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# Building Resilient Communities: State and Local Perspectives

September 15, 2020
3:00 – 4:00 pm EDT

U.S. DEPARTMENT OF ENERGY

# Virginia Castro

U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY

# Today's Presenters

**Will Lauwers**
Massachusetts Department of Energy Resources

**Megan Levy**
Wisconsin Office of Energy Innovation

**Peter Brandom**
City of Hillsboro, Oregon

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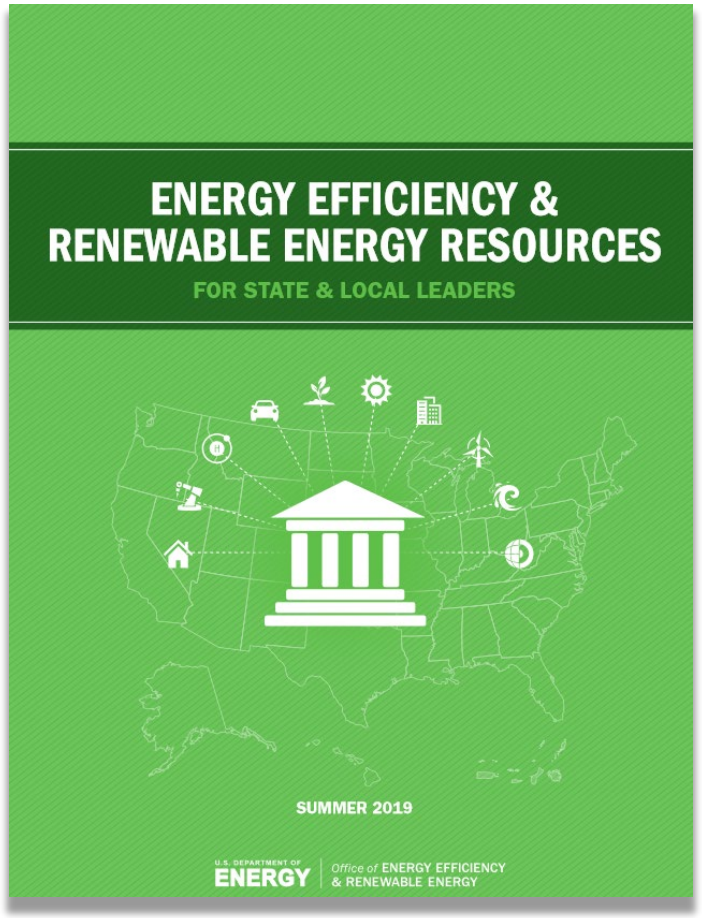
# Building Resilient Communities: State and Local Perspectives

## Today's panelists will discuss:

- What resilience means to them
- Federal funding, tools, and strategic partnerships
- Best practices and lessons learned



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**Energy Efficiency and Distributed Generation for Resilience: Withstanding Grid Outages for Less**

Communities across the United States experience extreme weather-related events that lead to disruptions in electric service.[1] In 2017 alone, the nation experienced droughts, floods, freezes, hurricanes, and wildfires that cumulatively cost over $300 billion in damages[2] and led to longer and more frequent disruptions in power.[3] Without on-site backup power, these disruptions endanger public safety, security, and health. To better prepare for future disruptions, state and local governments are reducing the electric demand of their critical operations through energy efficiency, as well as making new investments in microgrids with distributed generation to ensure continuous electric supply during extended grid outages to power critical facilities.[4]

The strategy is simple: when a critical public facility needs less energy to function, it also needs less backup generation on-site to operate when the grid goes down.[5] This strategy applies whether the site's resilience plan uses a diesel generator, combined heat and power (CHP), or battery storage combined with distributed renewable resources like solar photovoltaic (PV) or wind. For many public buildings, energy efficiency is a cost-effective investment that can also make it cheaper to power through a grid outage.[6]

Energy efficiency improvements also save money at public facilities during normal operations by lowering energy bills year-round. This spectrum of benefits can be especially appealing to public officials considering options for strategically investing in long-term energy resilience in their communities.

**Case Studies: Energy Efficiency Integration into Resilience Planning**

In the cases below, investments in distributed energy resources (DERs) were implemented in buildings where maintaining operations during a grid outage is a high priority. In each case, as part of a holistic strategy, energy efficiency helps the site maintain operations with less power needed:

[1] U.S. Energy Information Administration. (November, 2018). Average U.S. electricity customer interruptions totaled nearly 8 hours in 2017. https://www.eia.gov/todayinenergy/detail.php?id=37652.
[2] NOAA National Centers for Environmental Information (NCEI). (2019). Billion-Dollar Weather and Climate Disasters. https://www.ncdc.noaa.gov/billions/.
[3] U.S. Energy Information Administration. (November, 2018). Average U.S. electricity customer interruptions totaled nearly 8 hours in 2017. https://www.eia.gov/todayinenergy/detail.php?id=37652.
[4] National Association of Regulatory Utility Commissioners (NARUC). (April, 2019). The Value of Resilience for Distributed Energy: An Overview of Current Analytical Practices. https://pubs.naruc.org/pub/531AD059-9CC0-BAF6-127B-998CB5F02198; U.S. Department of Energy, Better Buildings. (August, 2018). Promising Practices in Energy Resilience. https://betterbuildingssolutioncenter.energy.gov/sites/default/files/Promising-Practices-Energy-Resilience.pdf.
[5] One recent report on microgrids and efficiency at U.S. military bases found that when a site "reduces those power needs through energy conservation and efficiency, its energy security costs drop proportionately." Noblis. (2017). Power Begins at Home: Assured Energy for U.S. Military Bases. https://noblis.org/wp-content/uploads/2017/11/Power-Begins-at-Home-Noblis-Website-Version-15.pdf.
[6] U.S. Department of Energy, Better Buildings. The Efficiency-Resilience Nexus. https://betterbuildingsinitiative.energy.gov/sites/default/files/attachments/Resilience%20factsheet%20BBC.pdf.

*Resources will be linked at the end of this presentation*



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# Will Lauwers

Massachusetts Department of Energy Resources

U.S. DEPARTMENT OF ENERGY

# Massachusetts' Energy Resilience

DOER Director of Emerging Technology

Will Lauwers

# Defining Resilience

- Presidential Policy Directive 21-- Critical Infrastructure Security defines "resilience" as

  *'the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents'*

- **Resilience is not 100% provision of service 100% of the time**
  - Resilience is instead a time varying description of the level of service provided following a disruptive event

Figure 2.2
Different Systems Will Have Different Resilience to the Same Disruption

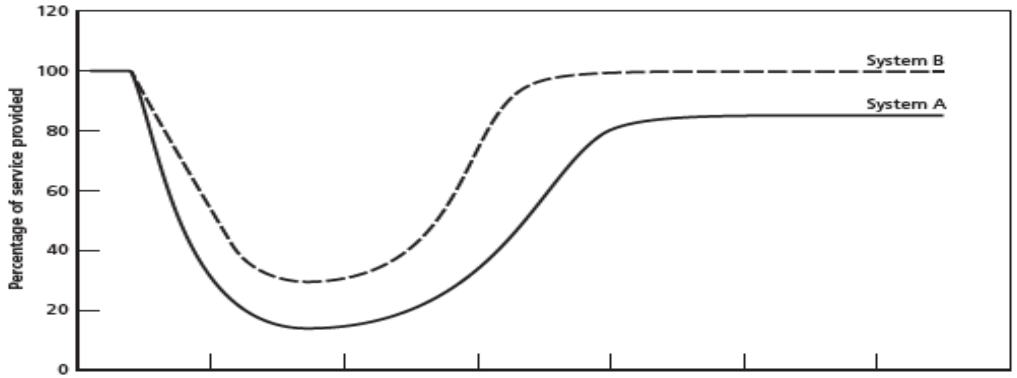



Figure 2.2 from RAND Study RR883

[Measuring the Resilience of Energy Distribution Systems]

# MA Executive Order 569

## Establishing an Integrated Climate Change Strategy for the Commonwealth

- Key Objectives
  - Mitigate and reduce greenhouse gas emissions
  - Build resilience and adapt to the impacts of climate change

- Tasks
  - Statewide Hazard Mitigation and Climate Adaptation Plan
  - Establish Municipal Vulnerability Preparedness program to enhance state and local partnerships, and provide direct support and technical assistance
  - Assessment of each Agency's vulnerabilities and adaptive capacity

***Resilience grants to facilities that provide critical services will help make Massachusetts a safer place.***
- Governor Baker, Sept 2016, Announcing $14 million to the Energy Resiliency Grant Program

North Andover, Massachusetts
Greater Lawrence Sanitary District
$4.4 million DOER Clean Energy Resilience grant recipient

# State Energy Context

## Resilience

Massachusetts energy context is typically stated simply as the end of a pipeline; **Methods to reduce cost and improve reliability and resilience at the end of a supply chain**

1. **Action Plan**
   - ✓ Identify hazards, plan enduring strategies and acute responses
   - ✓ Massachusetts Hazard Mitigation & Climate Adaptation Plan
2. **Reduce consumption and reliance**
   - ✓ Massachusetts ranked #1 in efficiency 9 consecutive years
   - ✓ Distributed generation programs to incent generation co-located with load
3. **Harden load to impact of disruption**
   - ✓ $40M Energy Resilience Initiative & Municipal Vulnerability Preparedness
4. **Diverse & redundant supplies** (prevent single-points-of-failure)
   - ✓ 2016 Energy Diversification Bill; procure off-shore wind and hydroelectric resources
5. **Harden supply chain**
   - ✓ Grid Modernization docket for Utilities to automatically resection the distribution system to mitigate the impacts of outages

# Cost Effective Resilience

## Blue Sky ROI

- It's much easier to receive approval for a capital intensive project with a positive ROI.

