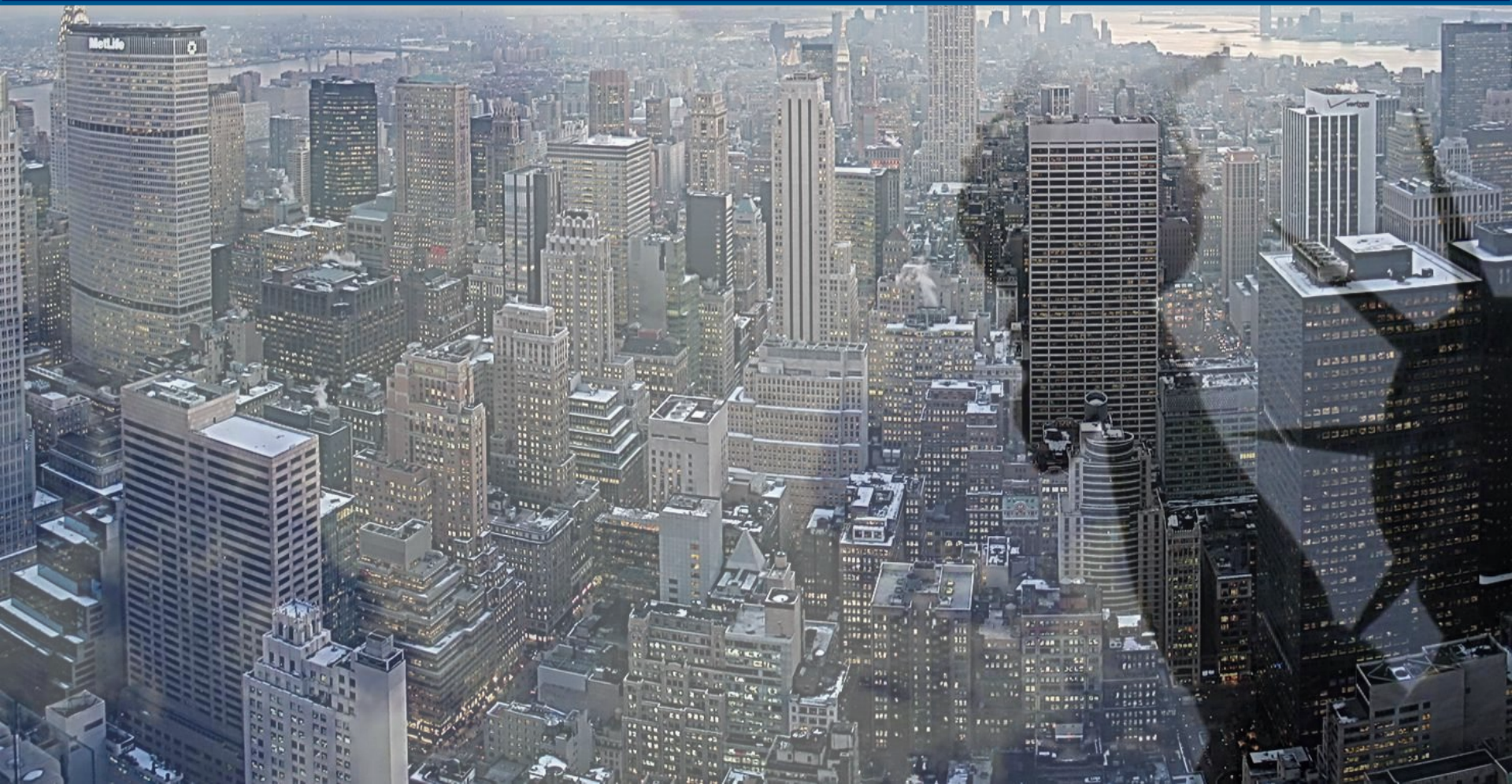
# NYSolar Smart DG Hub – Resilient Solar Project

**June 10, 2015**



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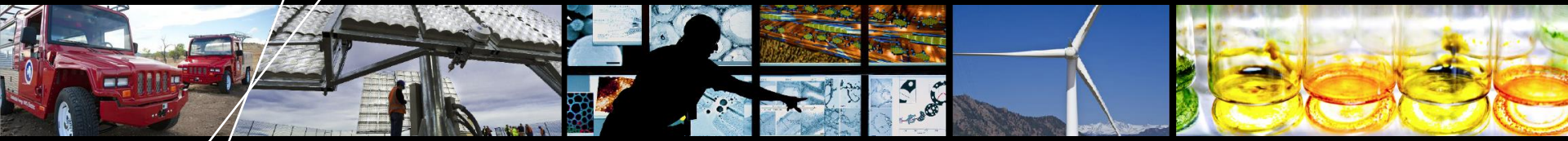
# NY Solar Smart DG Hub

