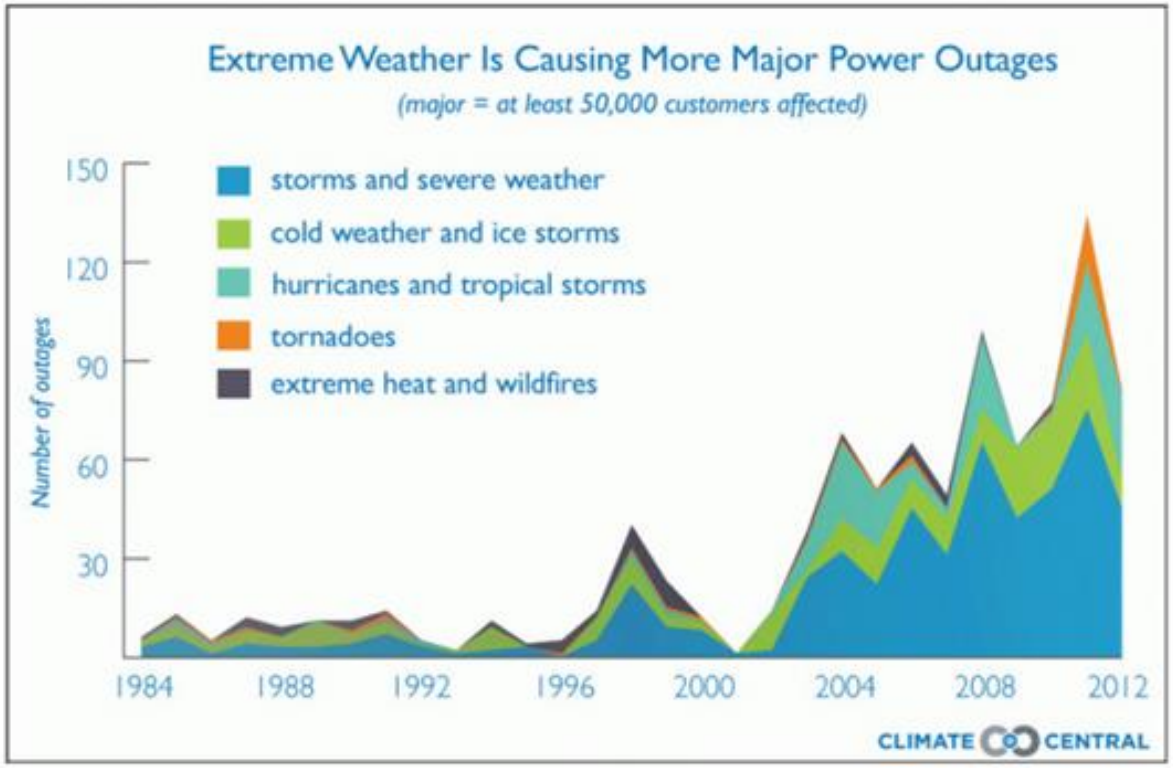
"The fact that the NYU hospital is dark but Goldman Sachs is well-lit is everything that's wrong with this country."

