Better Buildings Residential Network Peer Exchange Call Series:

Power Up: Residential Energy Efficiency and Resiliency

March 22, 2018

Call Slides and Discussion Summary

Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Poll
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers:
  - **Jeff Hebert**, Vice President, The Water Institute
  - **Seth Mullendore**, Vice President, Clean Energy Group
  - **Damei Jack**, Manager, Con Edison
- Open Discussion, Closing Poll, and Announcements

Better Buildings Residential Network

Join the Network

Member Benefits:

- Recognition in media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Solution Center guided tours

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year

Upcoming calls:

- April 12: Myth Busters: Exposing Residential Energy Efficiency Misconceptions
- April 26: Making the Grid Smart: Moving Toward Two-Way Communication in the Digital Age

Peer Exchange Call summaries are posted on the Better Buildings website a few weeks after the call

For more information or to join, for no cost, email bbresidentialnetwork@ee.doe.gov, or go to energy.gov/eere/bbrn & click Join

Jeff Hebert
Vice President
The Water Institute

U.S. DEPARTMENT OF ENERGY

THE WATER INSTITUTE
OF THE GULF®

ENERGY AT DIFFERENT SCALES

Power Up: Residential Energy Efficiency and Resiliency

March 22, 2018

Jeff Hebert
Vice President for Adaptation & Resilience
Director, Resilience Lab

RESILIENCE LAB

AT THE WATER INSTITUTE OF THE GULF

HUMAN

PREPARE OUR PEOPLE

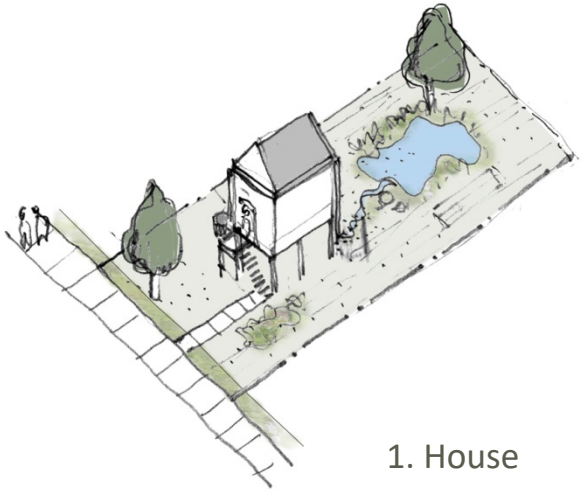
PHYSICAL

DESIGN FOR ADAPTATION

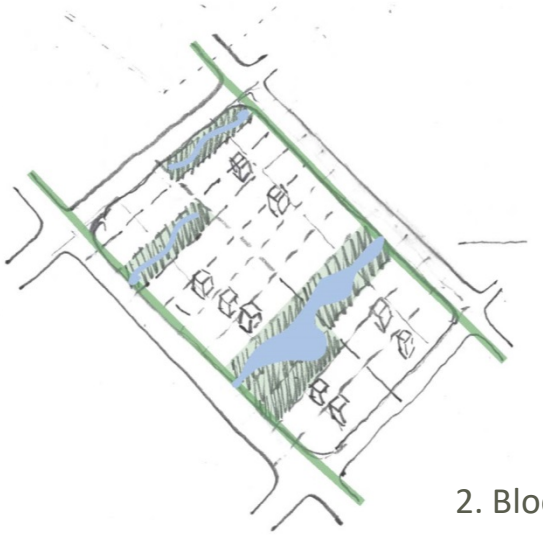
INTELLECTUAL

SHARE THE KNOWLEDGE

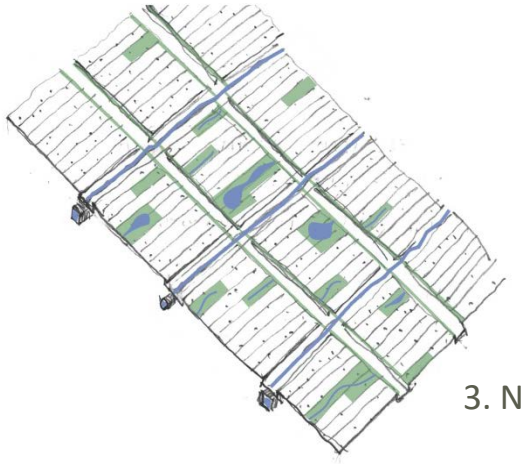
Develop Integrated Network of Solutions



1. House



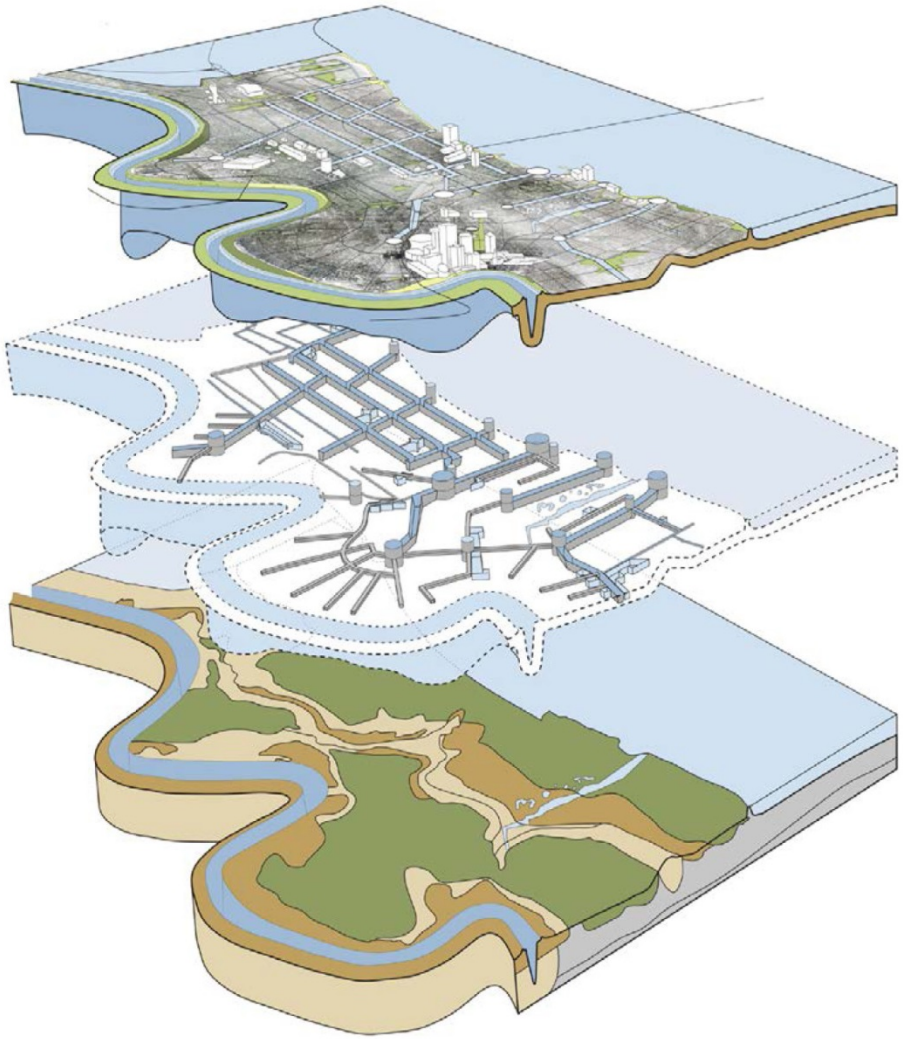
2. Block



3. Neighborhood

Courtesy Waggonner & Ball

Develop Integrated Network of Solutions



Inhabitation and Land Cover

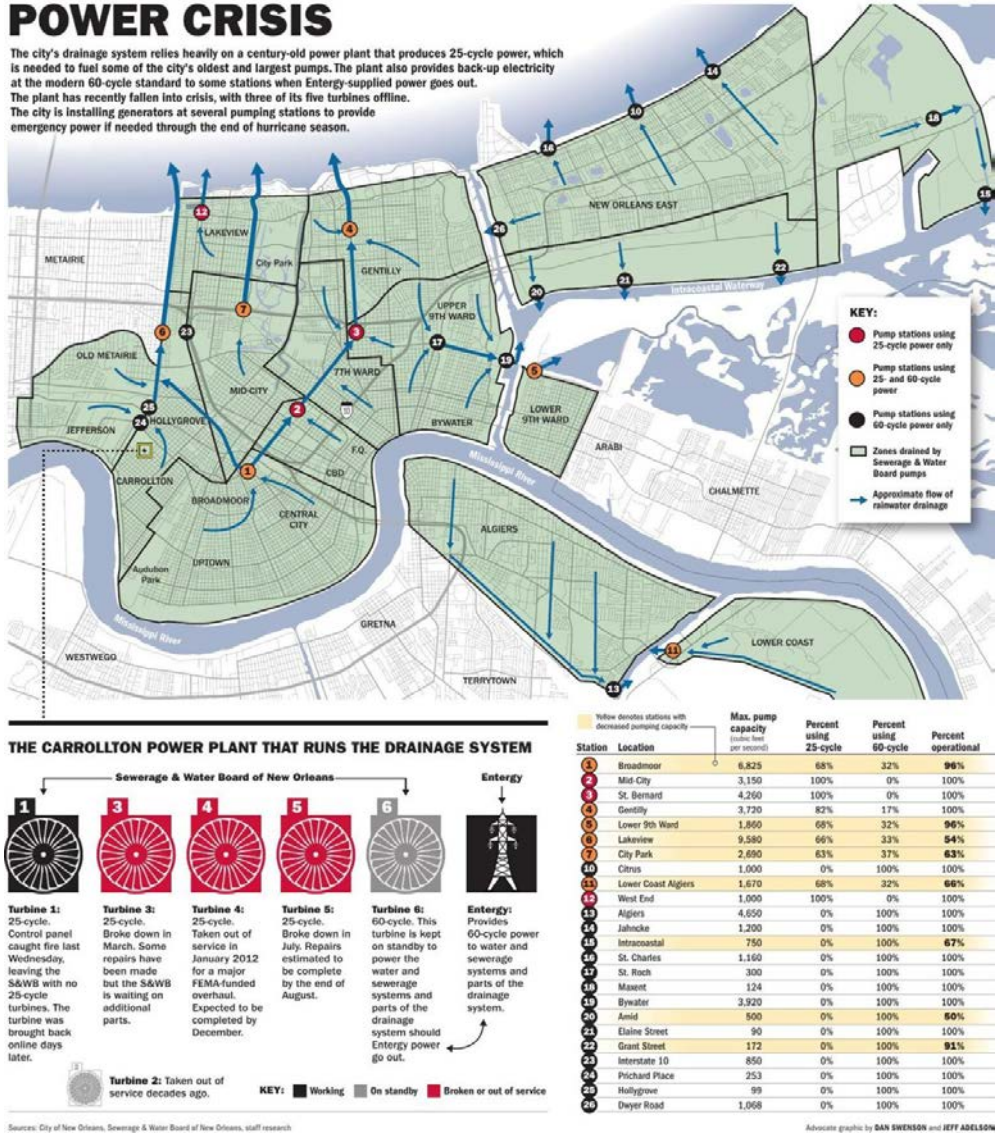
Infrastructure Networks

Soils, Water, and Biodiversity

Courtesy Waggonner & Ball

Implement Adaptive Management Systems

Water & Power Nexus



Lessons Learned

Relieve Stress on Energy Networks

- Improve Network Distribution
- Reduce household consumption
- Reduce utility/industrial consumption even in changing conditions

Prepare for Times of Disruption

- Scale resilience retrofits (PACE, etc.)