- Energy Efficiency is cost effective, particularly when resilience is a concern. Every kW of demand reduction is a kW that doesn't need to be backed up.

- Blue Sky ROI
  - Energy Charge Offset
  - Demand Charge Management
  - Continuous Operations & Maintenance

> "For conventional sewage treatment plants, around 30 percent of the annual operating costs is usually required for energy."
> *Waste Water Engineering: Treatment and Reuse 4th Edition*

- Resilience Valuation
  - Differentiate the value of providing service during blue sky vs. outage conditions
  - Tier loads; varying generation can support varying load profiles e.g. solar in summer may provide power to more loads than solar in winter

# Massachusetts Policy

## Supporting Energy Resilience

- Collaborate with Municipalities
  - Green Communities program provides technical assistance and grants
  - Municipal Vulnerability Preparedness program provides technical assistance and grants
- Collaborate across State Agencies
- Lead by Example
  - State facility energy resilience grants
- Energy Efficiency Incentives
  - MA ranked #1 in Energy Efficiency by ACEEE 9 years in a row
- Distributed Generation Incentives
  - Nation leading Clean Peak Standard includes a Resilience Multiplier
  - New SMART solar program incents energy storage with solar
  - SMART program provides additional incentive for public consumers of solar energy
  - CHP and Fuel Cells incentivized through the Alternative Portfolio Standard (APS)
    - Also incents renewable thermal (solar thermal, air source heat pumps, ground source heat pumps, bio-fuels)
  - Demonstration grants: $20M Energy Storage Initiative, $40M Clean Energy Resilience
- Provide the tools for informed decision making
  - Resilience clearinghouse http://www.resilientma.org/

# Massachusetts Policy

## CCERI Round 2: Municipal Services; Sterling, MA

- CCERI Round 2 focus on: Water, Wastewater, Police/Fire dispatch
  - Improve energy resilience of critical services
  - Lessons: complex and capital-intensive project management can be difficult for municipalities
- Sterling Project in Focus
  - Distribution connected energy storage system at a Municipal Light Plant substation
  - Police and Fire dispatch is close to the substation, and the battery can provide backup power for over a week of operations
  - The storage can also keep other circuits with substantial solar development online, enabling continuous operations
  - The MLP is looking into extending the circuit section supported by the battery, enabling incremental resilience improvements by backing up other municipal buildings
  - First distribution scale energy storage in MA
  - Ground breaking to installed and operational in <6 months
  - $400k/year savings passed on to MLP ratepayers
    - Transmission & Capacity savings

**DOER Resilience Funded**
**2 MW / 3.9MWh Energy Storage**
**Paired with Solar**

# Massachusetts Policy

## CCERI Round 3: Hospital Energy Resilience

- Hospitals provide critical services & moving patients is hazardous to patients and time intensive on emergency responders and equipment.
- Program focus on resilient Combined Heat and Power plants
  - Grants include Existing & new CHP, Reciprocating & Turbine, with and without absorption chillers, with and without energy storage, and with and without solar PV onsite
- Why CHP focus?
  - Hospitals are typically a good CHP fit due to substantial and predictable thermal loads
  - CHP are maintained and operated 100% of the time for an ROI, and are therefore likely to be in good operating condition at the time of an emergency event
  - as compared to diesel generators which sit idle for long periods, are designed for short duration operations, and have a history of failures during emergencies
- Funded engineering & equipment to enable CHP black start and island
  - Black start is the ability to turn on without an external power source
    - need power to turn-over CHP
      - blackstart generator, compressed air, or battery energy storage
  - Island is the ability to operate and serve local load without an external power source
    - Grid disconnect
      - CHP often have minimum import requirements which trip CHP, need to adjust CHP trip settings to permit islanding, which likely requires modifications to interconnection agreements.
    - CHP controls to prevent trips
    - Load controls and/or energy storage to balance electric load with thermal & prevent trips

# Massachusetts Policy

## CCERI Round 3: Hospital Energy Resilience

- Additional Considerations
  - Synchronization procedures
    - Automatic load controls vs. Manual
    - **Ride-through** vs. blackstart
      - Ride-through means the system will attempt to continue to operate through the outage event.
      - If no ride-through, system will trip with outage, UPS will cover through backup genset turn-on, and CHP is then blackstarted
    - **Procedure manual** onsite to ensure staff onsite know how to initiate black start & island
      - For example, if load isn't automated, process may include staff located across facility communicating via radio to incrementally increase load as CHP ramps up. Too much load too fast and CHP can trip, too slow and CHP can trip.
        - Synchronization procedures thus are drafted based on common loading on various circuits to plan which order and timing to add loads.
      - Energy storage is an alternative which can vary its output to match the CHP ramp. This simplifies the process, but requires investment in ESS and a controls scheme
  - Site Service Feed configuration
    - Most critical infrastructure have **switchgear** served by 2 independent distribution circuits to increase reliability
    - Often switchgear needs to be replaced to enable island mode & communications to site generation
  - If the broad outage is associated with natural gas supplies, then a CHP system likely goes down due to the same event conditions

# Electric Building Resilience

- Electrification of the thermal sector is core to meeting our GHG objectives
  - MA DOER 2018 Comprehensive Energy Plan
    - https://www.mass.gov/service-details/massachusetts-comprehensive-energy-plan-cep
- Cost effective electrification of buildings requires high-performance envelopes
  - We've seen passivehouse high-performance envelopes with incremental cost of just 1.4%
    - https://www.masscec.com/emerging-initiatives/passive-house
- Electric buildings only need to make a single energy source resilient, while combustion heated buildings need to enhance resilience of their electric supply and their fossil fuel supply
- High performance buildings can self-produce a higher percent of their energy needs with renewables, reducing reliance on external supply
- High performance buildings remain habitable for extended periods of time, even without operational heating & cooling systems

Energy storage paired with distributed generation can effectively buy down risk while providing a positive return on investment to the facility.

**THANK YOU**

# Megan Levy

Wisconsin Office of Energy Innovation

# Building Resilient Communities: A Wisconsin Perspective

MEGAN LEVY
WISCONSIN OFFICE OF ENERGY INNOVATION
BETTER BUILDINGS WEBINAR SERIES
SEPTEMBER, 2020

# Climate Resilience & Adaptation

- *Climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends or disturbances related to climate.*

- *Improving climate resilience involves assessing how climate change will create new, or alter current, climate- related risks, and taking steps to better cope with these risks.*

- *Climate adaptation is the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities."*

# Department of Defense (DoD) concern about energy resilience is being captured in policy, directives, and instructions

- DoD Directive 4180.01 – DoD Energy Policy is to strengthen energy security by improving the energy performance of installations
- DoD Instruction 4170.11 Installation Energy Management
  - *Establishes requirements for energy resilience on military installations and allows for the use of integrated, distributed, and renewable energy sources for energy resilience*
  - *Requires alignment between energy requirements and critical mission operations, ad maintaining primary and emergency energy systems*
- DoD Directive 4715.21: Climate Change Adaptation and Resilience (2016) requires

  DoD to:
  - *Consider climate change resilience in installation planning to include impacts on built and natural infrastructure*
  - *Engage with subnational government to promote compatible development*
  - *Assess and manage risks to built and natural infrastructure*

- Source: Converge Strategies: Summary briefing for energy officials July, 2019 Emery Resilience Planning

  https://convergestrategies.com/

# Military Service Energy Resilience Policies

**Army**

- Army Directive 2017-07 – 14 days energy and water requirement for critical missions
- Army Energy Security and Sustainability (ES2) strategy provides a roadmap to foster a more adaptable and resilient force

**Air Force**

- Air Force Policy Directive (AFPD) 90-17 – 7 days power requirement for mission essential critical infrastructure
- Air Force Energy Flight Plan sets goal that all mission critical functions have assured access to a reliable energy supply at all times by 2036

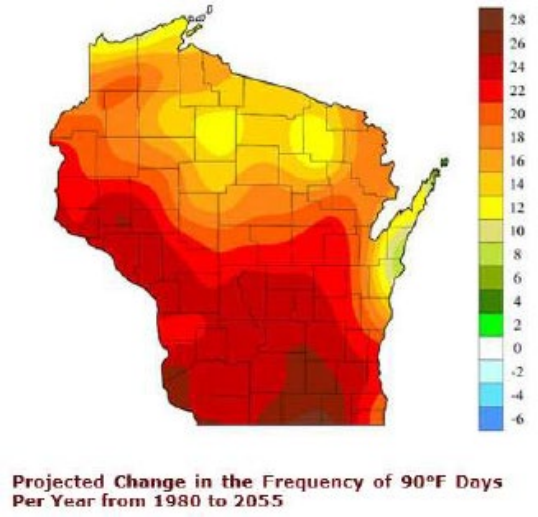
**Navy**

- Navy Energy Security Framework (ESF) describes the three pillars of energy security: 1) resiliency, 2) reliability, 3) efficiency
- Up to 7-day back-up power requirement, depending on type of facility