Extreme Weather Events & Power Outages

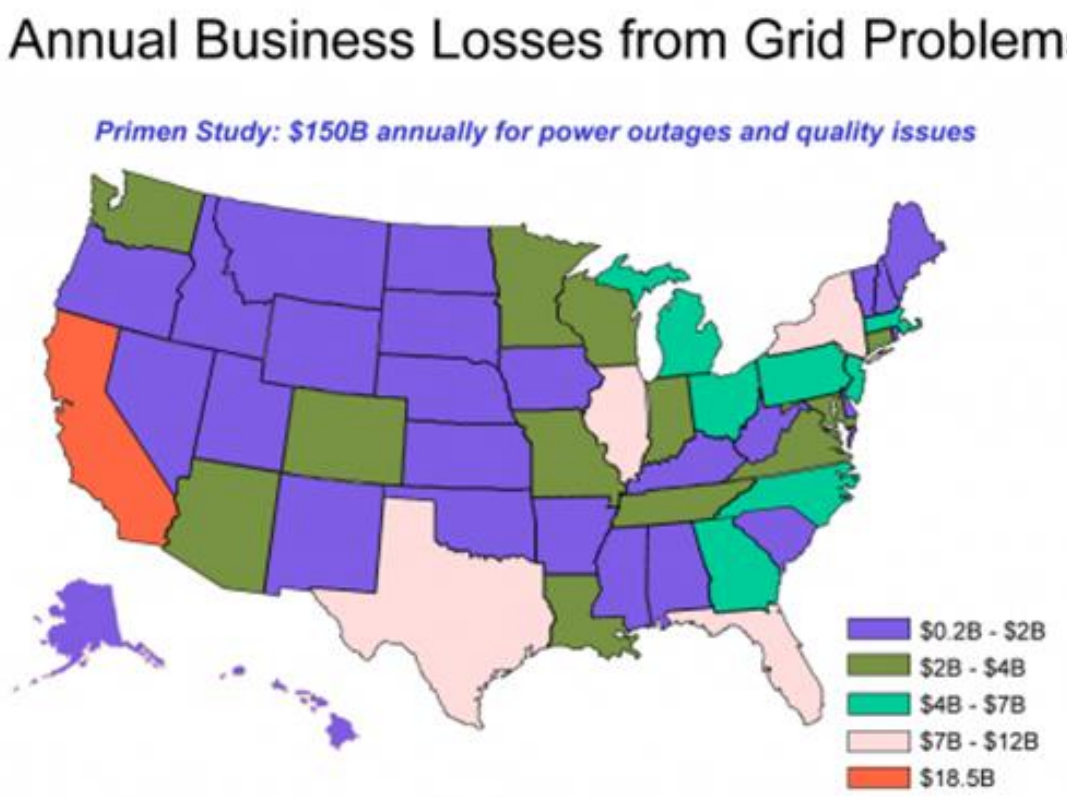


Source: National Oceanic and Atmospheric Administration

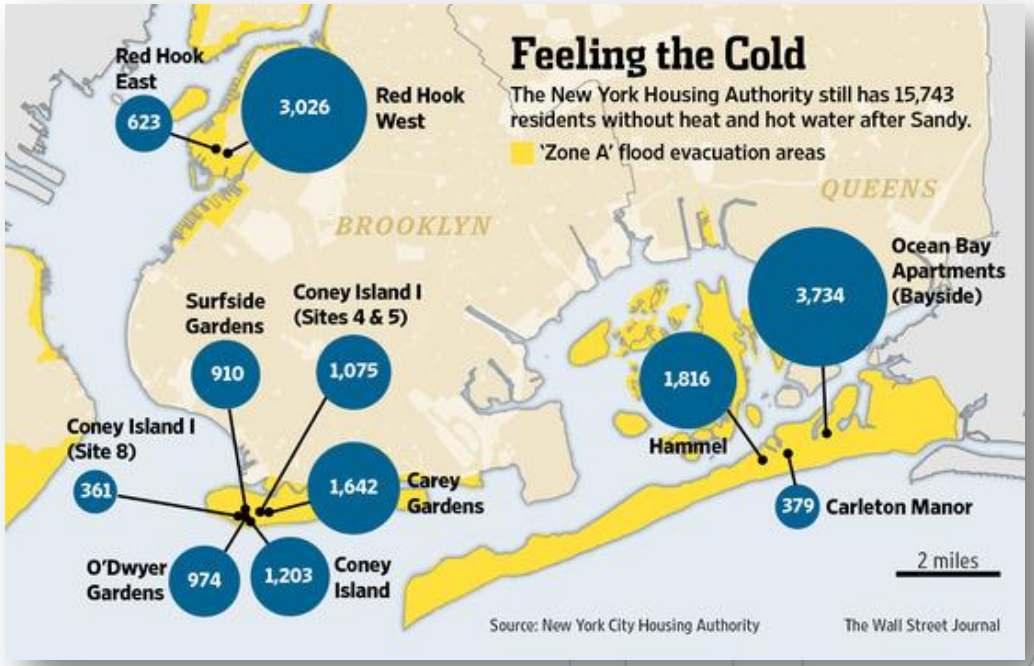
Extreme Weather Events & Power Outages



Extreme Weather Events & Power Outages



Extreme Weather and Low-Income Communities



- Extreme weather causes power outages and higher electricity prices—disproportionately affecting the poor and vulnerable.
- Severe climate-related, weather events cause disproportionate harm to low-income Americans.
- Low-income & elderly populations are the most vulnerable to high or low temperatures during power outages.

- Low-income areas have more difficulty responding & recovering from destruction.
- They lack income, savings, employment, insurance, communication channels & information – less resilient after severe weather.