- Create greater redundancy for critical facilities & systems
- Rebuild/repair with energy efficiency as a goal

Lower GHG emissions and reduced stress on energy system.

Presentation Highlights: The Water Institute

- **Resiliency starts at the small scale** (i.e., the individual house), and expands to larger scales such as block, neighborhood and integrated networks.
- **Intelligent adaptive systems will be needed to ensure resiliency in the future**, particularly as increased heat and cooling will put more stress on the water and energy systems.
  - Heavy rain in New Orleans, for example, disrupted the City's old systems that couldn't sustain an increased demand in water and energy.
- **Preparing for times of disruption is crucial,** such as integrating resiliency into existing homes, which make up for the majority of homes in cities.
- **Rural systems are more interconnected than urban ones,** which makes them even more vulnerable during times of disruption.
- **Renewables play a key role in resiliency**, both during and after a disaster, as they allow communities to resist and bounce back more quickly.

Seth Mullendore
Vice President
Clean Energy Group

U.S. DEPARTMENT OF ENERGY

Solar+Storage for Energy Resilience

Seth Mullendore - Clean Energy Group

Better Buildings Residential Network Peer Exchange

Power Up: Residential Energy Efficiency and Resiliency

March 22, 2018

RESILIENTPOWER

A project of CleanEnergyGroup

RESILIENT POWER

A project of CleanEnergyGroup

- Increase public/private investment in clean, resilient power systems
- Protect low-income and vulnerable communities: affordable housing and critical public facilities
- Advocate for state and federal supportive policies and programs
- Engage city officials to develop resilient power policies/programs
- Technical assistance for pre-development costs to help agencies/project developers get deals done
- See www.resilient-power.org for reports, newsletters, webinar recordings

The Issue: Increasing Energy Dependence

Our lives and safety are becoming increasingly dependent on access to electricity:

- Basic needs: refrigeration (food, medication), clean water
- Communications: mobile phones, Internet
- Medical devices: oxygen, dialysis, mobility
- Heating and cooling

Vulnerable populations (elderly, disable, low-income) are disproportionately impacted.

