

# RESILIENT



# POWER

A Project of **Clean Energy Group**

## National Summit on Smart Grid and Climate Change

December 3, 2014

Lewis Milford



# Who We Are



**RESILIENT  
POWER**

Evolution of a New Clean Energy Strategy  
to Meet Severe Weather Threats

September 2014

[www.resilient-power.org](http://www.resilient-power.org)  
[www.cleangroup.org](http://www.cleangroup.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

COLUMBIA, Va. — Researchers at Columbia University are trying to figure out what crucial material they may have lost when some of their backup generators didn't work during last week's power blackout.

This sad state of affairs should prompt the rest of us to confront a simple truth: our 19th-century electricity system is not suited for 21st-century needs. If we are to prevent similar critical failures in the future, we must look now for smarter energy solutions.

Some companies already have a head start. The First National Bank of Omaha has stopped using electricity from the grid — the interconnected system from which almost everyone gets electricity — as its primary power source. It is now producing its own energy and is using the grid only as a backup. First National, the largest privately held bank in the country, runs the seventh-largest credit card processing operation. The bank needs to be able to crunch large amounts of data 24 hours a day, seven days a week.

That's why the bank has purchased its own system of four fuel cells, which, like batteries, create energy through a chemical process instead of by burning fossil fuels. They are so clean that they are exempt from most air pollution rules.

The bankers aren't doing this because they are environmental activists. The real value of the fuel cell system is that it's nearly 100 percent reliable.

The bank competes with other companies for credit card business. The more time its computers can keep running, the more credit card transactions it can process — and the more business it can attract. Fuel cells can run almost all the time without interruption, allowing computers to operate constantly without crippling breakdowns.

According to industry statistics, a typical bank of corporate computers experiences nearly 300 power interruptions of one kind or another each year. American businesses lose an estimated \$20 billion a year from these failures. And in cases like the damage to the research materials at Columbia, there is no way to put a price on potential losses to science.

Lewis Milford is president of Clean Energy Group, a nonprofit group.

and public health. These problems will only get worse. The growing number of desktop computers and data centers running the Internet will increase the demand for high-quality power sources. As a result, computer-grade energy may soon add up to nearly 10 percent of demand for electricity, a figure that will only increase with greater Internet activity.

Most companies spend billions on back-up power systems, batteries or diesel generators to keep their computers running smoothly. These systems are necessary because the solar power system can be quite reliable. But such stopgap measures can't supply the guaranteed power that computers or other sensitive electric loads need. The New power blackout proved that.

What's the lesson? The First National Bank of Omaha's emergency generators weren't adequate. First National Bank isn't the only company that has turned to fuel-cell technology. post offices, telecom businesses, computer chip makers — virtually any critical city service that uses electric service or from using fuel cells.

Just last week, before his lab shutdown, Har

Time to r our out power



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

Latest Blog: 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



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 here for rationed gasoline, homes and businesses destroyed, and millions of people still without electricity.