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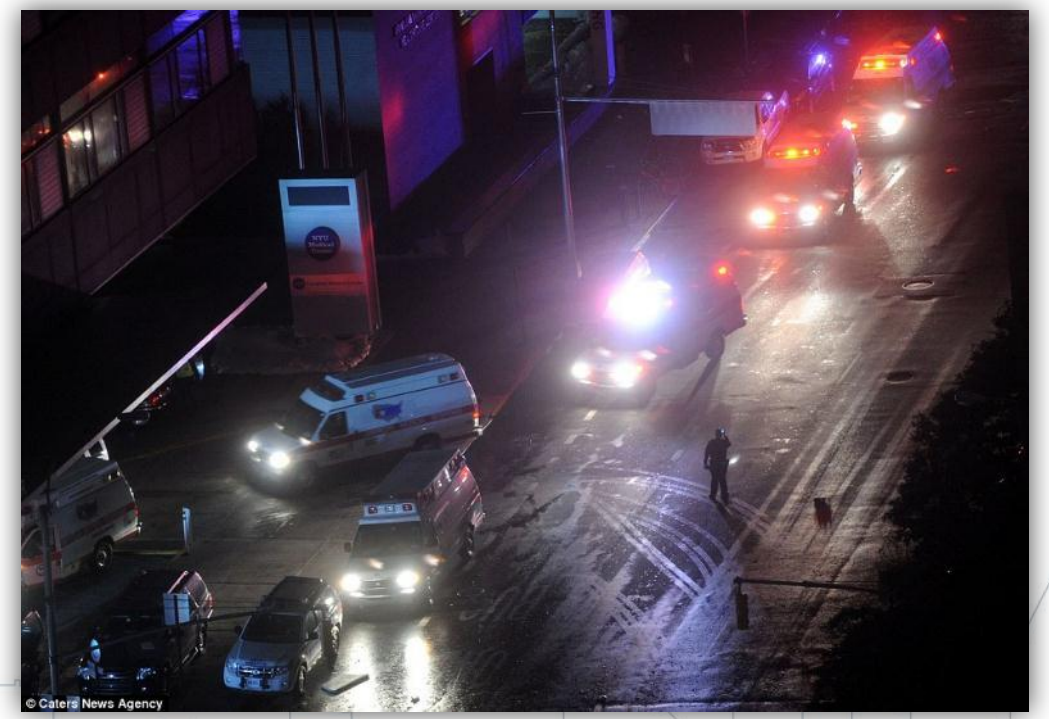
Need for More Power Resilient Solutions



Hospital workers evacuate a patient from NYU Langone Medical Center during Hurricane Sandy on October 29, 2012 in New York City. More than 200 patients were evacuated from the hospital after backup generators failed due to flooding. (Michael Heiman/Getty Images)

- Critical need for reliable distributed generation (DG) & resiliency in hospitals, affordable housing, police, fire stations, schools, hospitals, community centers, gas stations
- Protect vulnerable populations
- Distributed solar with batteries, CHP, fuel cells can provide life-saving power
- DG a democratizing force through community projects
- Resilient DG is both climate mitigation and adaptation

Resilient Power for Affordable Housing & Assisted Living Facilities

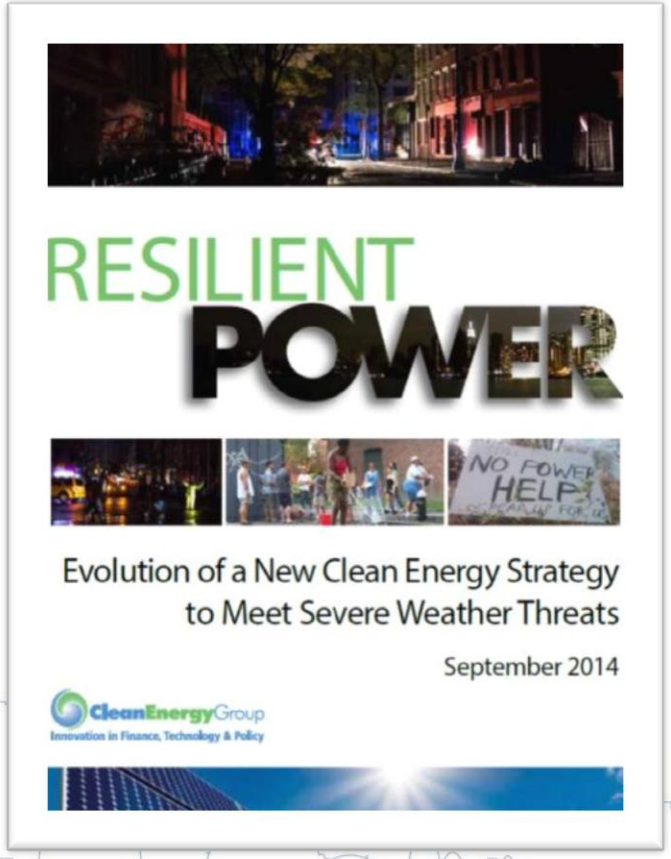
- **SuperStorm Sandy**: 375,000 New Yorkers—including 45,000 public housing residents—lived in mandatory evacuation zone.
  - Many low-income, elderly & disabled in NYC public housing were stranded.
  - No heat, backup generators, emergency boilers, or working elevators.
  - Many had no other affordable place to stay, no means of leaving their neighborhoods because mass transit did not operate.
- Small battery storage systems combined with on-site generation are needed for residents to shelter in place.
- Where possible, incorporate battery storage in HUD Better Building Partners' solar projects.

