



MASSACHUSETTS
CLEAN ENERGY
CENTER®

Clean Energy and Resiliency (CLEAR): Program Takeaways

Presented By

MassCEC Net Zero Grid Team

OUR MISSION

Accelerate the clean energy and climate solution innovation that is critical to meeting the Commonwealth's climate goals, advancing Massachusetts' position as an international climate leader while growing the state's clean energy economy.



The Need for Municipal Resilience



Climate change will lead to greater frequency and severity of weather events



To achieve decarbonization, transportation and heating will need to be electrified



This combination makes electric resilience increasingly critical for communities

Critical Facilities

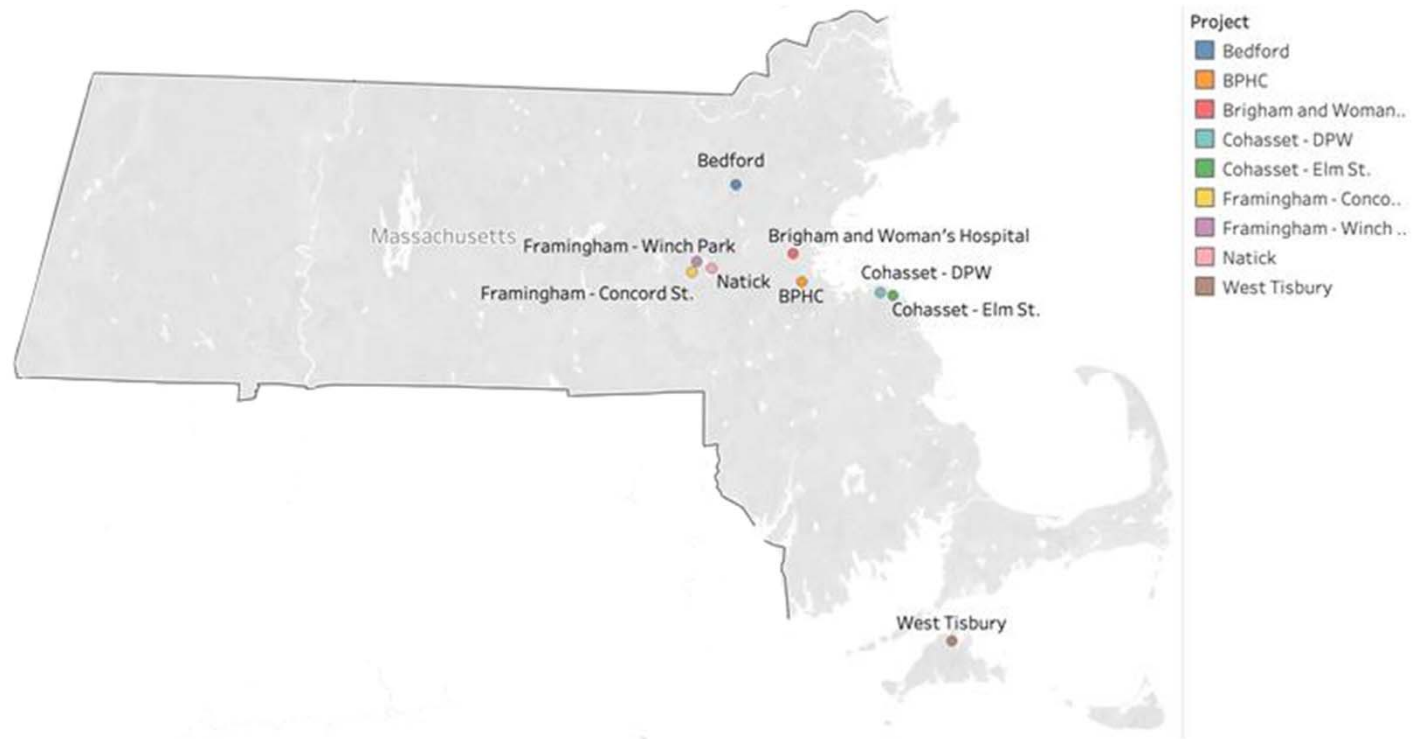
- **Critical facilities** are facilities that, if unable to function, would pose threats to life, public health and safety.
- It is especially important for critical facilities to remain resilient during emergency events in order to keep communities safe
- Examples include:
 - Hospitals, schools, shelters, libraries, grocery stores, gas stations, fire stations, wastewater treatment plants, etc.



Program Scope

- CLEAR sought to advance first-stage resilience system designs for critical facilities
- MassCEC awarded funding to consultants for:
 - **Microgrid feasibility studies**
 - Nine facilities, campuses, or communities in Boston, Framingham, Cohasset, West Tisbury, Natick, and Bedford
 - A **Resiliency Toolkit** that communities can use to identify resiliency needs and gather preliminary information
 - A **Resiliency Certification** to certify sites as resilient to outages

Map of CLEAR Projects



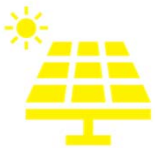
Design Considerations



Many of the sites selected for feasibility studies already included legacy diesel generators for back-up resilience.



CLEAR consultants explored how best to maximize existing resources and, where feasible, add solar power and battery storage.



The addition of solar power allows diesel generators to support a system during an outage for longer.

- Existing diesel generators can also diminish the size of the required battery.

Financial Considerations



Rooftop and canopy solar tend to make **sound investments** for municipalities, especially when using power purchase agreements

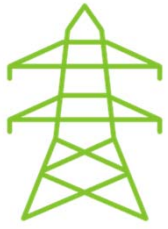


Energy storage can **diversify revenues** and prove a good investment for towns and cities.



However, if used for **resilience purposes** and not purely to maximize profit, revenue will be reduced

Financial Considerations (cont'd)



Electric distribution equipment necessary to provide resilience is costly and can cause the costs to outweigh financial benefits. Communities must have clear goals for the project and decide how highly to **prioritize resilience and financial payback**.



Significant **up-front capital costs** are required, but not necessarily recouped. **Grant support** from state or federal agencies can be crucial for municipalities to implement projects.

Operational Insights

- Pathways to implementation and procurement are crucial to successfully executing projects at the municipal level.
- Investments should be sized and wired to support the majority of a facility's energy needs. In practice, attempting to reduce costs by supporting only those loads which are critical in an emergency is challenging due to uncertain foreknowledge and rewiring requirements.



Operational Insights (cont'd)

- Large medical facilities present challenges to achieving decarbonization and resiliency due to high energy needs and the around the clock, critical nature of their work
- Vehicle-to-Grid (V2G) solutions may be a financially viable way to electrify and provide resiliency



Analytical Challenges

Historical data will fail to predict future "typical" outages as climate change causes **atypical events to occur more frequently**.

Predicting how typical load shapes will adapt to **unanticipated** demands and system constraints is challenging.

Established parameters, accepted definitions, and benefits of resilience remain undefined.

CONCLUSION

Resiliency is a critical component to reaching net zero emissions due to its secondary mitigation effects that establish a safe and secure path to electrification.

The marketplace as currently constructed will likely not provide resilience, but a statewide planning strategy could support greater resilience at the community level.

CLEAR aimed to identify scalable and replicable microgrid projects; however, this remains challenging due to site specific constraints and procurement challenges.