Source Converge Strategies: Summary briefing for energy officials July, 2019

# What Does Climate Change Mean to Wisconsin?

- Flooding
- More hotter days coupled with an increase in annual precipitation of 3.1 inches, primarily in south and west with some drying in north
- Economic impacts
- Society & the built environment
- Changing habitat

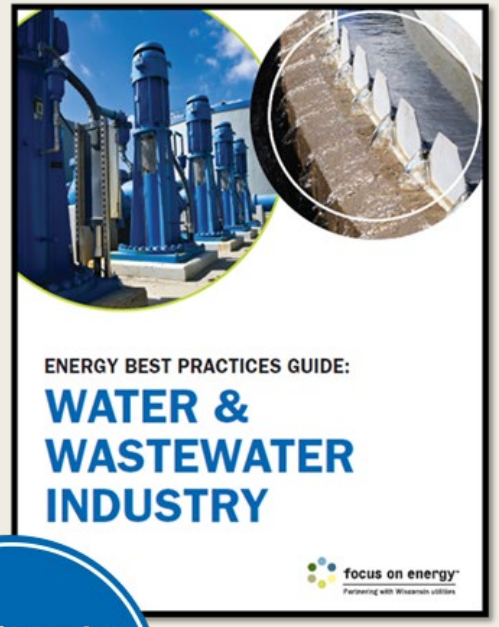


# The Big Audacious Goal That Will Make A Difference In The Next Decade?

- Develop strategies and steps to build Wisconsin's capacity for community and ecological resilience and adaptation to climate change
- Identify, frame, and strategize approaches focused on ***anticipation and prevention-not just disaster recovery***
- Quantify and communicate the **economic impact** of doing nothing vs well-thought out climate adaptation and resilience strategies.

# Energy Efficiency = Resilience

We need new goals for Energy Efficiency
Consider critical infrastructure microgrids around municipal water/wastewater loads

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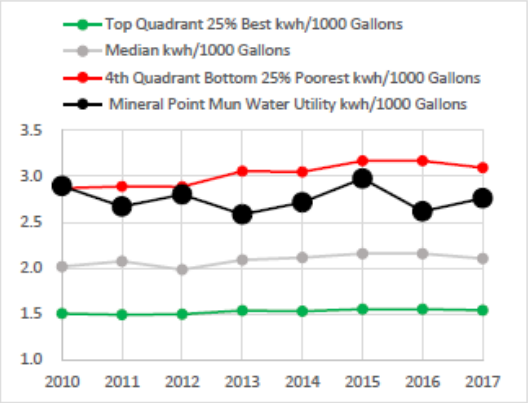
# Water Utility Analysis

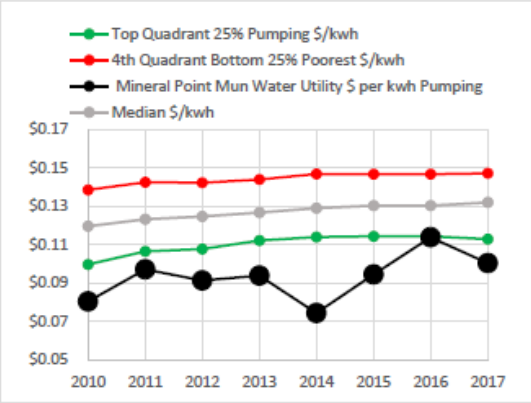
**Quartile Statistical Benchmarks where 1 = Top Quadrant 25% Best, 2 = 2nd Quadrant Good, 3 = 3rd Quartile below Median & 4 = 4th Quadrant Bottom 25% Poorest**

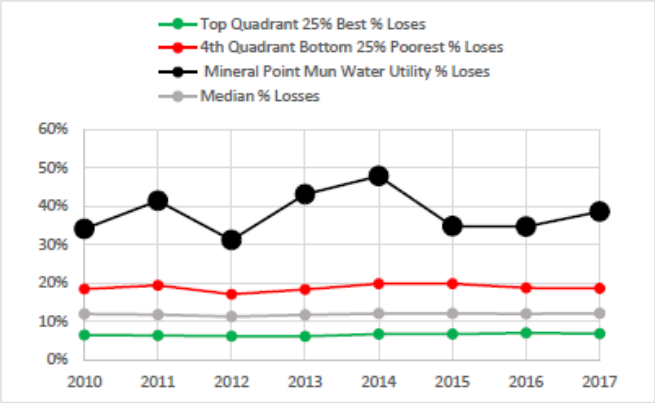
| Utility ID | Utility | Performance Benchmark | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010-2017 Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3740 | Mineral Point Mun Water Utility | kwh/1000 Gal Quad | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 3740 | Mineral Point Mun Water Utility | % Water Losses Quad | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 3740 | Mineral Point Mun Water Utility | $ per kwh Pumping Quad | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3740 | Mineral Point Mun Water Utility | $ per 1000 Gallons Quad | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |

*Water utilities with benchmarks of 3 (Yellow) and 4 (Red) can request that MEETAP prepare a system analysis of wells, towers and pumps to estimate demand, energy and cost savings (capacity and average operating characteristics – on-peak, capacity factor, constant flow high pressure control vs variable flow constant pressure, etc.).*

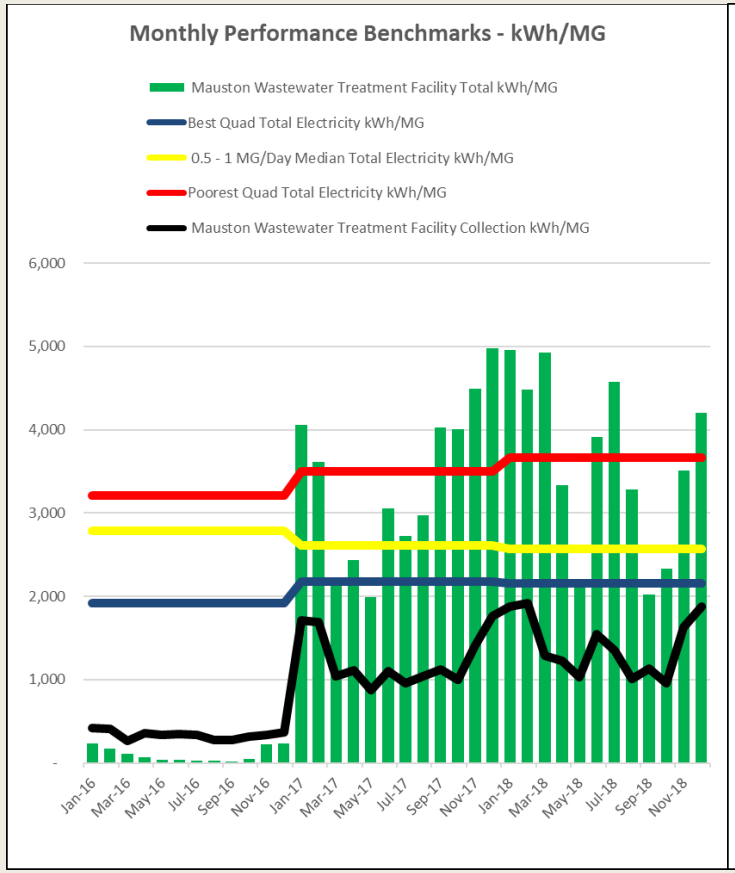
| Utility ID | Utility | Performance Benchmark | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010-2017 Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3740 | Mineral Point Mun Water Utility | kwh/1000 Gallons | 2.89 | 2.67 | 2.80 | 2.58 | 2.72 | 2.97 | 2.62 | 2.76 | 2.75 |
| 3740 | Mineral Point Mun Water Utility | % Water Losses | 34.07% | 41.39% | 31.15% | 43.07% | 47.78% | 34.77% | 34.66% | 38.55% | 38.18% |
| 3740 | Mineral Point Mun Water Utility | $ per kwh Pumping | $ 0.08 | $ 0.10 | $ 0.09 | $ 0.09 | $ 0.07 | $ 0.09 | $ 0.11 | $ 0.10 | $ 0.09 |
| 3740 | Mineral Point Mun Water Utility | $ per 1000 Gallons | $ 0.23 | $ 0.26 | $ 0.26 | $ 0.24 | $ 0.20 | $ 0.28 | $ 0.30 | $ 0.28 | $ 0.26 |