CEG Resilient Power Project – Objectives

- Expand clean resilient power at state and municipal level
- Protect low-income and vulnerable communities
- Focus on affordable housing
- Promote new technologies/business models

- New policy and financing options
- Support local projects
- Public education, technical assistance, information sharing
- Create national network
- Support new federal initiatives

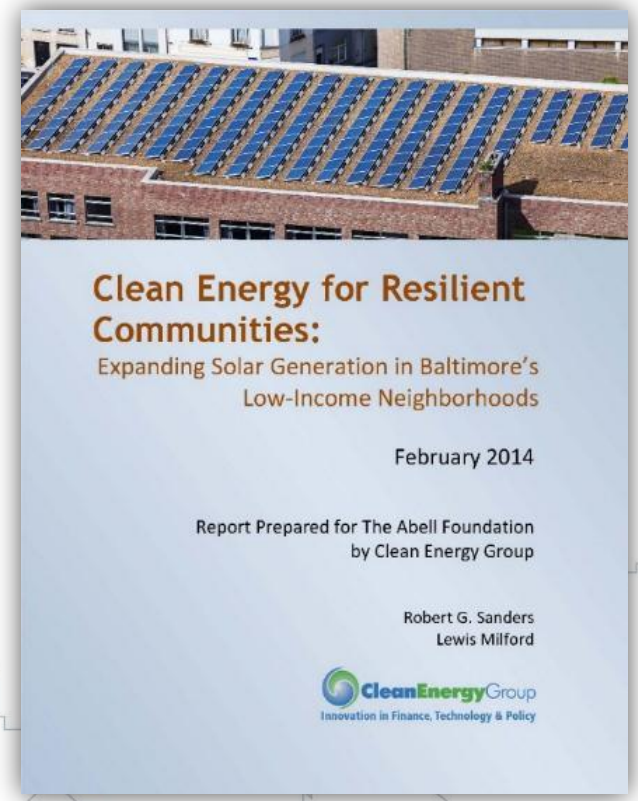
CEG Resilient Power Project



- Goal: significantly increase public/ private investment for clean, resilient power systems.
- Engage city officials to develop resilient power policies/ programs, link to state energy policies.
- Technical assistance for resilient power projects to help agencies/ project developers get deals done.
- http://www.cleanegroup.org