The Solution:
Resilient Power Systems

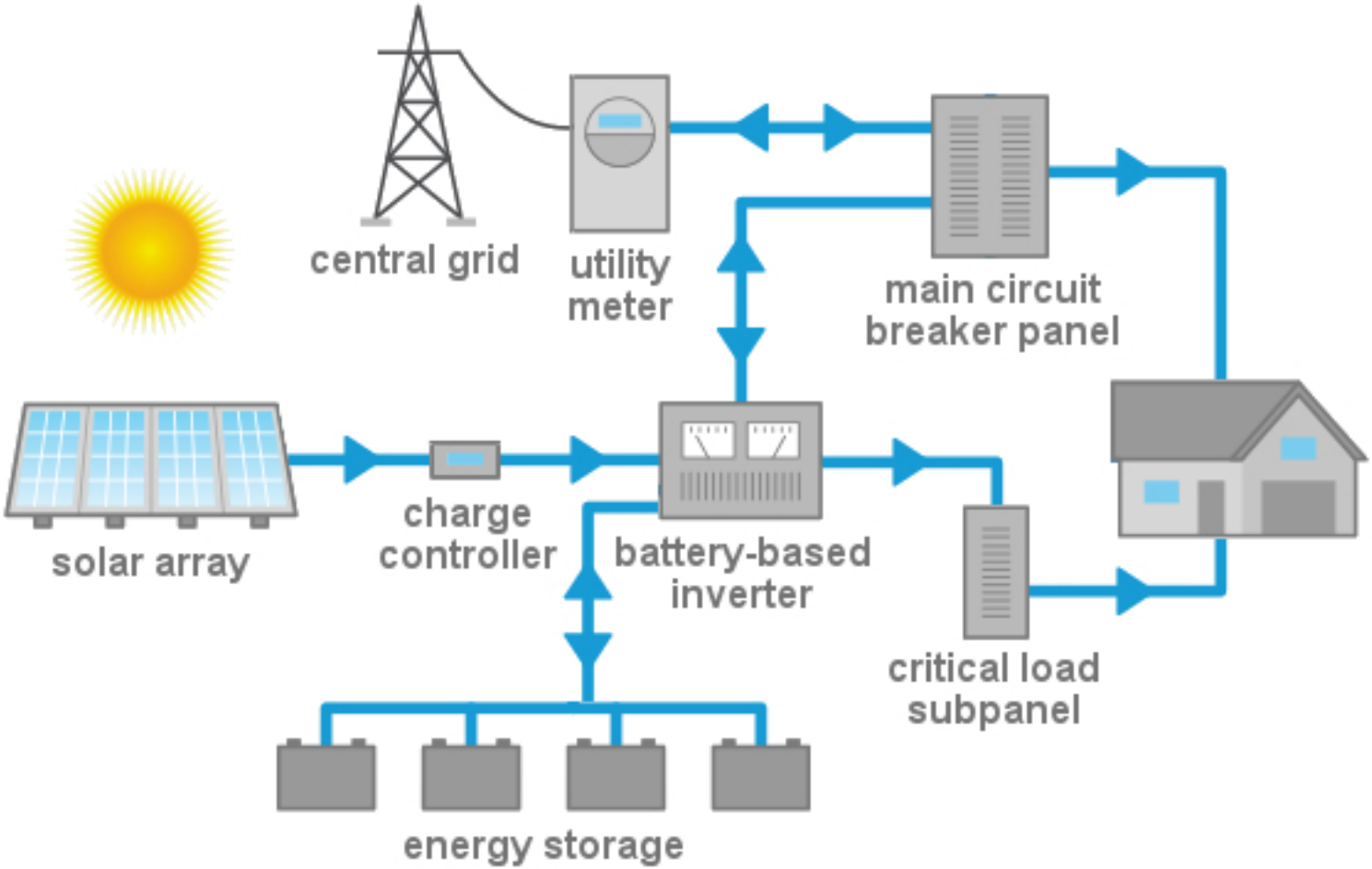
Generators?

Maybe, but generators have consistently failed when called upon during emergencies, both due to equipment failures and lack of access to fuel supplies.

Solar+Storage Offers a More Reliable Solution

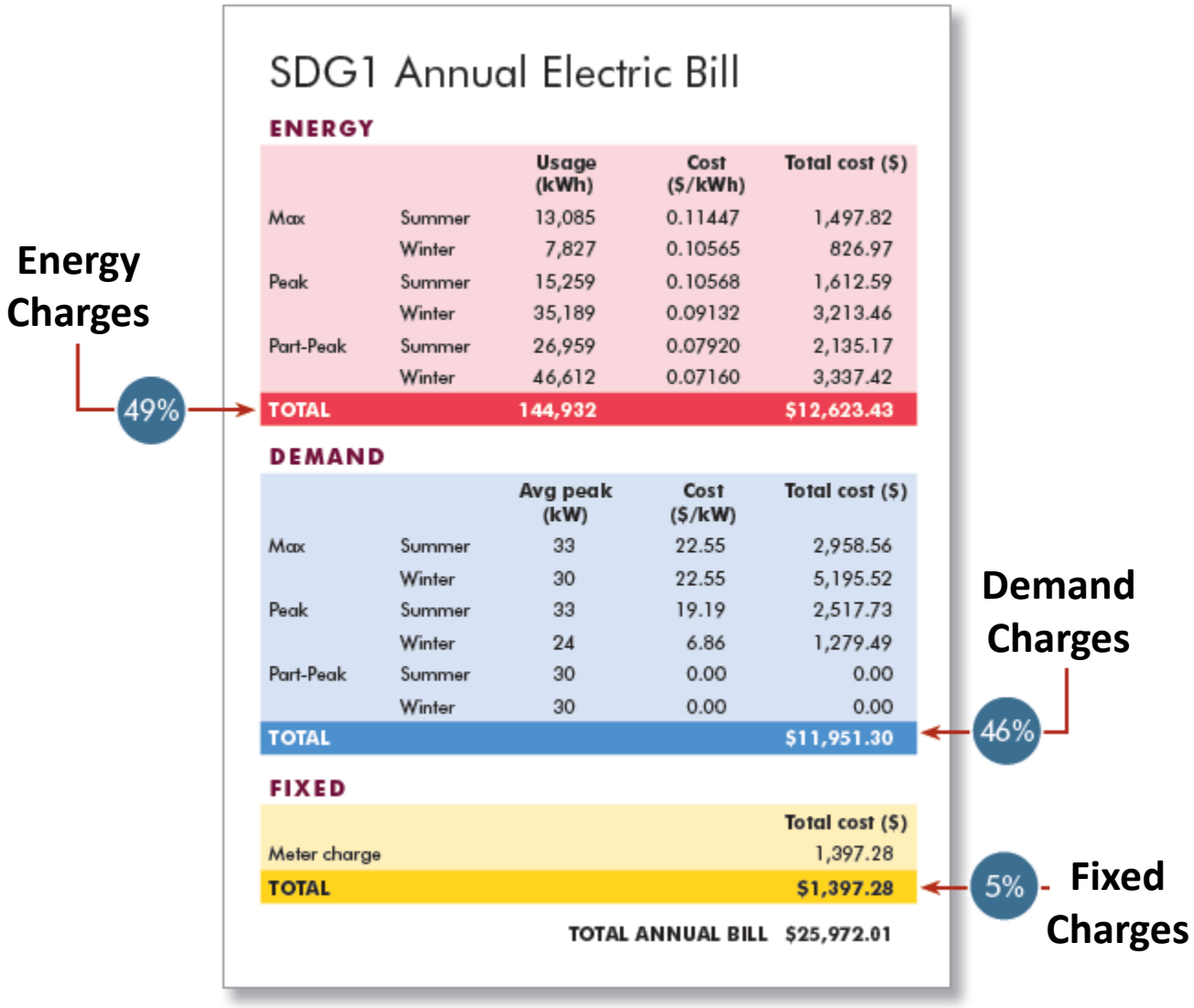
Unlike generators, solar PV and battery storage can operate all year long, regularly delivering electric bill savings and ready to act when an outage occurs. With enough solar to recharge the batteries, lack of fuel is not an issue.

How Does Resilient Power Work?