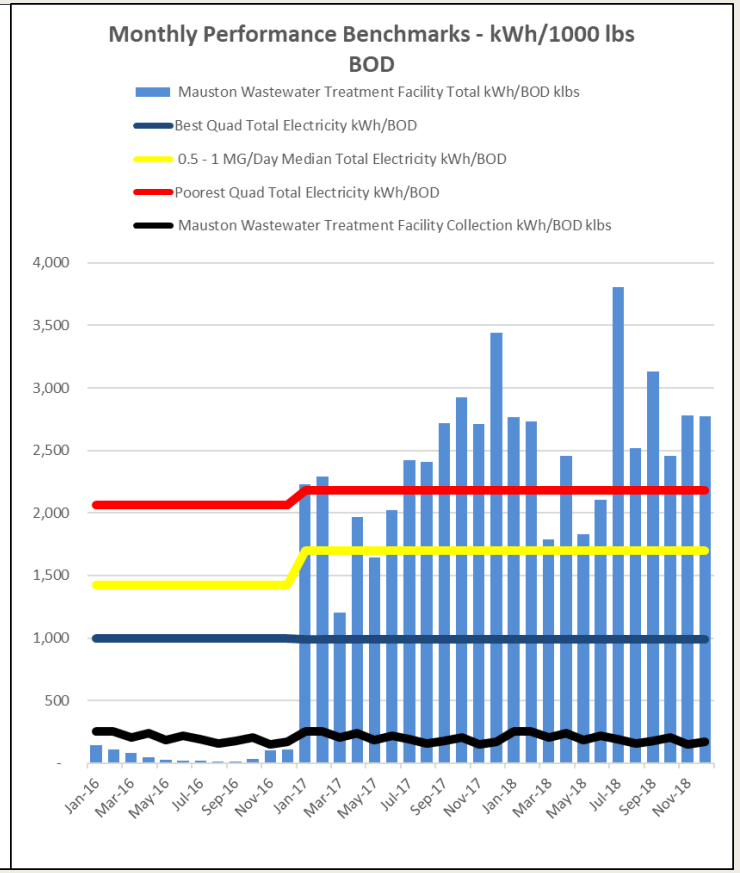


# Facility Performance and Benchmarking Analysis




Water and/or wastewater utility managers index their facility's energy usage through a production or demand index, such as kWh/MGD or kWh per 1,000lb of Biological Oxygen Demand (BOD). This index is called a Key Performance Index (KPI) or Energy Performance Index (EPI). Establishing an energy baseline helps facility managers understand the relative efficiency or change in efficiency relative to the core purpose of the operation, i.e., water production or wastewater treatment. It is recommended utilities set a goal to save five to ten percent of its energy after it has implemented energy efficiency measures, a new annual average line is set as the targeted KPI level with monthly Monitoring & Verification (M&V).

# Challenges & Barriers to Pursuing Solutions

- A regulatory framework to advance and support resilience in the face of climate change in Wisconsin
- **Coordination across agencies (local-county-state-federal)**
- Capacity to develop and implement solutions
- Becoming proactive rather than being reactive
- Building public support

1. Flooding
2. Human health & safety
3. Agriculture & land use
4. At-risk species & habitat
5. Energy security
6. Resilience in rural communities
7. Institutions & support

Source: https://www.wisconsinacademy.org/sites/wisconsinacademy.org/files/Track%203.pdf

# Climate Fast Forward Recommendations

•Resilience Recommendations:
{Near term 1-3 years}
• Create a state-funded and state-run AmeriCorps-like program to coordinate resilience
• **Pilot microgrids for critical infrastructure**
{Long term 4-10 years}
• Develop a new message for community engagement and education

# What Next?

Local Governments, Tribal Nations & Facility Operators/Owners

- PLAN- Grants available (state and Federal)
- Think outside the macro-grid- consider alternatives, particularly public purpose microgrids, community resilience centers, flexible grid
- What could the impact of privately owned microgrids be?
- COMMUNICATE- with utilities, emergency management, local government.

- Be **Creative**
- Be **Practical**
- Be **Prepared**

# What Can You Do?

Local Governments & Tribal Nations

- Set a Goal
- Plan with electric, water, wastewater utilities, critical infrastructure owners, businesses,

- Understand <u>and prioritize</u> infrastructure in your jurisdiction
  - *What facilities perform life safety functions?*
  - *What facilities enable responders to function during emergencies?*
  - *What facilities provide basic essential services (water, wastewater, power, etc.)*
  - *Which facilities already generate renewable energy? Is it all grid-tied?*
  - *Consider the value of resilience- NREL working on this*

# OEI NEXT STEPS

- Statewide Assistance For Energy Resilience and Reliability (SAFER2 grant)
- Recruit Tribes and Communities to participate in “deep-dive analysis”
  - *Deep-dive components (customized to participants’ needs and goals):*
  - *Wisconsin Clean Cities fleet assessment*
  - *Grant review- provided by OEI & WEM- listing of all available funding sources*
  - *Micro-grid feasibility study of critical infrastructure*

*Current project example:*

*The Oneida Nation has already deployed a significant amount of solar PV, this analysis will consider linking loads to storage, associated costs, and practicality of alternative back-up power to diesel or propane generators.*