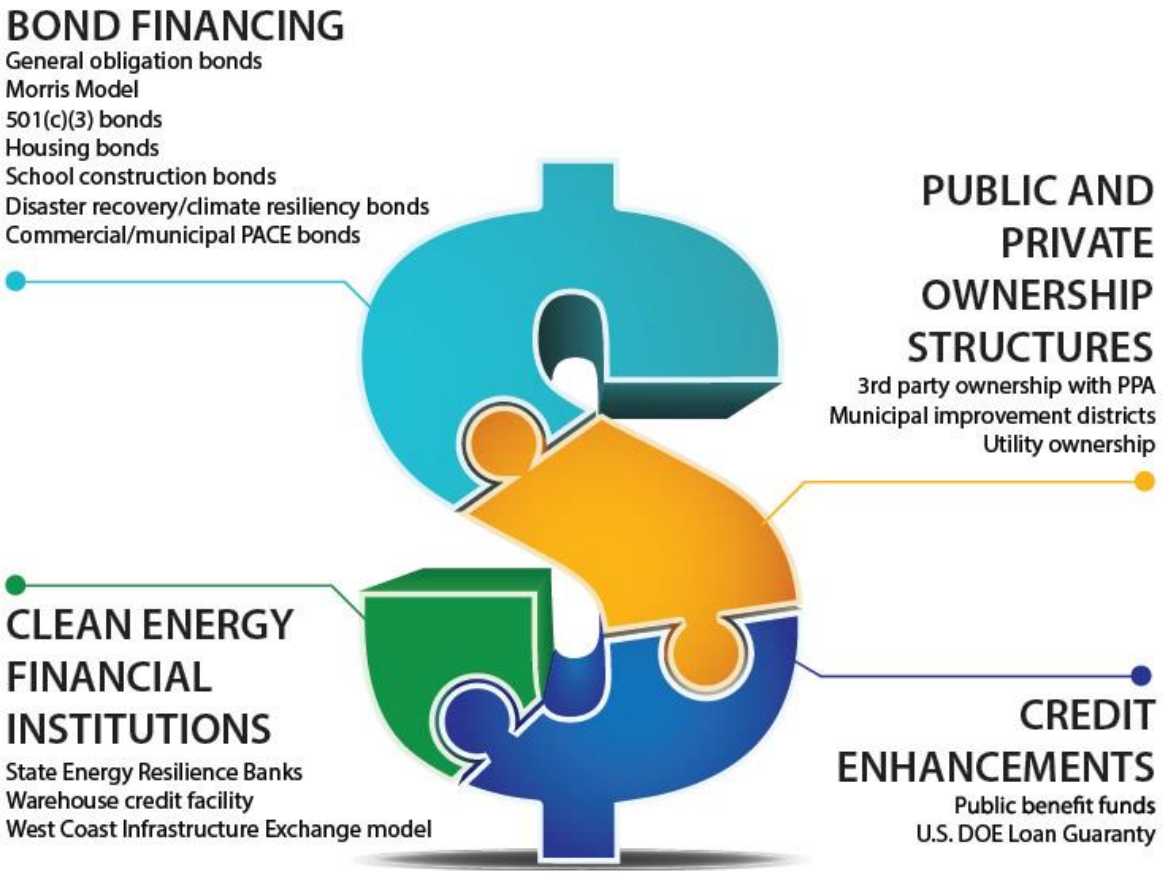
Community Resilient Power: Baltimore

- How can cities deploy more solar in low income communities and be more power resilient?
- CEG report built on Baltimore's DP3 Report that evaluated critical facilities/ infrastructure.
  - Focus on community buildings
  - Bonds and credit enhancement mechanisms
  - Public buildings and nonprofit-owned facilities.
  - Third-party ownership, lease-financed
  - Foundation PRIs
  - Public schools, libraries, police/fire stations.
  - Explore legal exposure under ADA.
  - The full report can be downloaded at RPP-ResilientCommunities.



Innovative Financing Models

- Once decision is made to pursue resilient power project – how do you finance it?
- Municipalities, housing/ community developers have broad range of options.

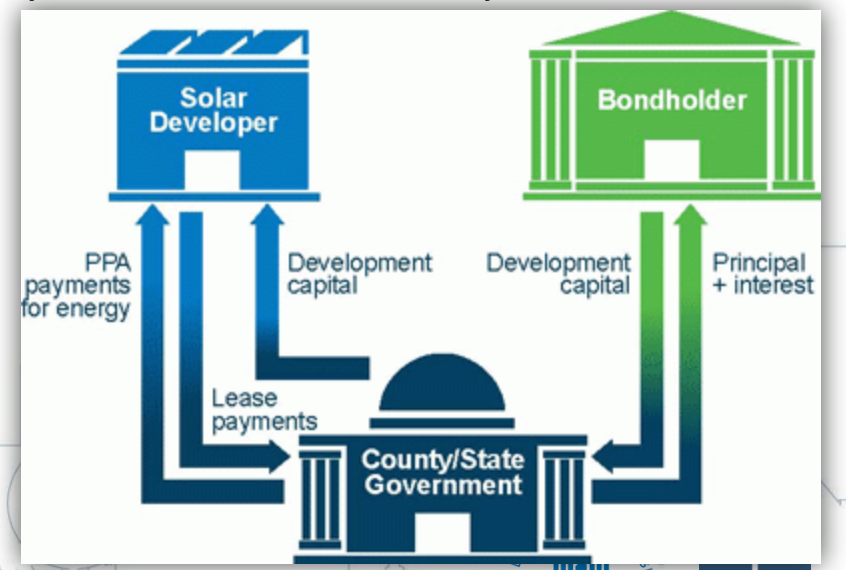


Source: Clean Energy Group

Bond Financing

- Existing bond tools can be used to finance pooled resilient power projects
  - GO bonds: NYC City Controller – multi-billion dollar "Green Bond Program"
  - 501(c)(3) bonds: hospitals, universities, affordable housing, community facilities
  - School construction bonds
  - Disaster recovery/ resiliency bonds: NYC Green Bond Program, Louisiana PSC ($315M of bonds by a LA bond authority for disaster recovery & reserves for future storms