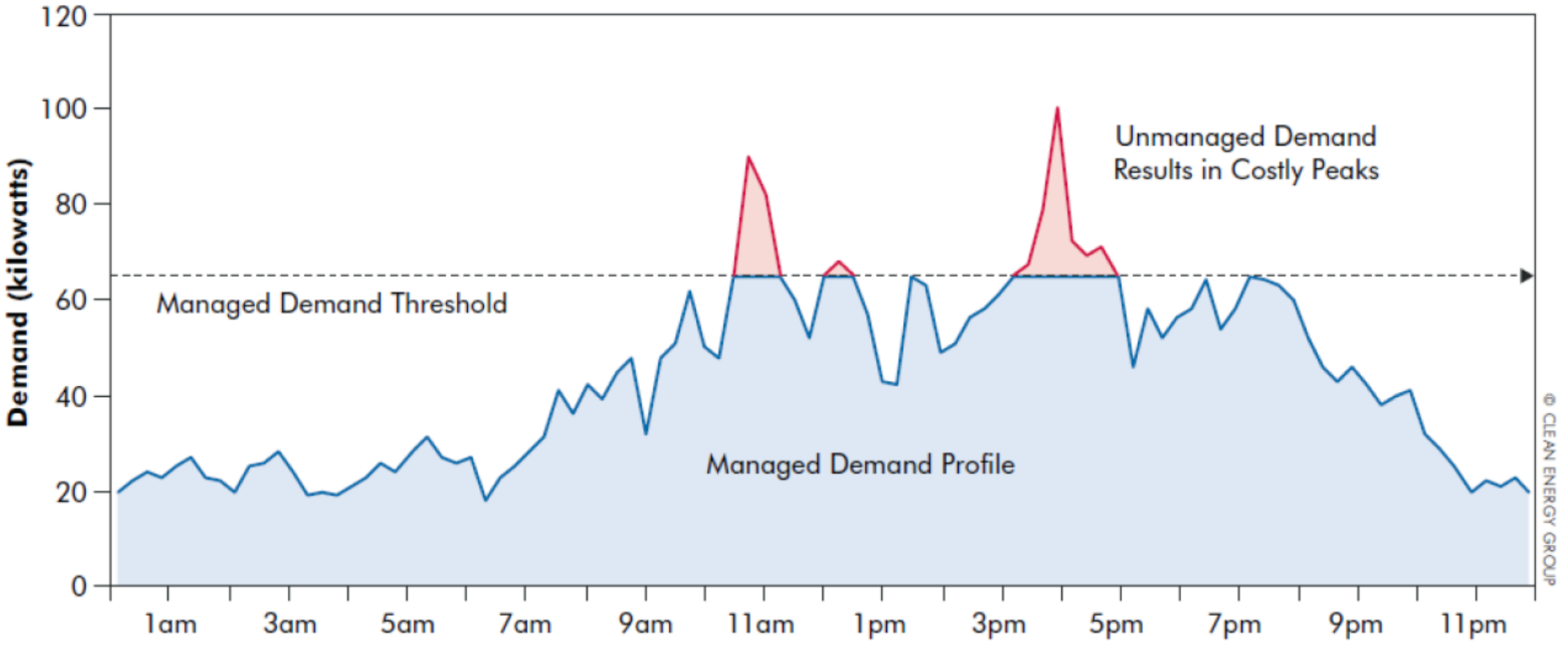


Resilient Power in Affordable Housing

How Can Solar+Storage Save Money?



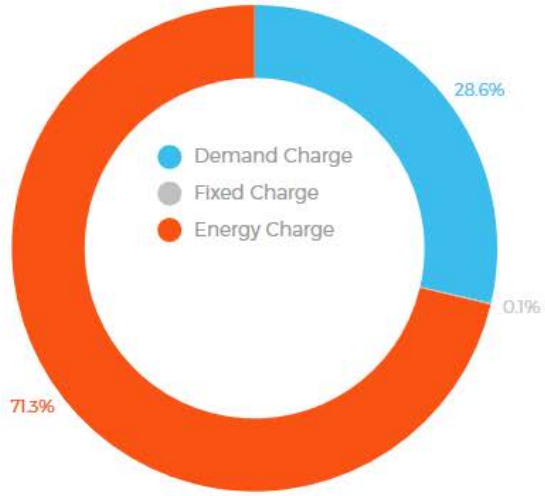
How can battery storage reduce demand charge expenses?

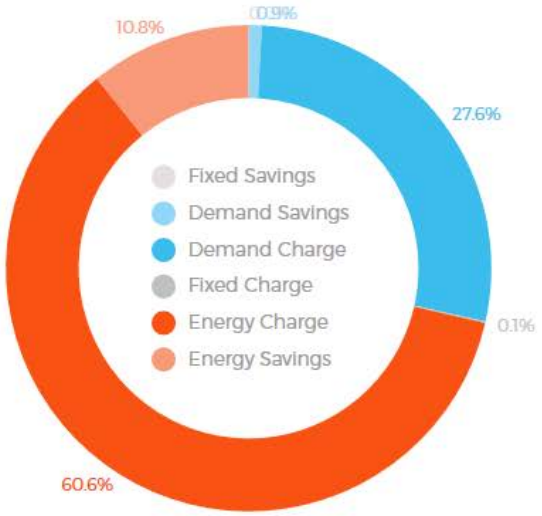


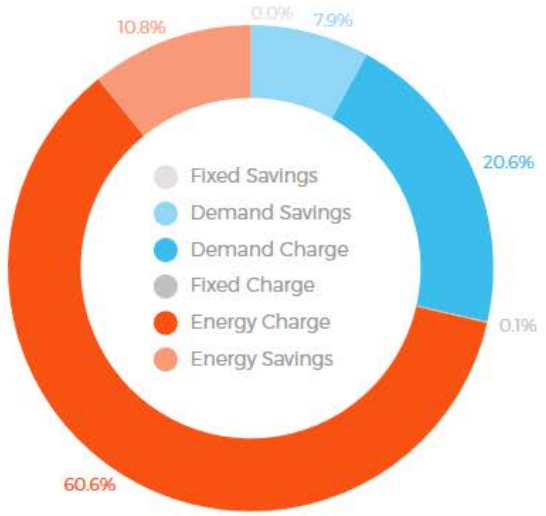
Through the deployment of an energy storage system, peak demand can be effectively capped at a specified level—significantly reducing utility demand charges. Assuming a demand charge of $15 per kilowatt and peak demand reduction from 100 kilowatts to 65 kilowatts each period (as shown here), energy storage could reduce the customer's demand charge by $525 per billing period, amounting to an annual savings of $6,300.

Case Study: Boston Housing Authority

Tariff:	G-2 (B2)
Energy Charges:	$ 421,924
Demand Charges:	$ 169,446
Fixed Charges:	$ 618
Total Utility Bill:	$ 591,989