# CASE STUDY- ONEIDA NATION

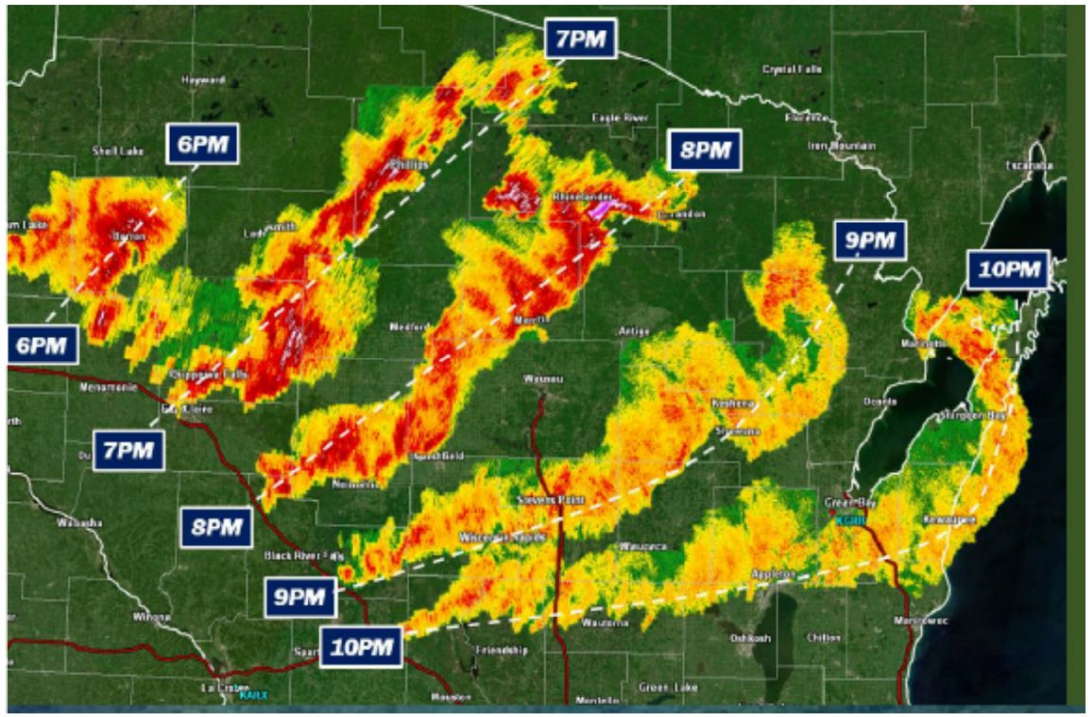



*Figure 1 Wind events July 2019* https://www.weather.gov/grb/071919_severe_event

# CASE STUDY- ONEIDA NATION

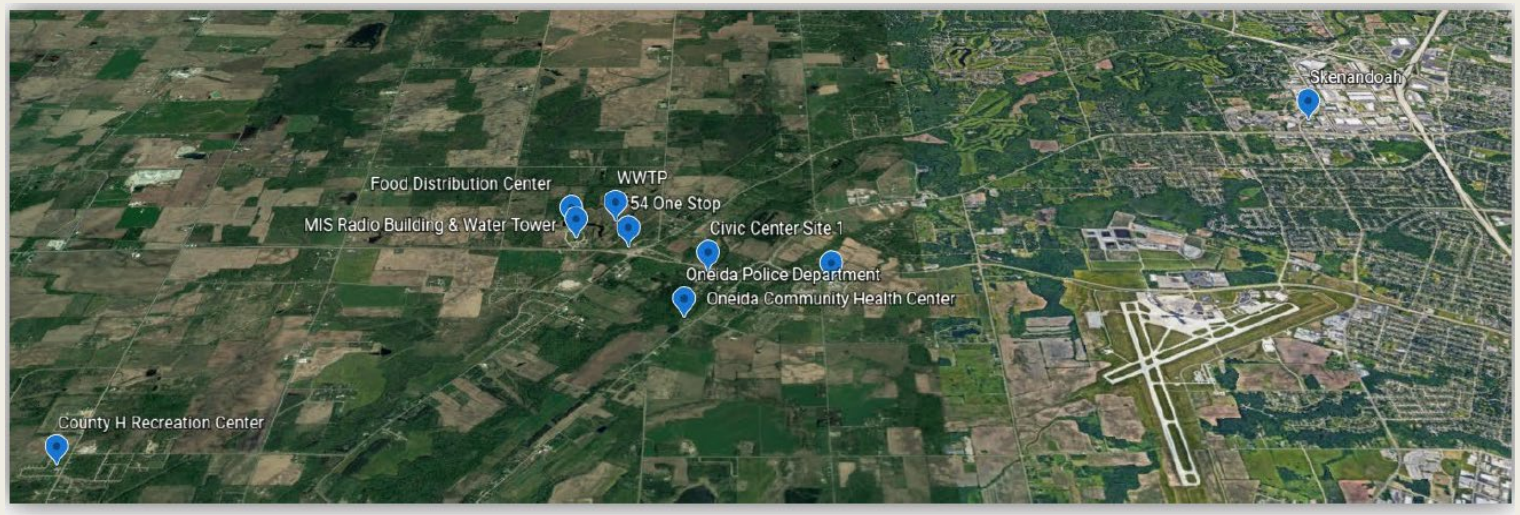



**Figure 2:** Map of Critical Facilities Targeted for Study

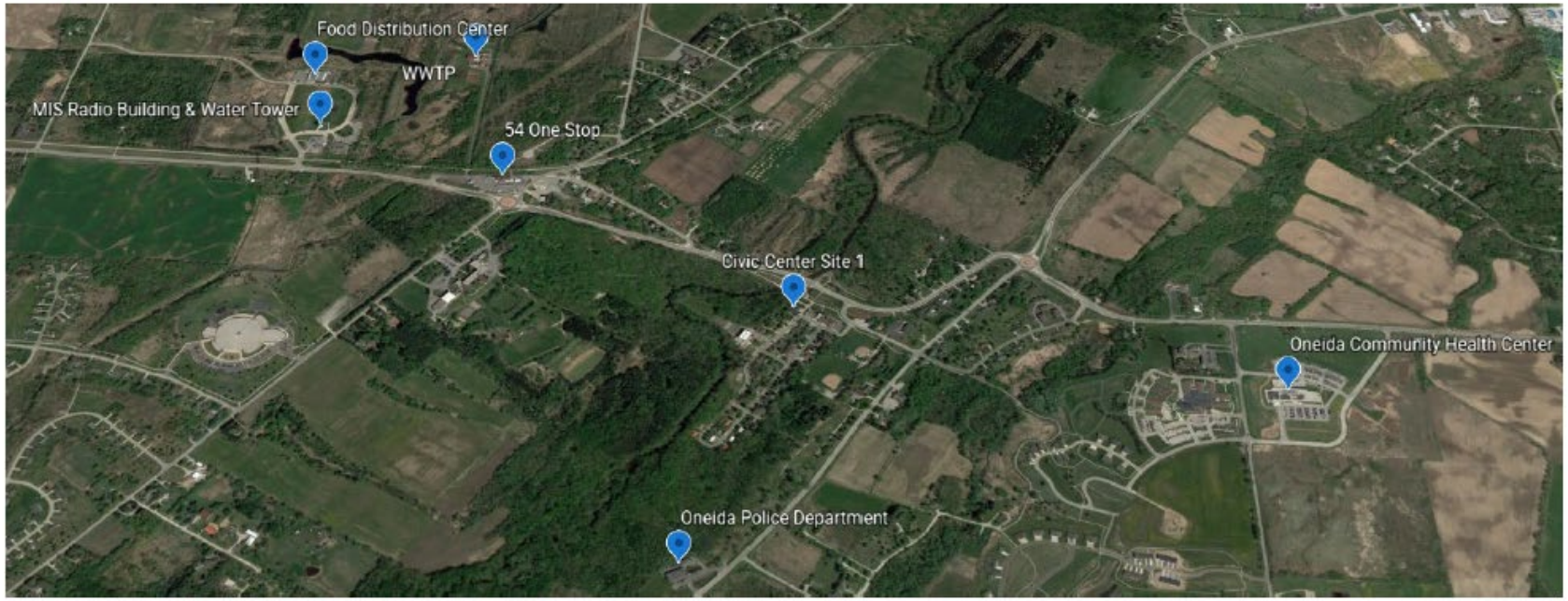
# CASE STUDY CONTINUED

- Technology Alternatives
- Conventional Fuel back-up Generators
- Renewable DERs
- Storage
- Controls
- Load Management

- Facility Alternatives
- Single Facility microgrid
- Partial-feeder campus microgrid serving multiple critical facilities
- Full-Substation microgrid serving multiple campuses