## 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



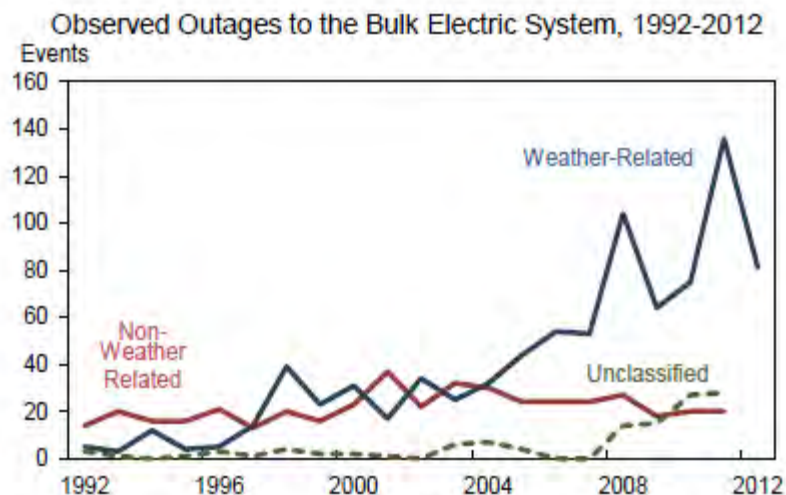
Prepared by Clean Energy Group

OCTOBER 2005

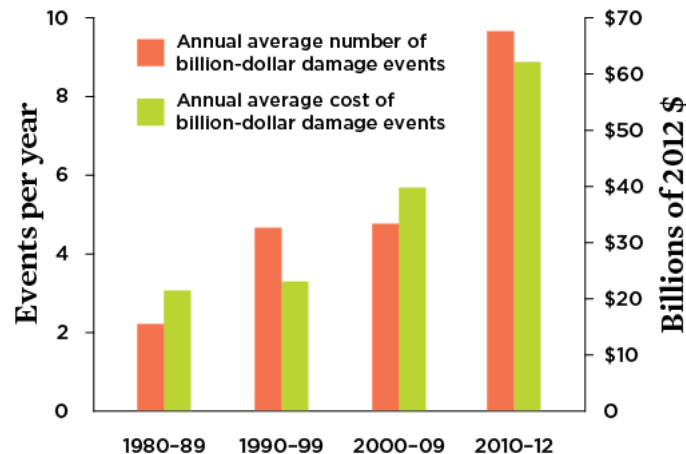
# RESILIENT POWER

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# Aging US Power Grid Blacks Out More Than Any Other Developed Nation\*



Source: Energy Information Administration



Source: Union of Concerned Scientists; Steve Clemmer, 2014

Year	Total number of outages	People affected
2008*	2,169	25.8 million
2009	2,840	13.5 million
2010	3,149	17.5 million
2011	3,071	41.8 million
2012	2,808	25.0 million
2013	3,236	14.0 million

\*Partial-year data. Data collection began on February 16, 2008.

Source: Blackout Tracker – 2013 US Report (Eaton)

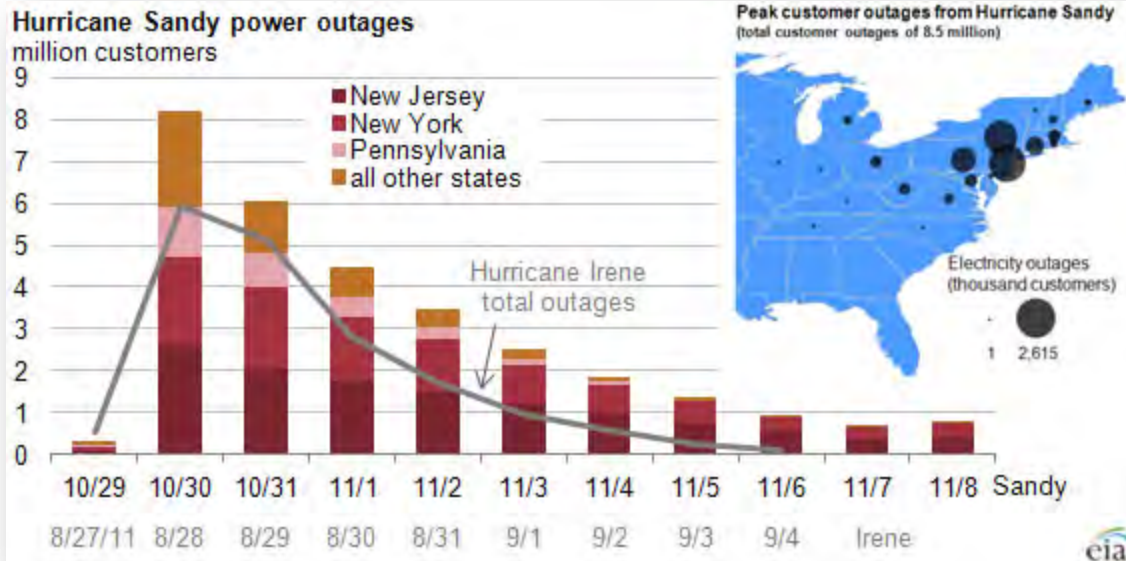
\* See: <http://www.ibtimes.com/aging-us-power-grid-blacks-out-more-any-other-developed-nation-1631086>