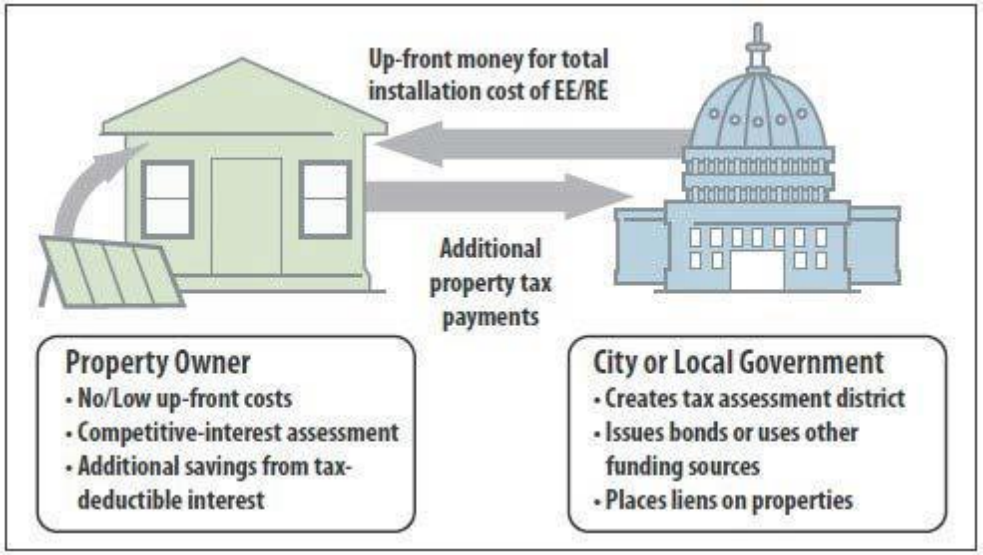
- Morris Model:
  - Innovative public-private financing for solar on public buildings
  - Hybrid model: public entity issues a government bond, transfers low cost capital to developer for lower PPA price.
  - Bonds are issued for a pool of projects



Bond Financing

C-PACE bonds:

- Provides states & municipalities with financing for CE building projects
- Bonds are repaid by property assessments added to building owners' property taxes.



Clean Energy Finance Institutions

NJ Energy Resilience Bank:

- First-in-the-nation Energy Resilience Bank (ERB).
- Designed to address a repeat of the devastating impacts of SuperStorm Sandy:
  $200 million of CDBG-DR funds for municipalities to finance clean resilient power solutions.
- For critical public facilities, initially clean water/ wastewater treatment facilities
- Other critical facilities: public housing, schools used as emergency shelters, hospitals, emergency response facilities, etc.

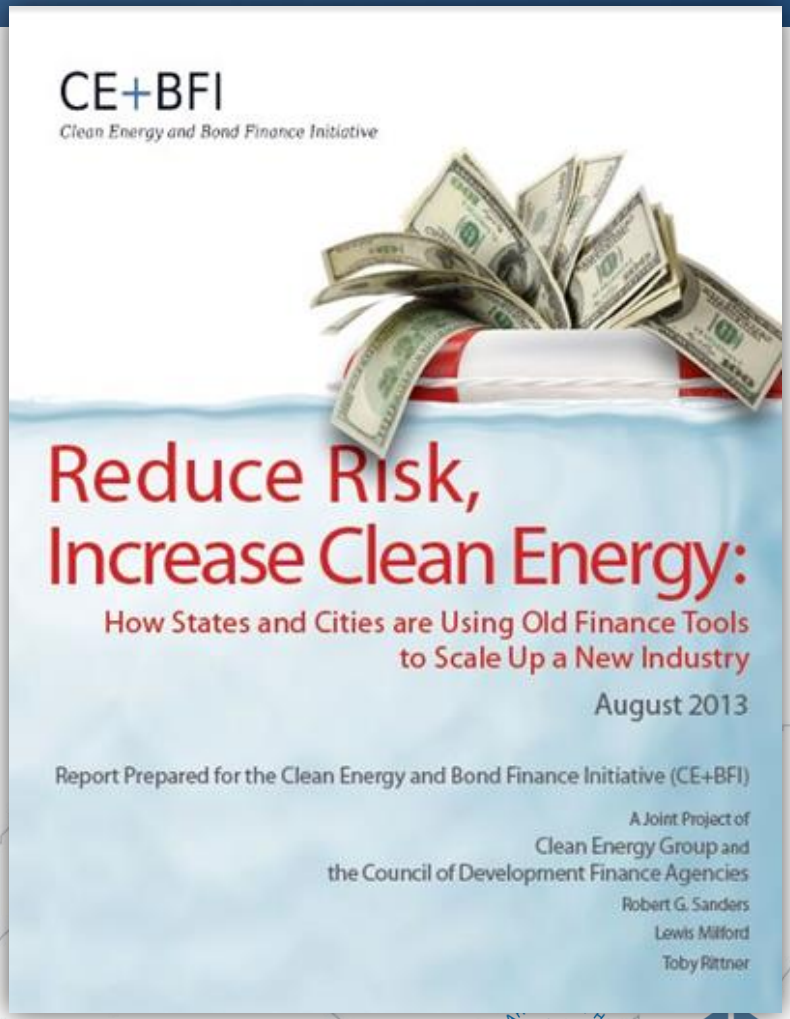
- Jointly managed by NJ BPU and NJ EDA
- Direct loans and grants, but can also provide credit enhancement for bond issuances, etc. A model other states should evaluate for possible replication.