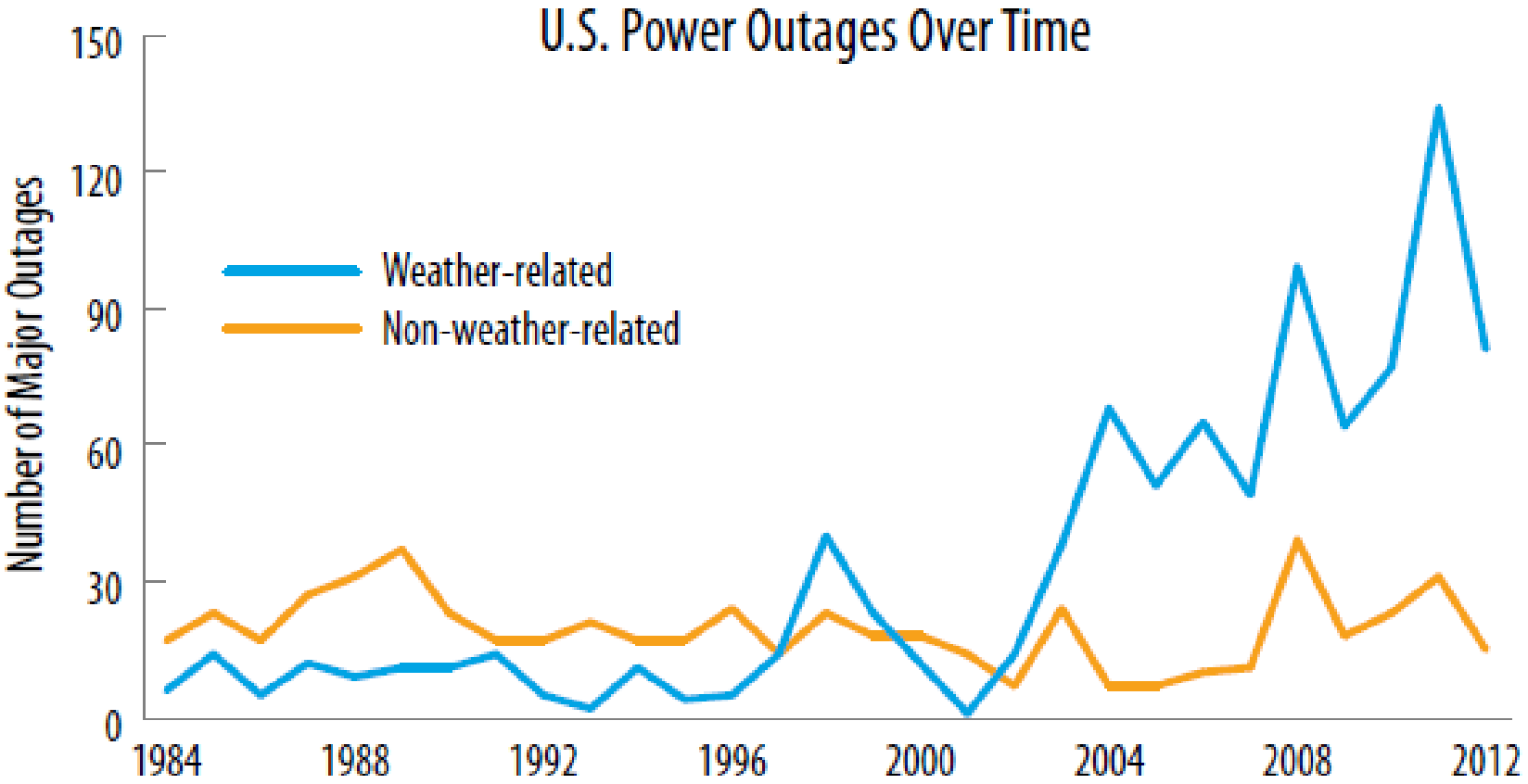



**Kate Anderson**

**Software and Hardware Working Group Co-Lead**

**National Renewable Energy Laboratory (NREL)**

# Why Resilient Solar: Increasing Grid Disruptions

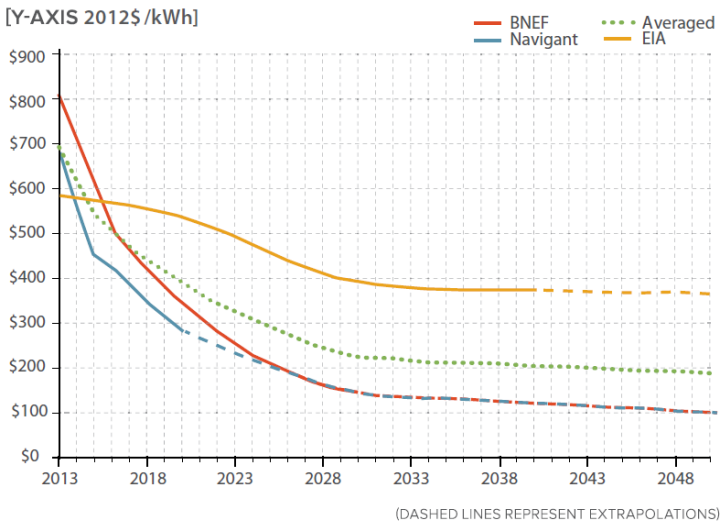



*Source: Blackout: Extreme Weather, Climate Change and Power Outages. (Kenward & Raja 2014)*

# Economic Impact

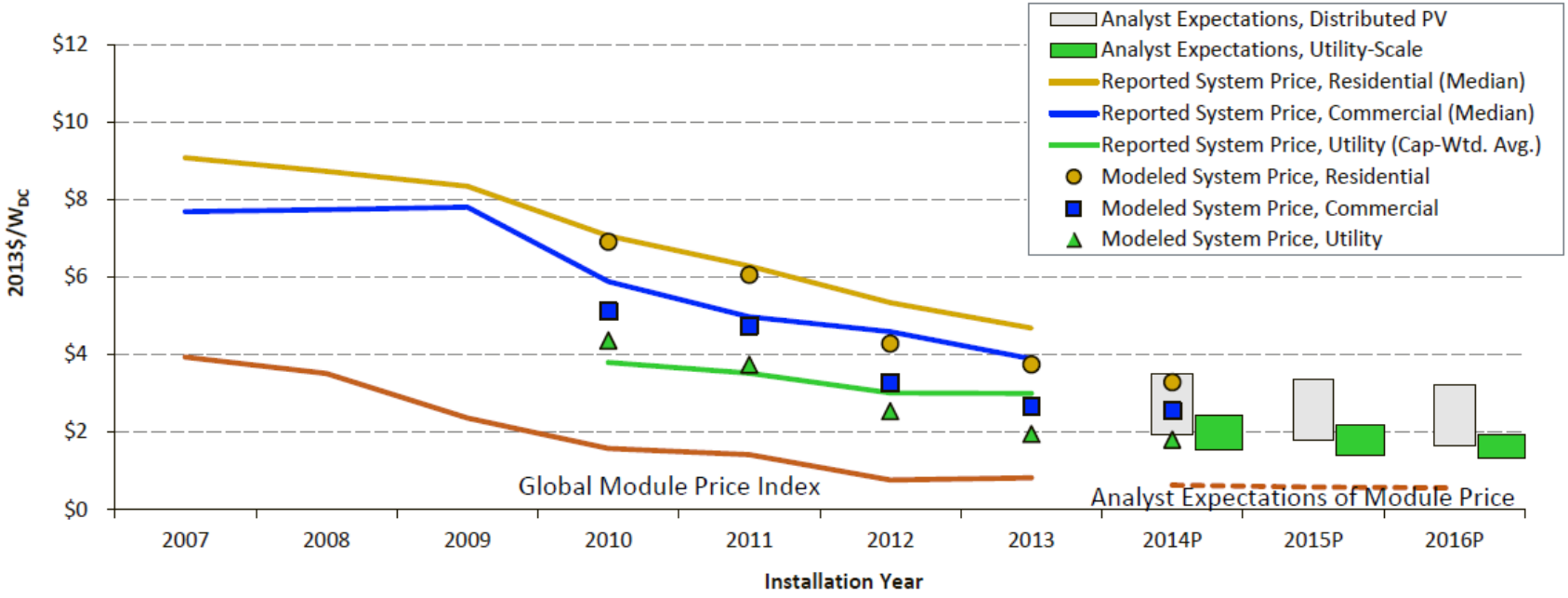
- The economic impact of blackouts caused by natural disasters can be significantly higher than the cost of system repairs (Johnson 2005)
- Sustained weather-related outages cost communities $18 billion - $70 billion per year (Campbell 2012)
- Electricity losses associated with Hurricane Sandy (2012) resulted in $27 billion - $52 billion in economic losses