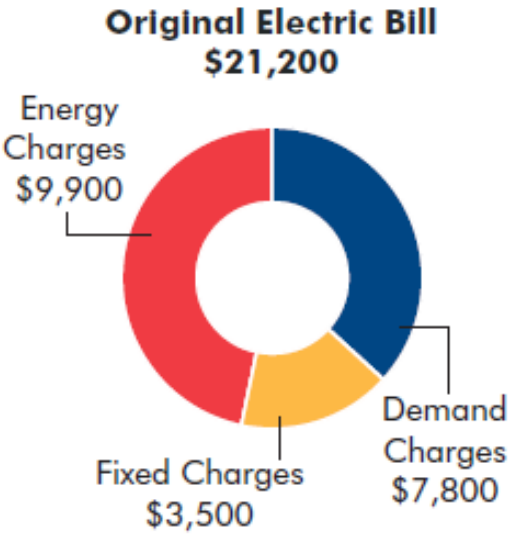


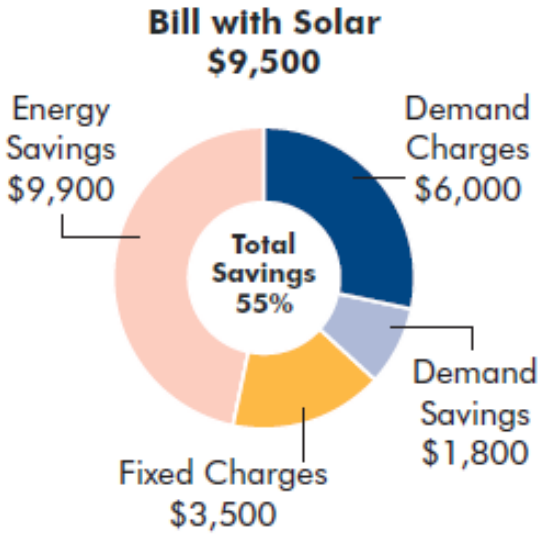


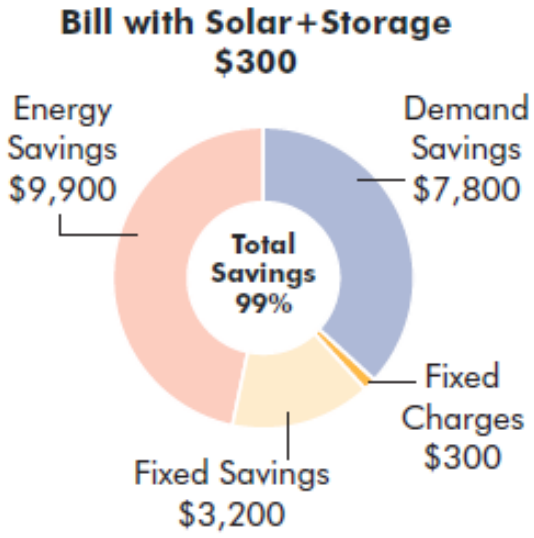


	Solar PV Only	Solar PV & Storage
Energy Savings:	$ 64,006	$ 64,364
Demand Savings:	$ 5,183	$ 47,142
Payback:	2.98 years	2.32 years
NPV:	$ 547,375	$ 1,063,885
IRR:	27.13 %	35.74 %

Case Study: Southern California Affordable Housing







	System size	Installed cost	ITC value	Depreciation tax savings	Additional incentives	Annual bill savings	Percent savings	Payback period (years)
Solar	90 kW PV	$315,000	$94,500	$121,600	$0	$11,700	55%	8.6
Battery storage	30 kW/90 kWh battery	$112,100	$33,600	$43,300	$37,000	$9,200	43%	2.5
Solar+ storage	90 kW PV + 30 kW/90 kWh battery	$427,100	$128,100	$164,900	$37,000	$20,900	99%	5.8

The Added Value of Resilience

Placing a value on the benefits provided by solar with storage during grid outages can significantly impact project economics and system design.

Large Hotel

Value on Resiliency?	Assigned Value of Resiliency ($/hour)	PV Size (kW)	Battery Capacity (kWh)	Net Present Value ($)
No	$0	0	0	$0
Yes	$5,317	363	60	$50,640

Source: NREL, CEG - Valuing the Resilience Provided by Solar and Battery Energy Storage Systems
https://www.cleanegroup.org/ceg-resources/resource/valuing-resilience-solar-battery-energy-storage/

Contact Information

Seth Mullendore
Vice President and Project Director
Clean Energy Group

Find us online:
www.resilient-power.org
www.cleanegroup.org
www.facebook.com/clean.energy.group
@cleanenergygrp on Twitter
@Resilient_Power on Twitter

CleanEnergyGroup
Innovation in Finance, Technology & Policy

RESILIENT POWER
A Project of Clean Energy Group

Presentation Highlights: Clean Energy Group

- **Solar combined with storage can provide a more resilient energy source throughout the year:** lithium-ion batteries are more resistant and installing batteries on rooftops can help avoid flooding.
  - Generators may be impacted by rain and fail due to technical issues: Puerto Rico's situation has been described as a mass failure of generators. The issue with solar is that when there's an outage, the solar system is shut down automatically.
- **Energy storage can lower the demand charges**: When demand reaches a peak point with higher utility costs, energy will be used from the battery storage and not from the utility. Lowering the demand during peak times also helps the utilities to lower costs.
- **The payback period for combined solar and storage is less than 6 years**, which is less than solar or storage alone.
- **Communicating resiliency to communities after a disruptive event** is usually the best time to convince people to take action.

Damei Jack
Manager
Con Edison

U.S. DEPARTMENT OF ENERGY

Con Edison Non-Wires Solutions

Damei S. Jack
Customer Energy Solutions
March 20, 2018

Agenda

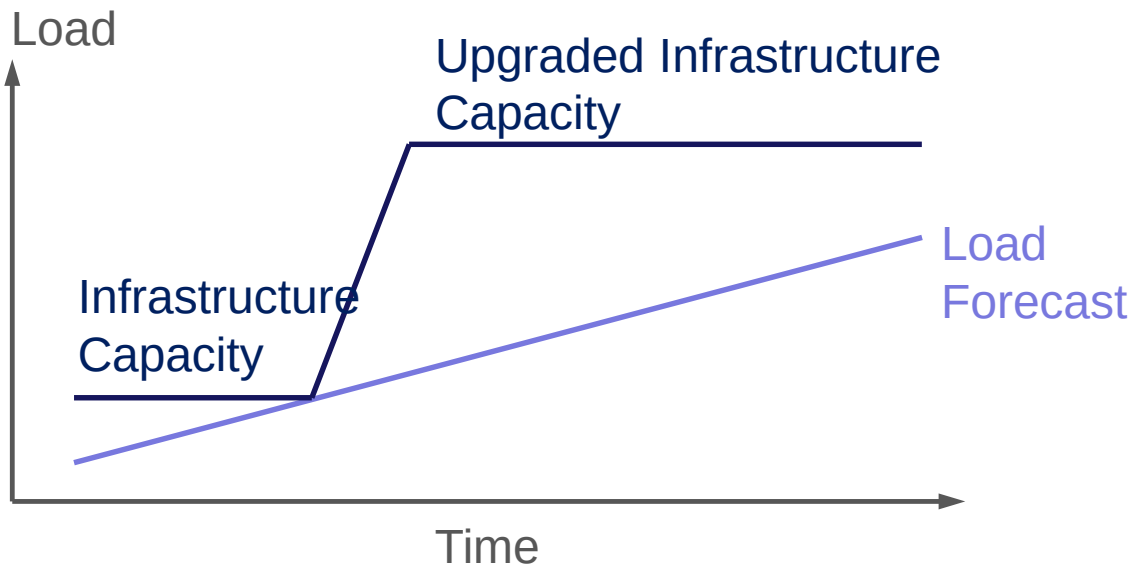
- Non-Wires Solutions
- BQDM Program
- Portfolio Development Approach
- Program Challenges
- New Opportunities

About Consolidated Edison

	Customers	Infrastructure	Service Territory
Electric	3.3 million	One of the largest underground systems in the world	All 5 boroughs and Westchester County
Gas	1.1 million	4,333 miles of gas mains and services	3 out of the 5 boroughs and Westchester County
Steam	1,760	Largest district steam system in the world	Manhattan below 96th Street