# 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.”

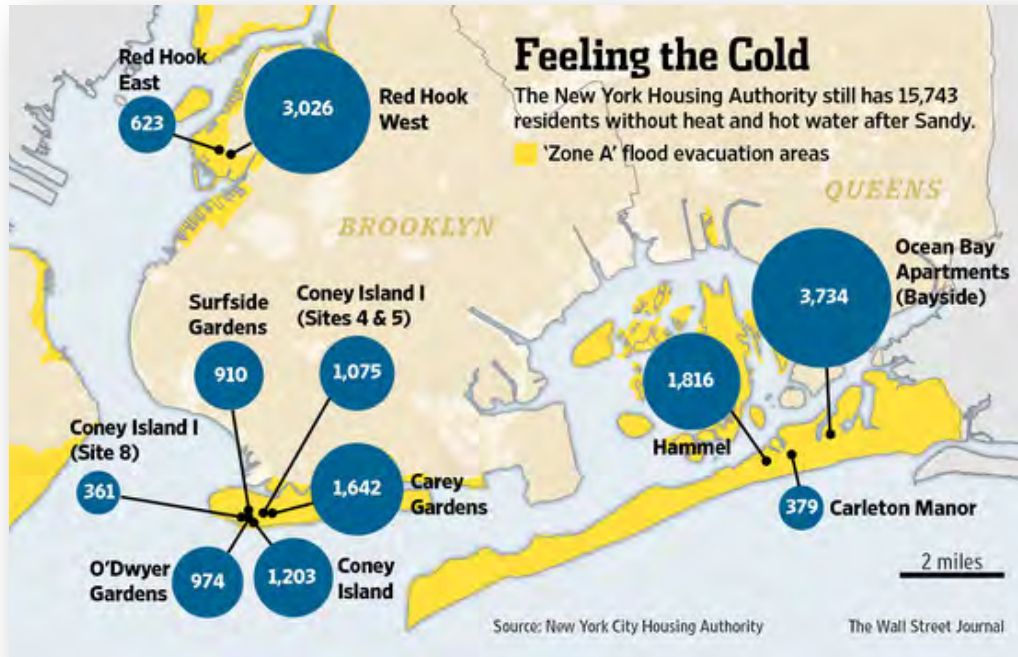
*Hurricane Sandy Rebuilding Strategy:  
Stronger Communities, A Resilient Region (Aug. 2013)*



**“The fact that the NYU hospital is dark but Goldman Sachs is well-lit is everything that’s wrong with this country.”**



# Extreme Weather 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.

# Extreme Weather Disproportionately Hurts Vulnerable & Low-Income Communities



- Extreme weather events harm more counties with lower income households.
- Flooded counties had households at 14% below US median income.
- Drought & heat waves affected counties with households at 5% below US median income.



- **Hurricane Sandy:** 110 US fatalities and \$42+ billion in property damage - costliest U.S. hurricane.
- 600,000 people live in 6 low-lying, mostly NY minority communities of South Bronx, Newtown Creek, Brooklyn Navy Yard, Red Hook, Sunset Park & Staten Island.
- In Red Hook (Brooklyn), the borough's largest housing project, 4,000 of the 6,000 residents had no heat or water for over a week after the storm.
- No backup generators at senior centers.



# 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



# CEG Resilient Power Project – Objectives

- Expand clean RPP 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

# Solar Storage

- Combines solar PV with battery storage
- For resilient power – special switches are added to isolate (“island”) the PV/battery in case of grid failure
- Provides continuous electricity to critical infrastructure to ensure essential services:
  - Food, water, shelter, heating & cooling, medical & emergency services, communications, fueling.
  - For hospitals, affordable housing, assisted living & community facilities, shelters, distribution centers, gas stations, police/fire stations, cell towers, etc.

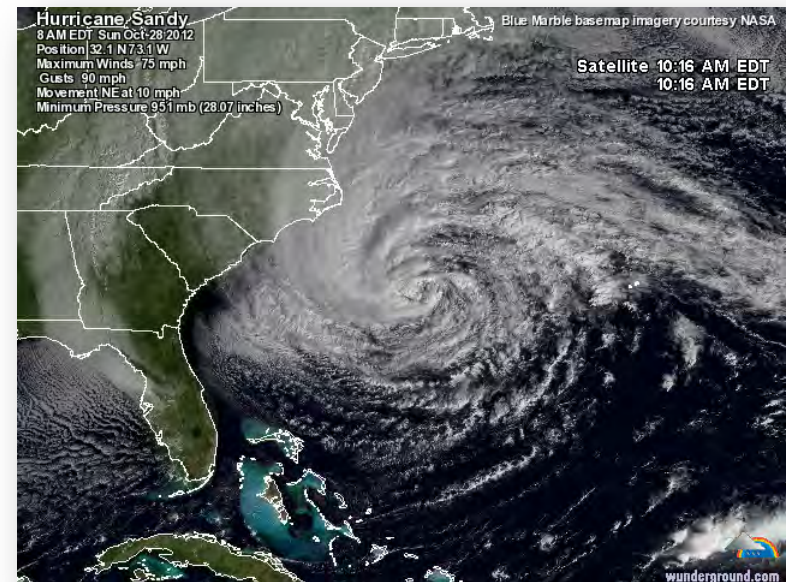


# Northeastern States Resilient Power Initiatives

Following Hurricane Sandy, the Northeastern states began to work with Clean Energy Group to develop resilient power solutions.