Credit Enhancement

- Risk reduction methods that improve credit worthiness of a projects/ companies, reduce cost of borrowing.
  - Guarantees, pledge of additional collateral, cash reserve accounts, subordinated debt
- SBC funds used as credit enhancement
  - Hawaii Green Infrastructure Loan Program
- U.S. DOE Loan Guaranty Program
  - $4 billion in loan guarantees to support innovative CE/EE projects
  - 5 eligible technology areas, the first of these grid integration & storage (microgrid, resilient power)
  - Opportunity to aggregate projects statewide and regionally.

Credit Enhancement

- New framework for CE investment being built by states providing credit enhancement
- "Reduce Risk, Increase Clean Energy"
  - States are playing an important transitional role to a time when CE securities are a readily traded asset class
  - By reducing risk for investors, states are also reducing the cost of financing and securing long term fixed rate capital for CE
  - www.cleanegroup.org



Public & Private Ownership Structures

- Over the past decade, companies such as SolarCity transformed residential solar PV by providing lease financing.
- Third-party ownership is largely responsible for tremendous growth in residential solar in recent years.
  - **Can lease financing (3rd party ownership) accomplish for energy storage what it did for residential solar PV?**

Third-Party Ownership

- Solar Grid Storage & other storage developers are proving the model out for commercial, government & nonprofit entities.
  - Eliminates upfront costs to host
  - Transfers development & performance risk to the private developer.
- These companies' business models have benefited greatly from new FERC rules:
  - Owners of solar + storage systems can receive additional revenue streams from providing ancillary grid services:
    - E.g., demand response, frequency regulation services
    - ISOs need to pay sellers for frequency regulation-related performance payments for faster, more accurate response to dispatch signals
  - These new business models can make it much easier for customers to include storage using third party leasing and PPA financing.

Utility-owned & financed microgrids with resilient power

- **Vermont Solar + Storage Resilient Power Microgrid**
- One of the first US exclusively solar-powered microgrids
- First to provide full back-up power to an emergency shelter on the distribution network, first solar+storage microgrid developed on a landfill/brownfield site.
- Project supported with funding from federal-state-NGO partnership – remaining financing was rate-based.

- Incorporates 7,722 solar panels, capable of generating 2.5 MW of electricity
- Incorporates 4 MW of battery storage, both lithium ion and lead acid, to integrate the solar generation into the local grid
- Will provide resilient power to a Rutland school that serves as an emergency shelter (additional critical facilities may be similarly supported by this microgrid in the future)