# Falling PV and Storage Costs




*Source: The Economics of Grid Defection (RMI 2014)*

*Source: Photovoltaic System Pricing Trends (DOE 2014)*



# Current State of Resilient PV

- **Most PV systems installed today are technically incapable of providing consumer power during a grid outage**
  - For safety reasons, current operating standards require that grid-connected solar PV systems automatically disconnect from the grid during a power outage
  - Most of these systems are not designed to function as both a grid-connected and a standalone system, and therefore completely cease power production during a system outage
  - In addition, most PV systems in place today are not coupled with batteries or an auxiliary power source (such as a diesel generator) to allow them to provide continuous power to a load
- **If designed for both grid-connected and standalone operation, however, PV hybrid systems can provide power when the grid is down**

# Case Study: Midtown Community School

- **During Hurricane Sandy in 2012, back up generator fuel supply was limited & fuel delivery was difficult due to size and impact of storm**
- **Midtown Community School in Bayonne NJ served as a community shelter as a result of its hybrid solar-diesel system**
- **272 kW of PV installed with diesel generator and syncing inverters formed microgrid**
- **PV significantly cut amount of diesel needed to maintain electricity**

**Midtown Community School**
*Source: SMA Inverted 2012*

# Case Study: Princeton University

- **Princeton University's microgrid includes a natural gas cogen plant, 5 MW backup diesel generator, 5.4 MW of solar PV capacity, chillers, and thermal energy storage**

*Source: Princeton 2014*

- **Under normal circumstances, the microgrid is used for economic benefit to reduce peak demand and sell frequency regulation services into the RTO ancillary service market**

- **During Hurricane Sandy, operators disconnected the microgrid and successfully supplied critical power to the campus for 1.5 days, providing services to the community and avoiding millions of dollars of research-related losses**