CEG's role:

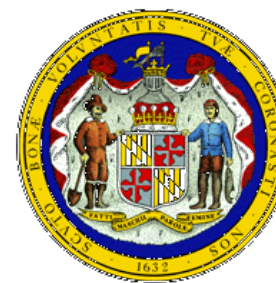
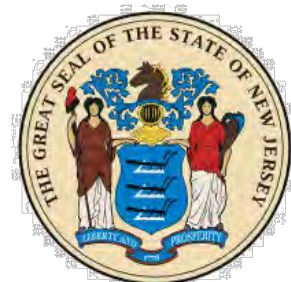
- Assist with program development
- Assist with RFP development
- Facilitate information sharing
- Provide technical assistance
- Provide information to stakeholders





# Results

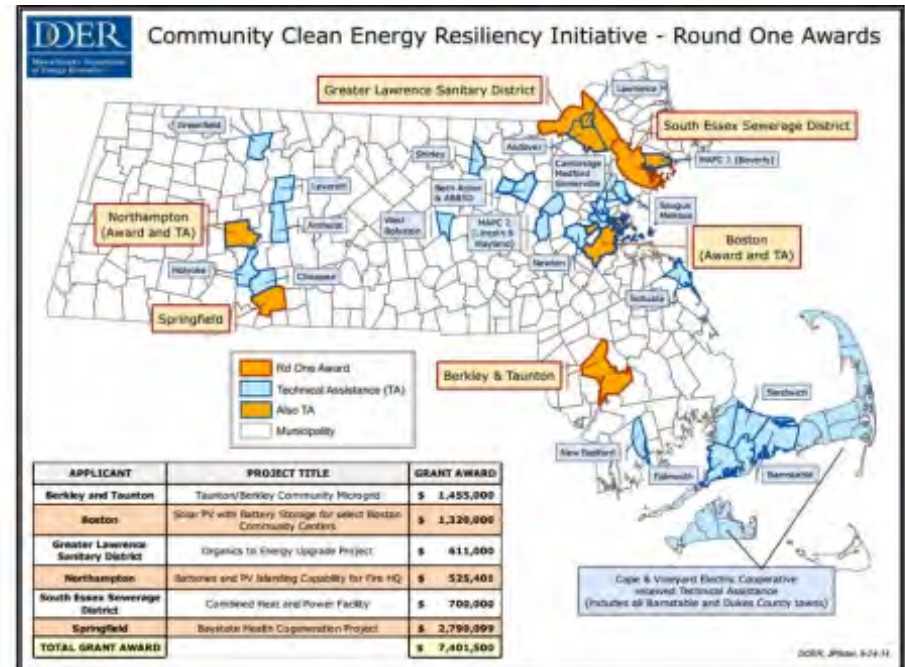
- **Connecticut** Department of Energy and Environmental Protection (DEEP): \$48 Million Microgrid Grant and Loan Pilot Program
- **New Jersey** Board of Public Utilities (BPU): \$200 Million Energy Resilience Bank and \$10 Million Energy Storage Program
- **Massachusetts** Department of Energy Resources (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



See <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/resiliency-initiative.html>

\* MassCEC pursuing additional resilient power projects

# New Jersey Energy Resilience Bank (ERB)

- July 2014: Nation's 1st Energy Resilience Bank
- Finance local distributed resilient power projects
- Funded with \$200 million in NJ CDBG-Disaster Recovery allocation
- Loans & grants, but can also provide credit enhancement for bond issuances & other financing.
  - Initial priority wastewater treatment
  - Others to come: public housing, hospitals, emergency response facilities, municipal buildings, correctional facilities, transportation & transit, school emergency shelters.