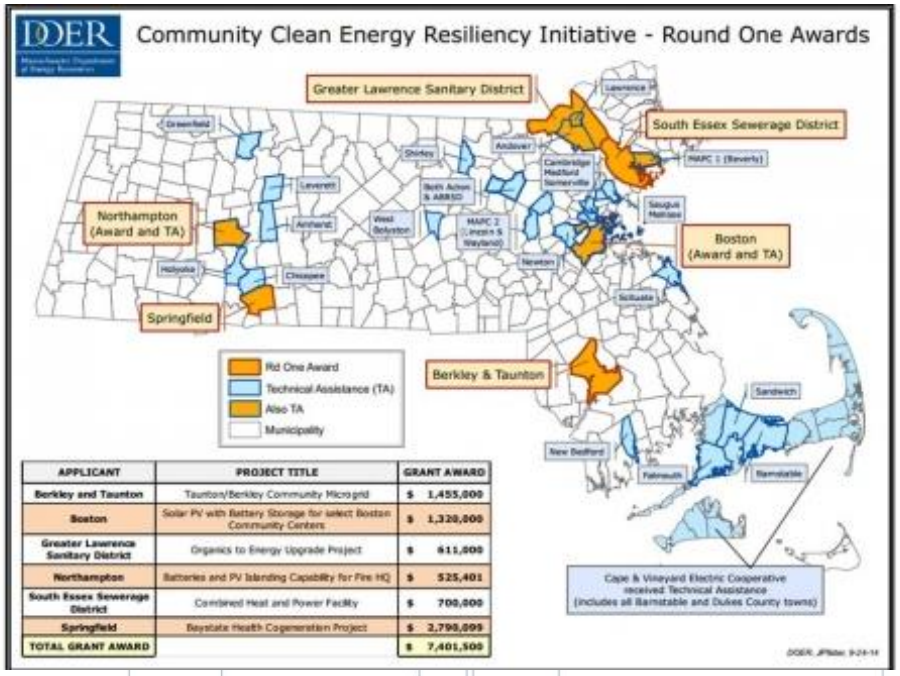
Results

- **Connecticut** Department of Energy and Environmental Protection (DEEP): $48 Million Microgrid Grant and Loan Pilot Program
- **New Jersey** Board of Public Utilities (BPU): $200 Million Energy Resilience Bank and $10 Million Energy Storage Program
- **Massachusetts** Department of Energy Resources (DOER): $40 Million Community Clean Energy Resiliency Initiative
- **New York** State Energy Research and Development Authority (NYSERDA): $40 Million NY Prize microgrids competition and $66 million CHP program
- **Maryland** Energy Administration Microgrids RFP: Coming This Fall

TOTAL: >$400 Million in new state funds in the Northeast alone

Massachusetts DOER
Community Clean Energy Resiliency Initiative

- $40 million state incentive
- $ coming from ACP payments
- Focus on critical infrastructure
- Municipal-led projects
- Technology agnostic
- Includes Technical Assistance Fund



APPLICANT	PROJECT TITLE	GRANT AWARD
Berkley and Taunton	Taunton/Berkley Community Microgrid	$ 1,455,000
Boston	Solar PV with Battery Storage for select Boston Community Centers	$ 1,320,000
Greater Lawrence Sanitary District	Organics to Energy Upgrade Project	$ 611,000
Northampton	Batteries and PV Islanding Capability for Fire HQ	$ 525,401
South Essex Sewerage District	Combined Heat and Power Facility	$ 700,000
Springfield	Baystate Health Cogeneration Project	$ 2,790,099
TOTAL GRANT AWARD		$ 7,401,500

See www.mass.gov

* MassCEC pursuing additional resilient power projects

Massachusetts DOER
Community Clean Energy Resiliency Initiative

Round 1 Results

Applicant	Project Title	Grant Amount	Brief Description	Factility(ies)
Berkley and Taunton	**Taunton/Berkley Community Microgrid**	$ 1,455,000	Community microgrid	(1) Middle School - shelter (2) Emergency Services Building - Police and Fire (3) Community School - shelter (4) Municipal fueling station/pump (5) Police/fire radio repeater
Boston	**Solar PV with Battery Storage for select Boston Community Centers**	$ 1,320,000	Solar and storage based islandable community shelters	(1) Shelburne Community Center - shelter (2) Roslindale Community Center - shelter (3) Tobin Community Center - shelter (4) Curtis Hall Community Center - shelter
Greater Lawrence Sanitary District	**Organics to Energy Upgrade Project**	$ 611,000	Islandable and black start capable self-sustaining wastewater treatment facility	(1) Wastewater treatment facility
Northampton	**Batteries and PV Islanding Capability for Fire HQ**	$ 525,401	Solar and storage based islandable fire station, that incorporates existing backup generation for further resiliency	(1) Northampton Fire Department
South Essex Sewerage District	**Combined Heat and Power Facility**	$ 700,000	Islandable and black start capable combined heat and power facility at wastewater treatment facility	(1) Wastewater treatment facility
Springfield	**Baystate Health Cogeneration Project**	$ 2,790,099	Islandable and black start capable combined heat and power facility at regional hospital	(1) Baystate Health - hospital
Total		**$ 7,401,500**		

Conclusion

- Financing is just one key public resource that is needed to accelerate the deployment of resilient power for critical facilities and infrastructure.
  - Technical assistance
  - Targeted support for pre-development costs
  - Consistent, supportive policy

Resources

- usgbc.org
- cleanegroup.org
- cesa.org
- cebfi.org
- resilient-power.org

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