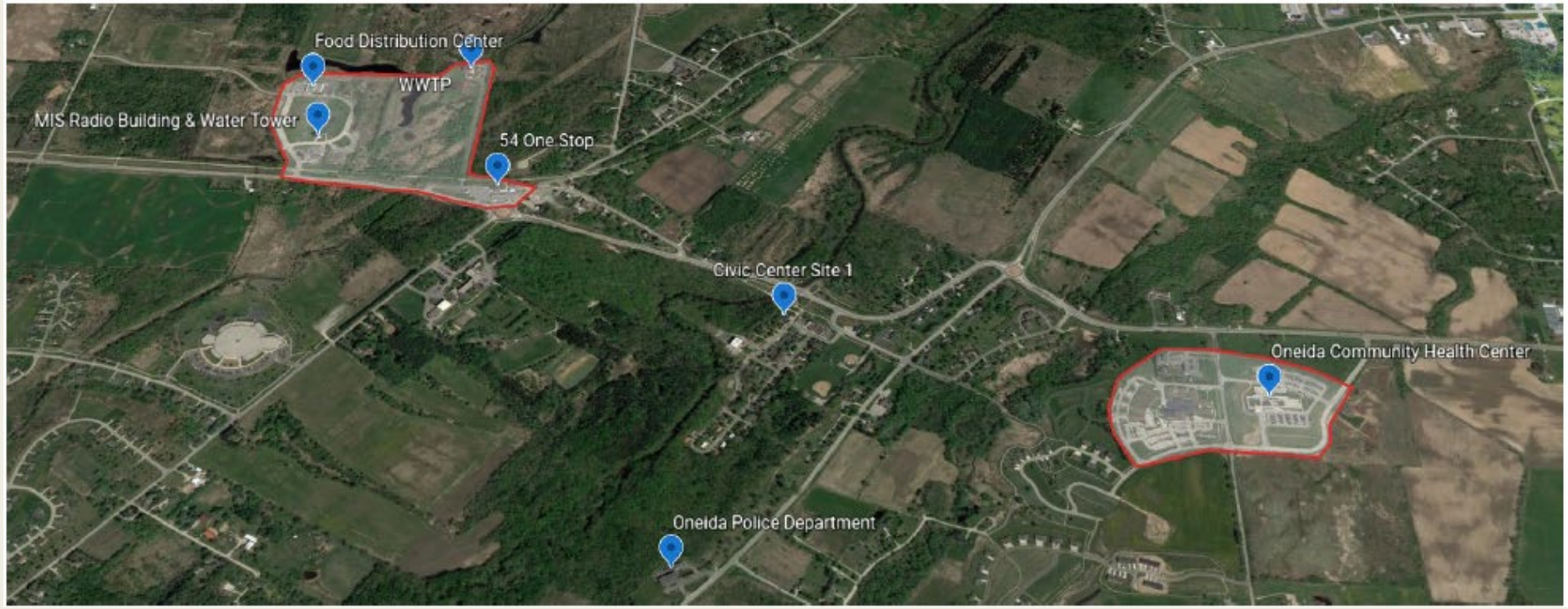
# Defining Critical Infrastructure

**Single-facility microgrids:**



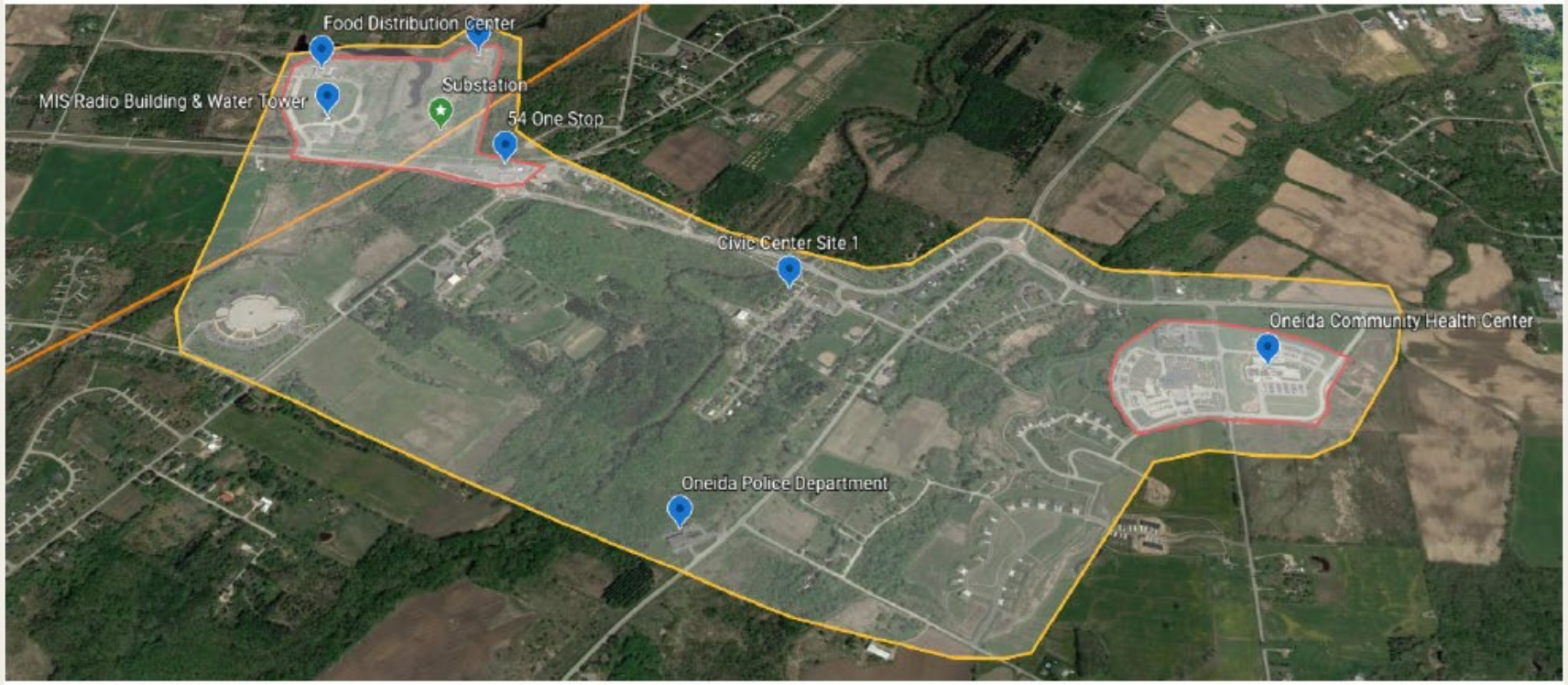
# Defining Critical Infrastructure

**Partial-feeder campus microgrids:**



# Defining Critical Infrastructure

**Full-substation microgrid serving multiple campuses:**



# Questions?

Contact OEI:

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Local Energy Programs Manager

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# Peter Brandom

City of Hillsboro, Oregon

Hillsboro OREGON

# Building Resilient Communities – a Local Perspective

Peter Brandom | *Senior Project Manager*

U.S. DOE Better Buildings Challenge Webinar - September 15, 2020

Hillsboro OREGON

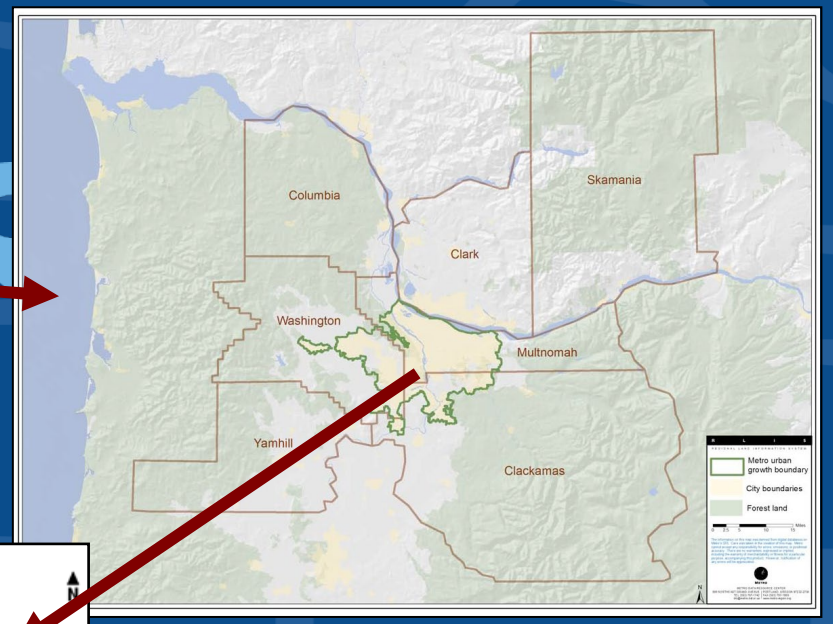
1 About Hillsboro

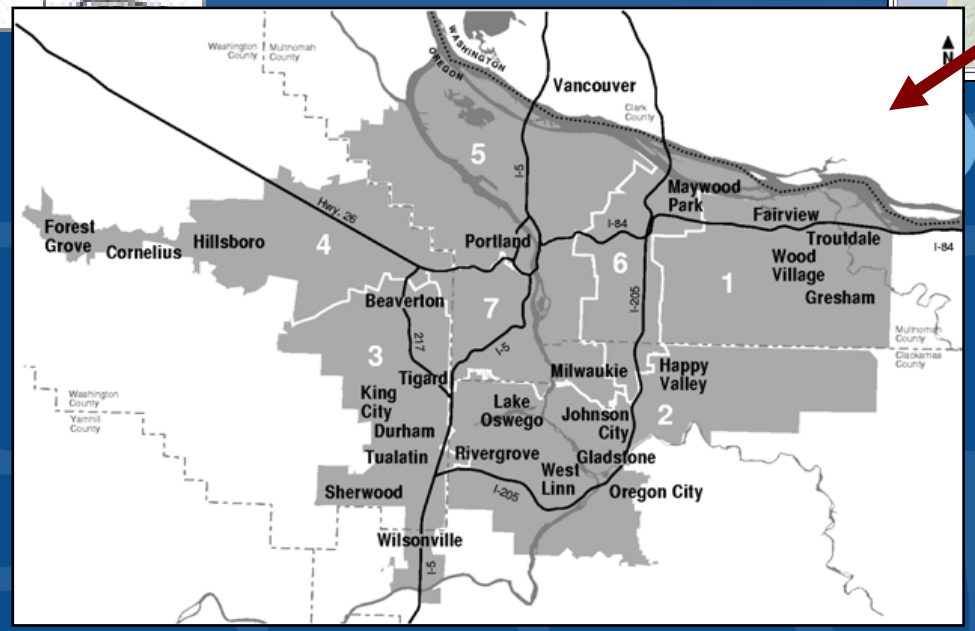
2 Resilience - what keeps us up at night?