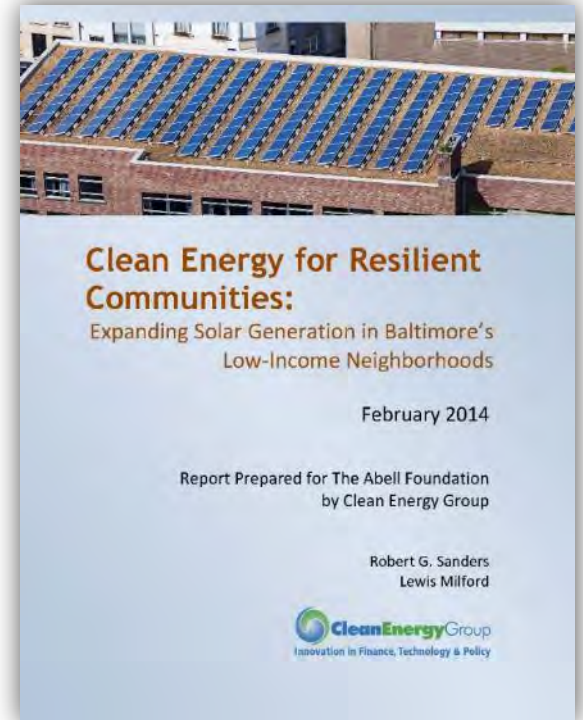
Next webinar: **New Jersey's Energy Resilience Bank** – October 28th at 2 pm; sign up at <http://bit.ly/RPP-NJERB>



# Community Resilient Power: Baltimore

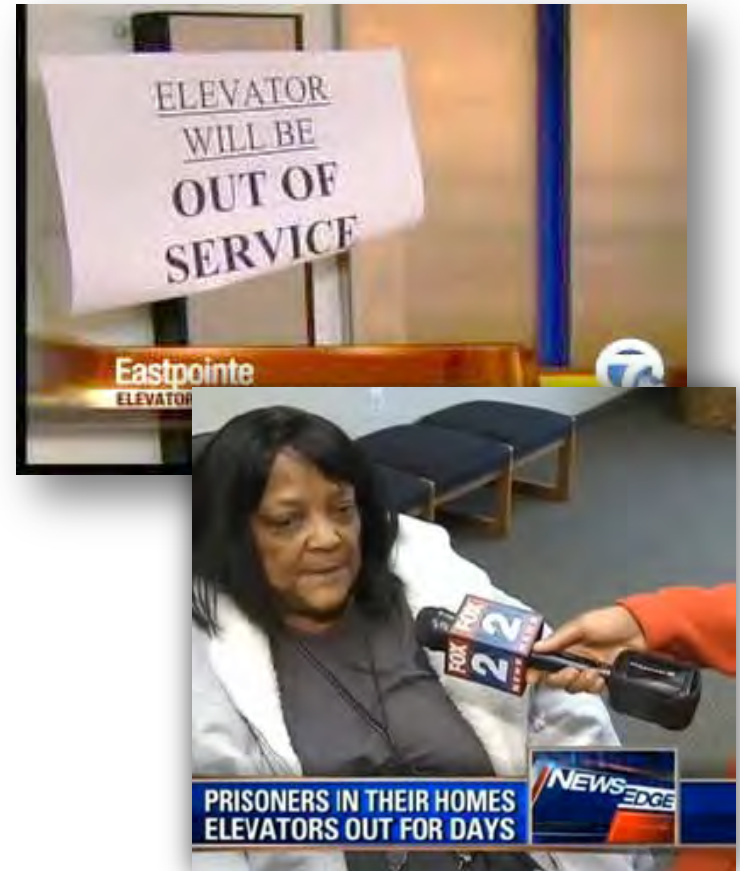
For community resilient power in Baltimore's low income communities, evaluate critical facilities for solar battery storage.

- Focus on community buildings
- Bonds and credit enhancement mechanisms
- Public buildings and nonprofit-owned facilities.
- Third-party or lease-financed
- Foundation PRIs
- Public schools, libraries, police/fire stations.
- Explore legal exposure under ADA.
- The full report can be downloaded at <http://bit.ly/RPP-ResilientCommunities>.



# 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.



# New Business Models Needed for Appropriate Size Technology

- Develop an appropriately sized resilient power business model for affordable and elderly housing, assisted living.
- Small battery storage systems combined with on-site generation.
- For critical loads: lighting, air conditioning/ refrigeration and medical/ communications.
  - Enables residents to shelter in place.
  - Reduces demands on overwhelmed first responder & emergency shelter services.
- Will better protect low income, elderly and disabled populations.





# Resilient Power and Federal Programs- A Better Coordinated Partnership

- DOE and state grants
- EPA and community resiliency programs
- HUD and Better Building Program
- FEMA State Mitigation Plan Review (October 17 comments)
- NSA and federal facilities
- FAA and airport power
- Federal Energy Labs
- OTHERS?





Lewis Milford  
President, Clean Energy Group  
Email: [Lmilford@cleanegroup.org](mailto:Lmilford@cleanegroup.org)  
Phone: 802-223-2554 x202

[www.cleanegroup.org](http://www.cleanegroup.org)  
[www.cleanenergystates.org](http://www.cleanenergystates.org)  
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