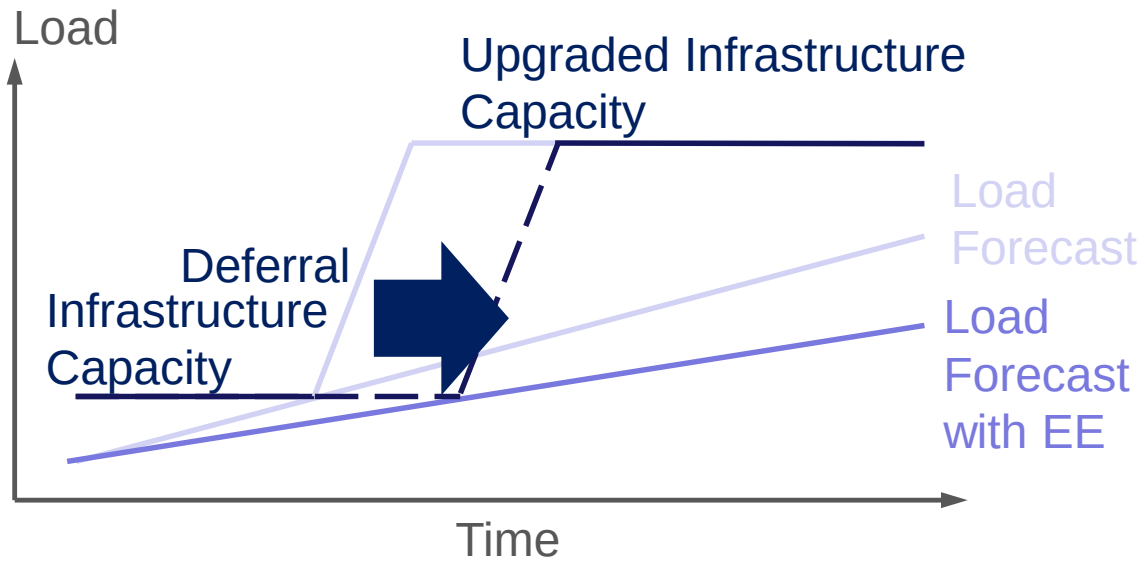
Non-Wires Solutions

- Traditional approach: build capacity based on forecast



Non-Wires Solutions

- Non-wires solution approach: lower forecast through EE/DM to defer upgrade



Brooklyn Queens Demand Management ("BQDM")

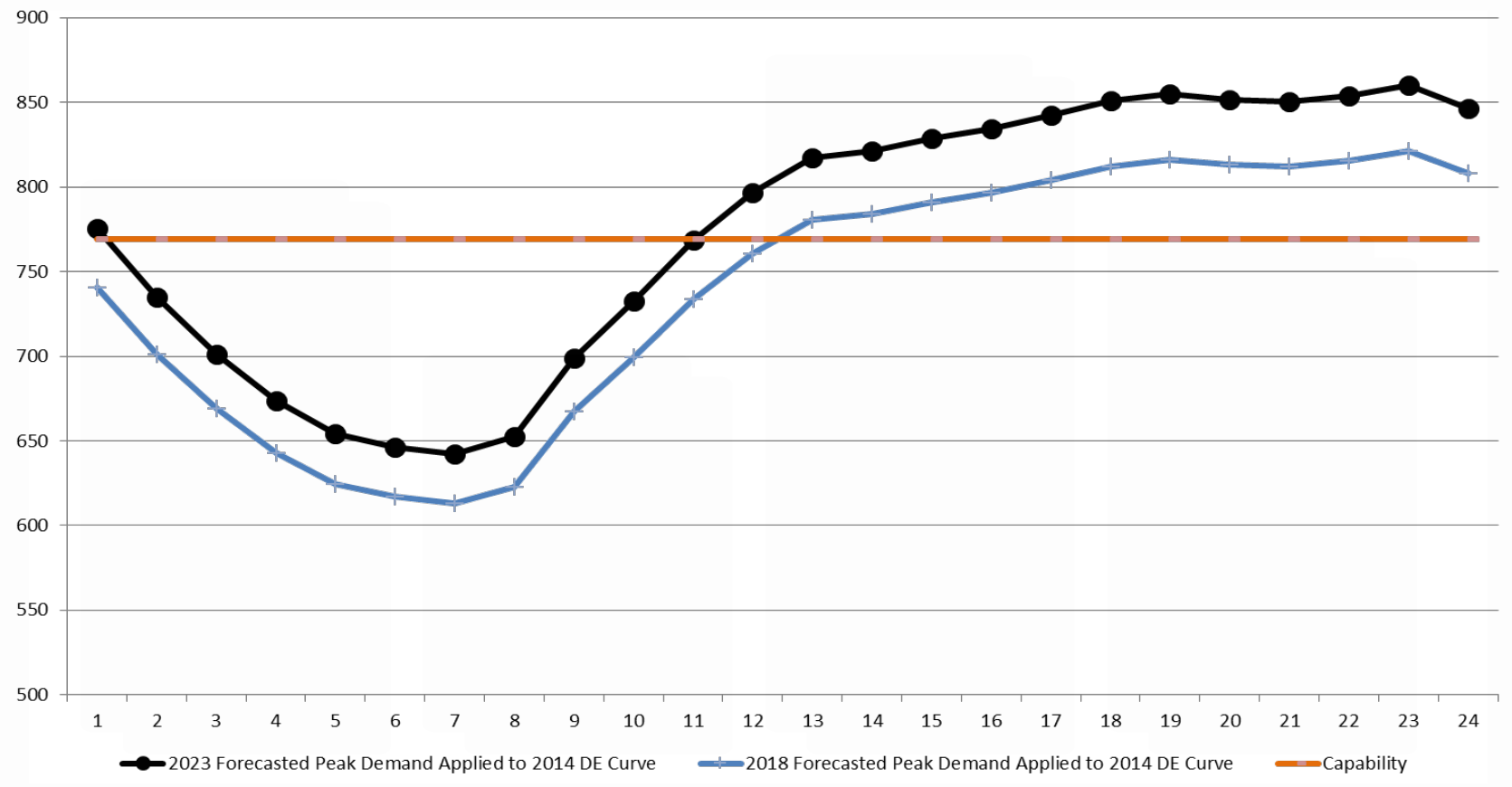
BQDM Program

- Peak growth in 3 networks in Brooklyn-Queens would require ~$1 billion in capital upgrades
- In 2014 Con Edison authorized to spend $200 million through 2018 to enable deferral of upgrade
  - Customer-side (41 MW, ~$150 million)
  - Utility-side (11 MW, ~$50 million)
- In 2017 Con Edison authorized to extend BQDM Program timeline (at no additional cost) to defer Glendale, a traditional part of the overall BQDM program, from 2019 to 2021