3 Related goals and achievements

4 Projects, programs and partnerships

Hillsboro
OREGON

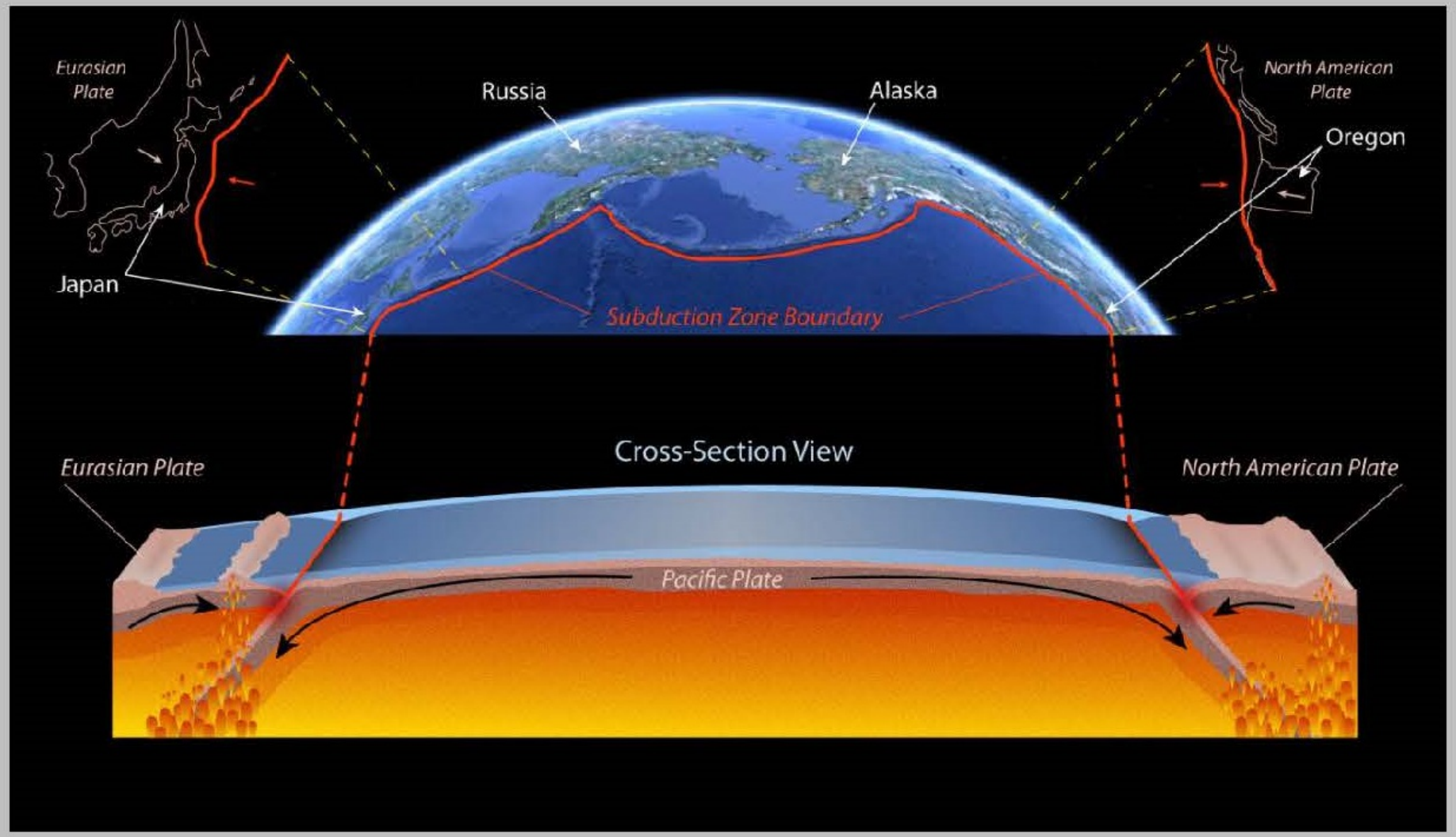


- Tualatin Valley, home to the Atfalati or Tualatin or Wapato Lake tribe of the Kalapuya Native Americans
- Population growth from less than 50,000 in 2000 to over 105,000 today
- Will approach 150,000 by 2035
- High tech economy anchored by Intel, largest and most advanced chip factories in the world
- Diversity of cultural and ethnic backgrounds
- History of racial exclusion, oppression and segregation in Oregon by the white majority

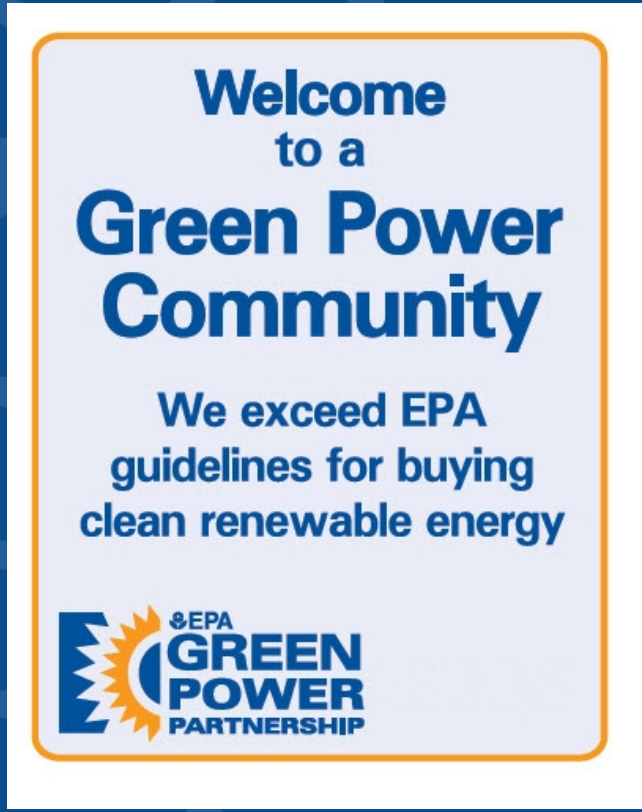
# Main threats to our community

- Pandemics!
- Earthquake – Cascadia Subduction Zone and others
- Wind and flooding
- Ice storms
- Climate change
  - Water supply
  - Climate migration
  - Economic impacts


Eurasian Plate
Russia
Alaska
North American Plate
Oregon
Japan
Subduction Zone Boundary
Cross-Section View
Eurasian Plate
North American Plate
Pacific Plate

# Goals & Achievements

- 10+ years of focused effort
- ⬇ facility energy use 26% since 2009
- ⬇ facility/fleet GHG emissions 30% since 2007
- Leaders in supporting electrified transport
- U.S. DOE resiliency modeling
- Community-wide and city purchase of renewable power



Hillsboro OREGON

# Sustainability Revolving Grant Fund

- Established in 2011
- Seeded with $50,000 from avoided energy costs
- Dedicated City fund
- Has funded 12 projects from 14 applications
- Awards range from $3,800 to $15,500

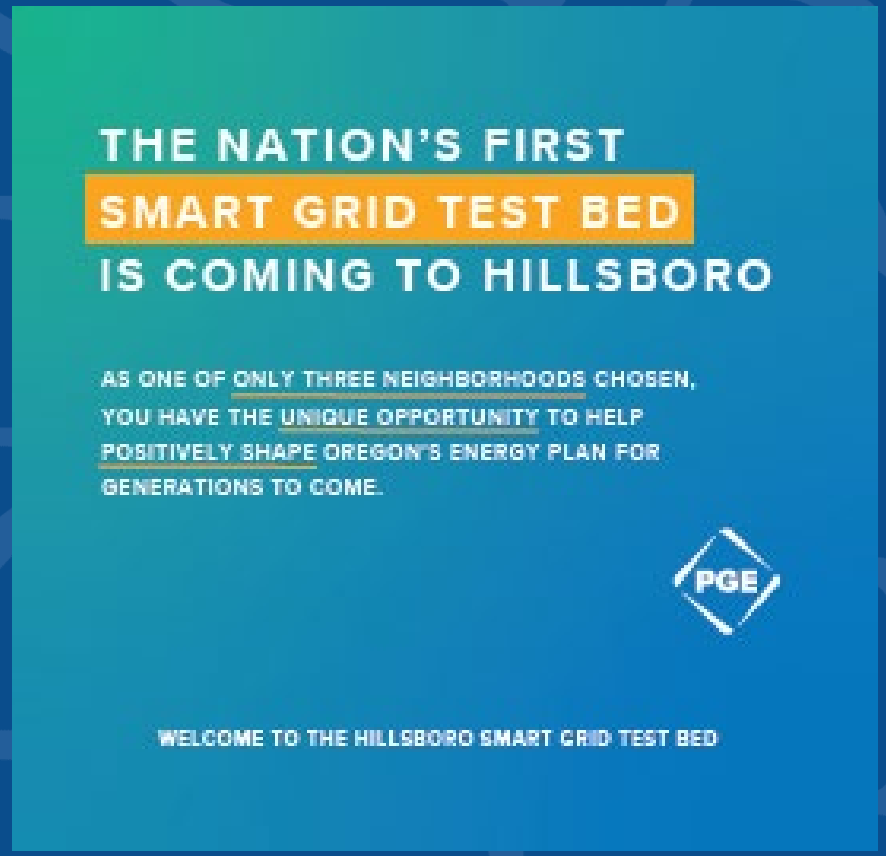
Hillsboro OREGON

# Sustainability Revolving Grant Fund Projects

- Mechanical and lighting retrofits
- Underwater swimming pool lights
- Telematics
- Renewable energy
- Smart irrigation technology pilot
- Propane powered mowers
- Bicycle maintenance stations

# Paradigm Shifting with Partnerships

- Portland General Electric Smart Grid Test Bed
- Green Tariff
- Climate mitigation and adaptation imperatives



# Questions/Discussion

email peter.brandom@hillsboro-oregon.gov
web www.hillsboro-oregon.gov | Twitter @cityofhillsboro

# Q & A

Submit Questions
**www.slido.com** event code **#DOE**

U.S. DEPARTMENT OF ENERGY

# Additional Resources

**DOE's Better Buildings Initiative's Resilience Webpage**:
https://betterbuildingsinitiative.energy.gov/resilience

**How Distributed Energy Resources Can Improve Resilience in Public Buildings: Three Case Studies and a Step-by-Step Guide**
https://www.energy.gov/eere/slsc/downloads/how-distributed-energy-resources-can-improve-resilience-public-buildings-three

**Energy Efficiency and Distributed Generation for Resilience: Withstanding Grid Outages for Less:**
https://www.energy.gov/sites/prod/files/2019/06/f64/EEDG-Resilience.PDF

**Energy Efficiency and Renewable Energy Resources for State and Local Leaders:**
https://www.energy.gov/sites/prod/files/2019/07/f64/Summer2019-SLSC-resource-guide.pdf

**FEMA and WIP Webinar Series on Energy Lifelines Mitigation**
https://www.energy.gov/eere/slsc/fema-and-wip-webinar-series-energy-lifelines-mitigation

**HUD and WIP Webinar Mitigating Natural Hazard Risks in the Energy Sector**
https://www.energy.gov/eere/slsc/downloads/mitigating-natural-hazard-risks-energy-sector-opportunities-hud-cdbg-mitigation

**RMI Hours Of Safety In Cold Weather: A Framework For Considering Resilience In Building Envelope Design And Construction**
https://rmi.org/wp-content/uploads/2020/02/Hours-of-Safety-insight-brief.pdf

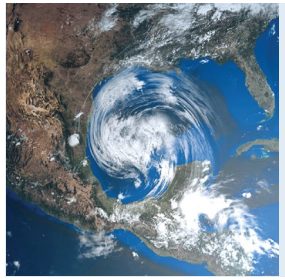
**PHIUS Assessing Passive Survivability in Multifamily Buildings**
https://www.phius.org/NAPHC2018/Assessing%20Passive%20Survivability_Lisa%20White.pdf?_ga=2.238318216.949342421.1543179829-364422003.1462897107