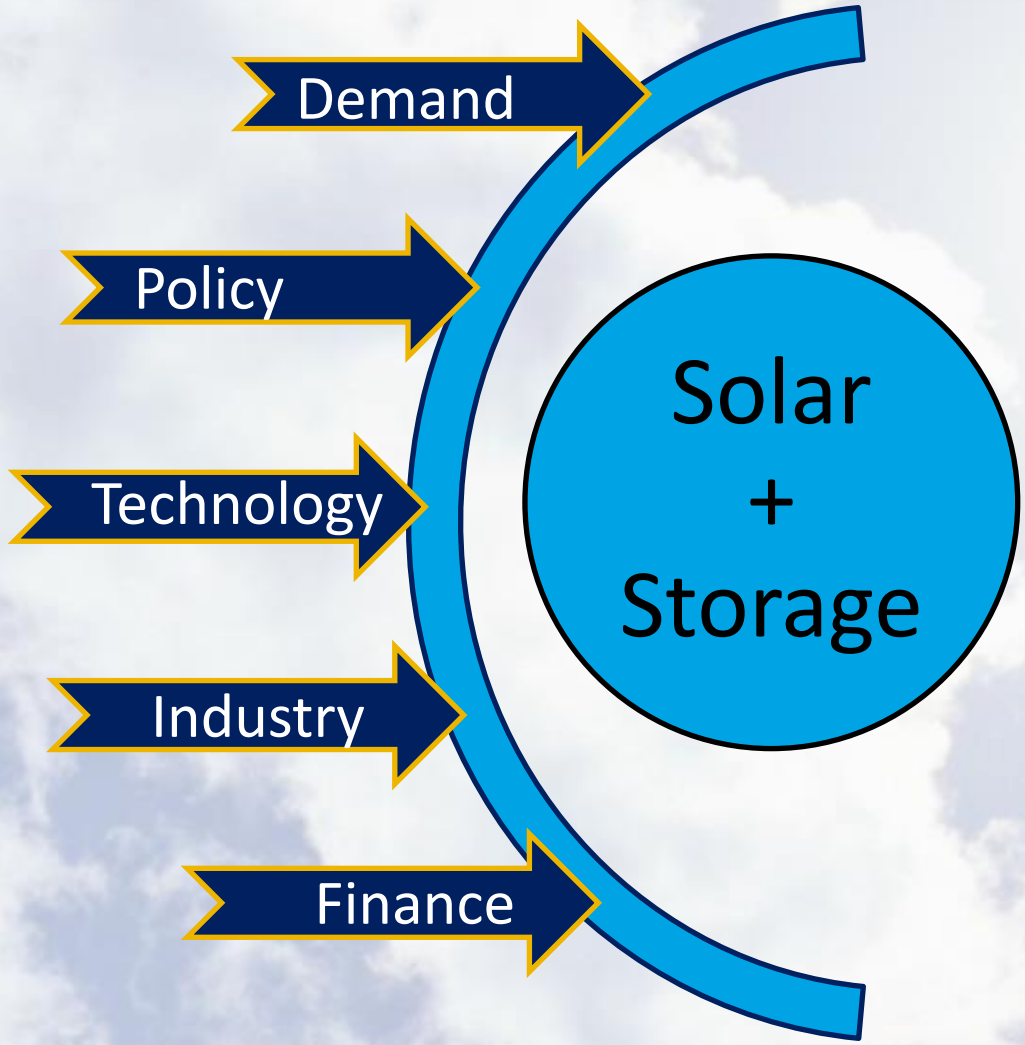
# Case Study: Rutland, Vermont

- **Rutland, VT has frequent storm-related power outages**
- **Rutland is constructing the country's first 100% solar-powered microgrid on a repurposed landfill**
- **Project includes 2.5 MW of solar capacity and 4 MW of battery storage (enough to supply 365 homes during normal weather conditions, or power the public shelter during emergencies)**


*Source: Green Mountain Power 2014*

- **In addition to backup power, the storage will provide quick-responding frequency regulation services for the grid**
- **Developed by utility Green Mountain Power, with support from the Department of Energy and other partners**

# Solar-Plus-Storage Potential




**There are only a few solar-plus-storage projects in NYC today**

**However, U.S. solar-plus-storage market value in 2014:**

*$42 million*

**Projected Growth by 2018:**

*$1 billion*

# DG Hub Overview and Goals

- Develop Platform
- Engage Stakeholders
- Create Strategic Pathways
- Increase Deployment of Resilient PV Systems

## Objective

**A more resilient distributed energy system in NYC, with a path for expansion across the state and country**

# DG Hub Structure

## PROJECT TEAM


NREL
NATIONAL RENEWABLE ENERGY LABORATORY

MEISTER
CONSULTANTS GROUP

ADVISORY BOARD

- Hardware Technologies Working Group
- Software Technologies Working Group
- Economics & Finance Working Group
- Policy & Legal Working Group

## PARTNERS

| | |
|---|---|
| U.S DOE | TSEC |
| U.S. DOD/ MIT | GE Global Research |
| Homeland Security | IBM |
| Mayor's Office | City of Boston |
| NYSERDA | NY-BEST |
| NYC EDC | EPRI |
| NYC OEM | SEPA |
| GSA | SMA |
| FEMA | Pataki-Cahill |
| Con Edison | Demand Energy |
| New York Power Authority | SolarCity |
| LIPA | SunPower |
| NYC DOB | First Solar |
| FDNY | Princeton Power |

# Smart DG Hub Resilient Solar 3-Year Plan

## Survey & Research

- Survey resilient PV costs: hardware, software, and balance-of-system
- Research barriers to a strong resilient PV market in NYC

Y1

Y2

## Resources & Roadmap

- Fact sheets, ready-for-market technology guidelines, model guidelines for codes and permitting
- Smart DG Hub Roadmap for Resilient Solar

Y3

## Tools & Outreach

- Resilient PV Layer on Solar Map, Resilient PV Solar Calculator
- Installer workshops, code official trainings, webinars

# Resilience Calculator

| Description | Goals |
| --- | --- |
| **Year 1**<br>**Resilient PV Financial Incentive Matrix and Fact Sheet**<br>*Matrix of existing and potential economic incentives for resilient PV* | • **Develop catalogue of all available incentive programs**<br>• **Easily digestible for broad audiences** |
| **Year 2**<br>**Calculator Component Recommendations**<br>*Matrix leveraged to build inputs for public facing calculator*<br>**Resilience Calculator Map Layer**<br>*Public-facing financial calculator for solar+storage* | • **Create tool for developers, general public and stakeholders to see economic potential of systems**<br>• **Integrates into existing NYS Solar Map** |
| *Progress to Date* | • **WG refining matrix and fact sheet** |

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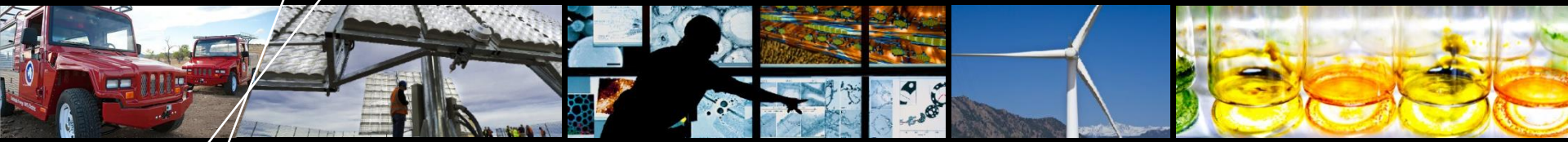


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