BQDM Geography

33

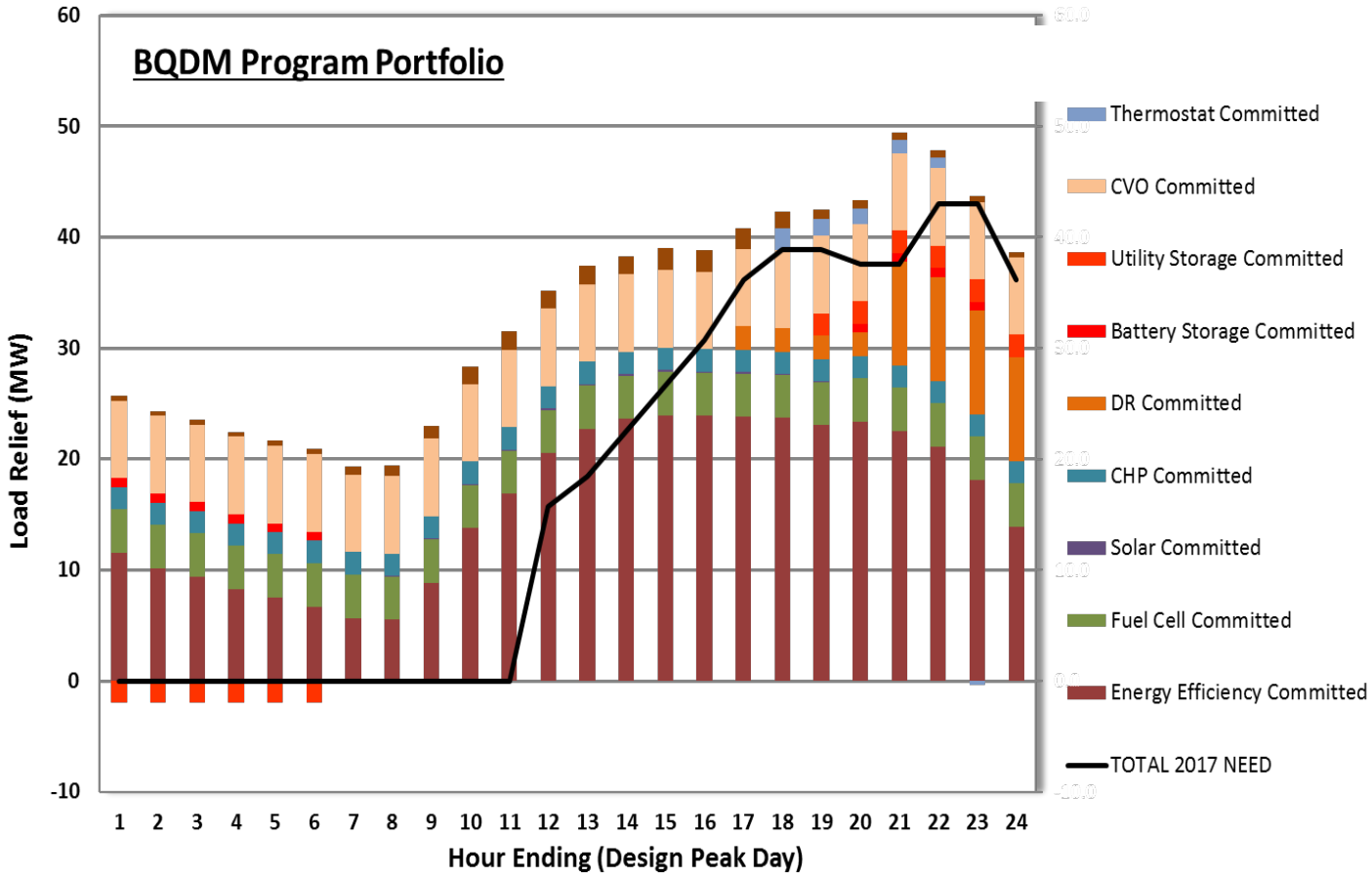
The BQDM Challenge
Solution Must Address 12 Hours



BQDM Program's Projects Contracted

BQDM CSS AND USS SOLUTIONS PORTFOLIO

ACRONYMS
DR – Demand Response
CHP – Combined Heat and Power
DMP – Demand Management Program
CVO – Conservation Voltage Optimization
C&I – Commercial and Industrial
CSS- Customer-Side Solutions
USS-Utility-Sited Solutions



Residential Customer Focus

1-4 Family Homes

Residential Lighting Direct Install

- Door-to-door canvassing efforts in the BQDM zone to offer Residential (1-4 family) customers **no cost** LED lighting upgrades.
- This is a "street sweep" effort: canvassers will be walking the neighborhoods, knocking on doors, offering upgrades.

Multifamily Energy Efficiency

Direct Customer Interaction

BQDM Customer-Sided Multi-Technology Project

DER technologies installed at an affordable housing facility include:
•300kW/1200kWh Li-ion Battery