**MA DOER Mobile Energy Storage Study**
https://www.mass.gov/service-details/mobile-energy-storage-study

# 2020-2021 Better Buildings Webinar Series

## BUILDING RESILIENT COMMUNITIES:
STATE AND LOCAL PERSPECTIVES

Tue, Sep 15, 2020 | 3:00 - 4:00 PM ET



## PLANNING FOR RESILIENCE IN MULTIFAMILY HOUSING:
A PORTFOLIO-WIDE APPROACH

Tue, Nov 17, 2020 | 3:00 - 4:00 PM ET

REGISTER TODAY

## RISK ASSESSMENTS:
EVALUATING BUILDING SITES FOR PORTFOLIO RESILIENCE

Tue, Feb 2, 2021 | 3:00 - 4:00 PM ET

REGISTER TODAY

## INNOVATIVE ENERGY EFFICIENCY FINANCING IN PUBLIC HOUSING

Tue, Sep 22, 2020 | 3:00 - 4:00 PM ET

REGISTER TODAY

## SCALING IMPACT:
MULTI-BUILDING APPROACHES TO ZERO ENERGY

Tue, Dec 1, 2020 | 3:00 - 4:30 PM ET

REGISTER TODAY

## PERSPECTIVES ON RESILIENCE:
INSUARANCE AND CREDIT UNDERWRITING

Tue, Feb 9, 2021 | 3:00 - 4:00 PM ET

REGISTER TODAY

## CPACE FINANCING TURNS 10:
IMPACTS, CHALLENGES, AND WHAT COMES NEXT

Tue, Oct 6, 2020 | 3:00 - 4:00 PM ET

REGISTER TODAY

## BEYOND ENERGY SAVINGS:
QUANTIFYING THE ADDITIONAL BENEFITS OF ENERGY EFFICIENCY

Tue, Jan 12, 2021 | 11:00 AM - 12:00 PM ET

REGISTER TODAY

## SMART TOOLS FOR SMART LABS

Tue, Mar 2, 2021 | 3:00 - 4:00 PM ET

REGISTER TODAY

## WASTEWATER TREATMENT 2.0:
THE NEXT PHASE OF ENERGY EFFICIENCY AND RECOVERY

Tue, Oct 20, 2020 | 3:00 - 4:00 PM ET

REGISTER TODAY

## DAVID & GOLIATH:
FINANCING ENERGY RETROFITS FROM THE TINY TO THE GIANT

Tue, Jan 19, 2021 | 3:00 - 4:00 PM ET

REGISTER TODAY

## YOU HAVE A DATA CENTER – NOW WHAT?
STORIES FROM THE FIELD

Tue, Apr 6, 2021 | 3:00 - 4:00 PM ET

REGISTER TODAY

# 2020-2021 Better Buildings Webinar Series

## INNOVATIVE ENERGY EFFICIENCY FINANCING IN PUBLIC HOUSING

Tue, Sep 22, 2020 | 3:00 - 4:00 PM ET

REGISTER TODAY

Energy and water efficiency upgrades in public housing can free up operating funds while reducing tenant utility bills and improving resident health and comfort. However, Public Housing Authorities (PHAs) face persistent financial barriers that often prevent them from accessing capital for retrofits. This webinar will present innovative solutions from three PHAs that successfully financed efficiency projects. Panelists will spotlight the proven, replicable approaches that made their projects possible.

# ON-DEMAND BETTER BUILDINGS WEBINARS

Through Better Buildings webinars, experts discuss a variety of topics from Air Management to Zero Energy. These webinars are helpful resources on key subject areas in energy efficiency, water efficiency, resilience, and more. Below are webinars we have held over previous years. For each webinar, you can watch the video recording and follow along with the slide deck. To sign up for an upcoming live webinar, click here.

## EXPLORE BY TOPIC

Building Envelope | Communications & Engagement | Data Centers | Energy Data Management | Financing | Green Leasing | Health & Wellness | Industrial | K-12 Schools | Lighting | Multifamily | Plug & Process Loads | Refrigeration | Renewables Integration | Resilience | Smart Labs | Space Conditioning | Treasure Hunts | Waste Reduction | Water & Wastewater | Workforce Development | Working with National Labs | Zero Energy Buildings

Indicates the session was a part of the 2020 Virtual Summit. To view a full list of the Summit Sessions, click here.

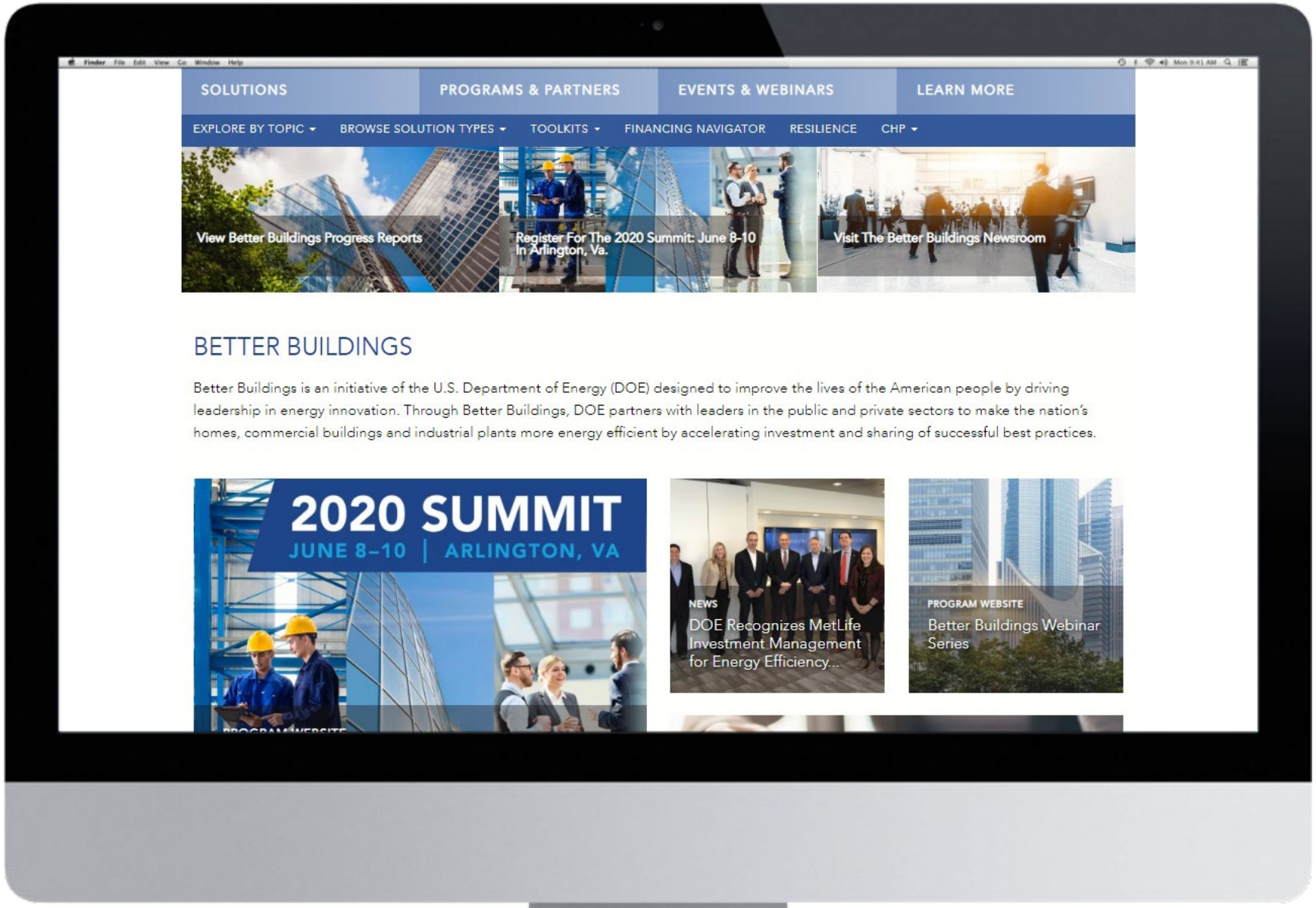
### BUILDING ENVELOPE

A building's envelope (walls, windows, roof, and foundation) accounts for approximately 30% of the primary energy consumed in residential and commercial buildings. Explore all previously recorded webinars on this topic by pressing MORE.

- Unsealed: The Building Envelope Campaign (2020)
- Sneak Peek of the Building Envelope Campaign (2020)
- Addressing the Envelope: Recognizing Building Enclosure Improvements (2020)
- Innovative Wall Technologies for Commercial Buildings (2019)
- Energy Savings Impact of Airtightness in U.S. Commercial Buildings (2019)
- Building Envelope/Enclosure Commissioning and Retro-commissioning (2017)

## Discover online learning opportunities today.

- Explore popular topics
- Watch recordings
- Follow along with slides

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# Additional Questions?

## Please Contact Us

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@BetterBldgsDOE

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