•400 kW Fuel Cell

•390 kW Solar

BQDM PROGRAM'S RISKS TO EXECUTION

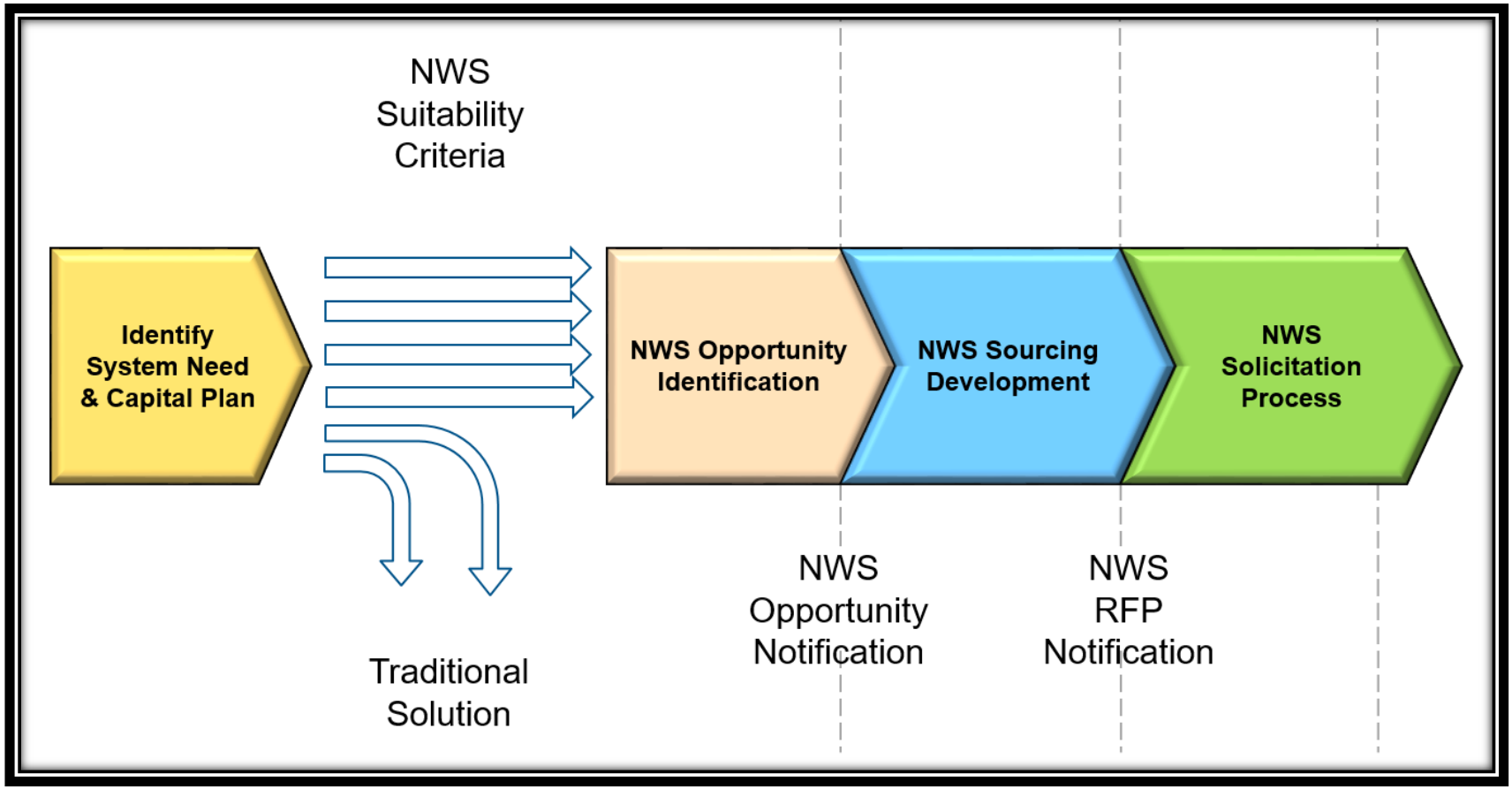
Non-Financial Risks Persist

Risks → Resources↓	Customer Acquisition	Electric Inter-connection	Gas Inter-connection	City Planning or Buildings Department	Fire Department New York	Budgetary Cycle and/or Lead Time
CHP	Medium	Medium	Medium	Medium	Medium	High
Fuel Cells	High	Medium	Medium	High	Medium	Medium
Demand Response	High	Medium	Medium	Medium	High*	Medium
Battery	High	Medium	N/A	High	High	High
Ice Storage	High	Medium	N/A	Medium	Low	High
Solar	High	Medium	N/A	Low	Low	Medium
Energy Efficiency	Medium	N/A	N/A	Low	N/A	Medium
Residential EE	High	N/A	N/A	Low	N/A	High
Public Entity EE	Low	N/A	N/A	Low	N/A	High
C&I EE	Medium	N/A	N/A	Low	N/A	Medium
CVO	N/A	N/A	N/A	N/A	N/A	Low

**** - Demand Response FDNY Risk is "High" for batteries***

NEW Non-Wires Solutions Identification

Planning Process and Sourcing Overview



Promoting Non-Wires Solutions to the Market

Non-Wires Solutions

Related Information

- RFP CLARIFICATION QUESTIONS (PDF)
- NON-WIRES ALTERNATIVES PROGRAM AGREEMENT (PDF)
- NON-WIRES ALTERNATIVES PROGRAM AGREEMENT-ADDENDUM 1 (XLSX)
- NON-WIRES SOLUTIONS WEBINAR (PDF)
- SUPPLIER ENABLEMENT TEMPLATE (XLSX)
- EO 2022 SPECIFICATION (PDF)

Non-wires solutions have the potential to reduce customers' electric bills, improve reliability, and defer capital infrastructure. We've identified several opportunities to create such change.

Responses to RFP questions can be found below.

Projects	Current Status	Documents
Primary Feeder Relief - Columbus Circle	**RFP closed. Under evaluation.**	RFP Questionnaire
Primary Feeder Relief - Hudson	RFP closed. Will not proceed.	RFP Questionnaire
Water Street Cooling Project	**RFP closed. Under evaluation.**	RFP Questionnaire
Primary Feeder Relief - Williamsburg	**RFP closed. Under evaluation.**	RFP Questionnaire
Cable Crossings (Flushing)	RFP available	RFP Questionnaire
Plymouth Street Cooling Project	**RFP closed. Under evaluation.**	RFP Questionnaire
Load Transfer W 42st	RFP available	RFP Questionnaire
W. 65th Street #1	Project deferred due to decrease in the projected load	Project Description
Glendale Project	**BQDM Auction rules available**	2019 BQDM Program Extension Auction Requirements 2019 BQDM Program Agreement 2019 BQDM Program FAQs
Yorkville Crossing	No longer a candidate	Project Description

- www.coned.com/nonwires
- REVConnect
- REV & Con Edison Rate Case Proceedings

Presentation Highlights: Con Edison

- **The project aimed to reduce, not only peak demand, but also the overall energy throughout the day.** Brooklyn has high energy use, including at night time, due to many restaurants in the area.
- **Communicate, communicate, communicate**: project contractors promoted the BDQM project and encouraged the adoption of newer technologies. Con Edison partnered with NYSERDA and provided incentives for people wanting to adopt these technologies.
  - **The boots-on-the-ground approach** also helped understand people's needs and how the program can meet their goals.
- **The BQDM project was a learning experience and the joint utilities in NY state are currently looking at a way to standardize the process.** A third round of projects have just started.

Discussion Highlights: What are the gaps in knowledge around residential energy efficiency and resiliency that, if filled, would help improve work in this area?

- More education on **the connection between energy efficiency and resilience** is key.
- **Need to find a way to monetize energy efficiency and resilience:** Communicating the tangible cost reduction that comes with energy efficiency can help motivate people towards more upgrades.
  - MA had a Community Clean Energy Resiliency Initiative, for example, that offered cost incentives for storage batteries.
- **Funding remains a challenge.** The people who are more stressed by utility bills are less likely to make this transition: vulnerable populations cannot afford to install solar panels.
- **More data on how residents are using energy, e.g. through advanced metering infrastructure (AMI),** would help inform program design and match residents' needs.

Upcoming Seasonal Messaging Opportunities

Now is the time to start planning energy efficiency messaging!

June 10

Children's Day

June 21

Summer Solstice

June 22

National HVAC Tech Day

Enhabit

IE3

Explore the Residential Program Solution Center

Resources to help improve your program and reach energy efficiency targets:

- Handbooks - explain *why* and *how* to implement specific stages of a program.
- Quick Answers - provide answers and resources for common questions.
- Proven Practices posts - include lessons learned, examples, and helpful tips from successful programs.
- Technology Solutions NEW! - present resources on advanced technologies, **HVAC** & **Heat Pump Water Heaters**, including installation guidance, marketing strategies, & potential savings.

https://rpsc.energy.gov

Addenda: Attendee Information and Poll Results

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Call Attendee Locations

Call Attendees: Network Members

- American Council for an Energy-Efficient Economy (ACEEE)
- Boulder County
- Center for Sustainable Energy
- City of Chula Vista Conservation Section
- City of Kansas City
- CLEAResult
- CLEVELAND PUBLIC POWER
- Group14 Engineering Inc.
- New York State Energy Research & Development Authority (NYSERDA)
- Wisconsin Energy Conservation Corporation (WECC)

Call Attendees: Non-members (1 of 2)

- ABCD, Inc.
- AEA
- APT Habitat
- Ballarat Consulting
- Brendle Group
- California Public Utilities Commission
- City of North Miami
- Clallam County
- Clean Energy Group
- Community Office for Resource Efficiency (CORE)
- Con Edison
- Delaware Division of Energy and Climate
- EfficiencyOne
- Georgia Watch
- Green Compass Sustainability
- Hale Koa Hotel
- HILCO Electric
- ICF
- Illuminating Engineering Society
- Local Government Commission
- Maryland Energy Administration
- MassEnergize
- Mercy Housing Management Group
- National Council of Structural Engineers Associations
- National Fuel Gas Company

Call Attendees: Non-members (2 of 2)

- New Buildings Institute
- New York City Department of Housing Preservation and Development
- New York Office of Energy
- Pennsylvania Housing Research Center
- Portland Energy Conservation
- Proctor Engineering
- Seek More LLC
- Sierra Business Council
- Sinte Gleska University
- Solar Habitats, LLC.
- Southeast Energy Efficiency Alliance
- Southwest Environmental Finance Center
- Sunnyvale Cool
- The Building People
- The Water Institute
- Timber Block USA
- Utah Clean Energy

Opening Poll

- Which best describes your organization's familiarity or experience with resiliency and its connection to residential energy efficiency?
  - Very experienced/familiar – ***48%***
  - Some experience/familiarity – ***43%***
  - Limited experience/familiarity – ***6%***
  - Not applicable – ***3%***
  - No experience/familiarity – ***0%***

Closing Poll

- **After today's call, what will you do?**
  - Seek out additional information on one or more of the ideas – ***66%***
  - Make no changes to your current approach – ***17%***
  - Consider implementing one or more of the ideas discussed – ***11%***
  - Other (please explain) – ***6%***