

The Boston Solar Evacuation Route Pilot:

Building Emergency and Transportation Systems Resiliency

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The City of Boston

- Capital of Massachusetts
- About 600,000 residents
- Largest metro area in New England
- ICLEI City
- Recently updated Climate Action Plan
 - Includes recommendation to address climate adaptation
- Inaugural U.S. Department of Energy Solar America City

Renewable Energy in Emergency Preparedness and Energy System Resiliency

- In the Spring of 2009 the Solar Boston program hosted a facilitated meeting of Boston emergency preparedness officials
- Inter-departmental group included:
 - Mayor's Office of Emergency Preparedness
 - Boston Emergency Management Services
 - Police Department
 - Public Health Commission
 - Transportation Department
 - Management Information Services

Solar Emergency Preparedness Facilitated Discussion

- **Significant concern about electricity grid failure:**

- Heat waves
 - 2003 East Coast Blackout
 - 2001 California Energy Crisis
- Hurricanes
 - Less frequent in New England, but still a major concern
- Ice storms
 - 2008 New England Ice Storm
- Coastal flooding
 - Many of the region's base load power plants are located along major waterways
- Terrorism

Proposed Solar Applications for Emergency Preparedness

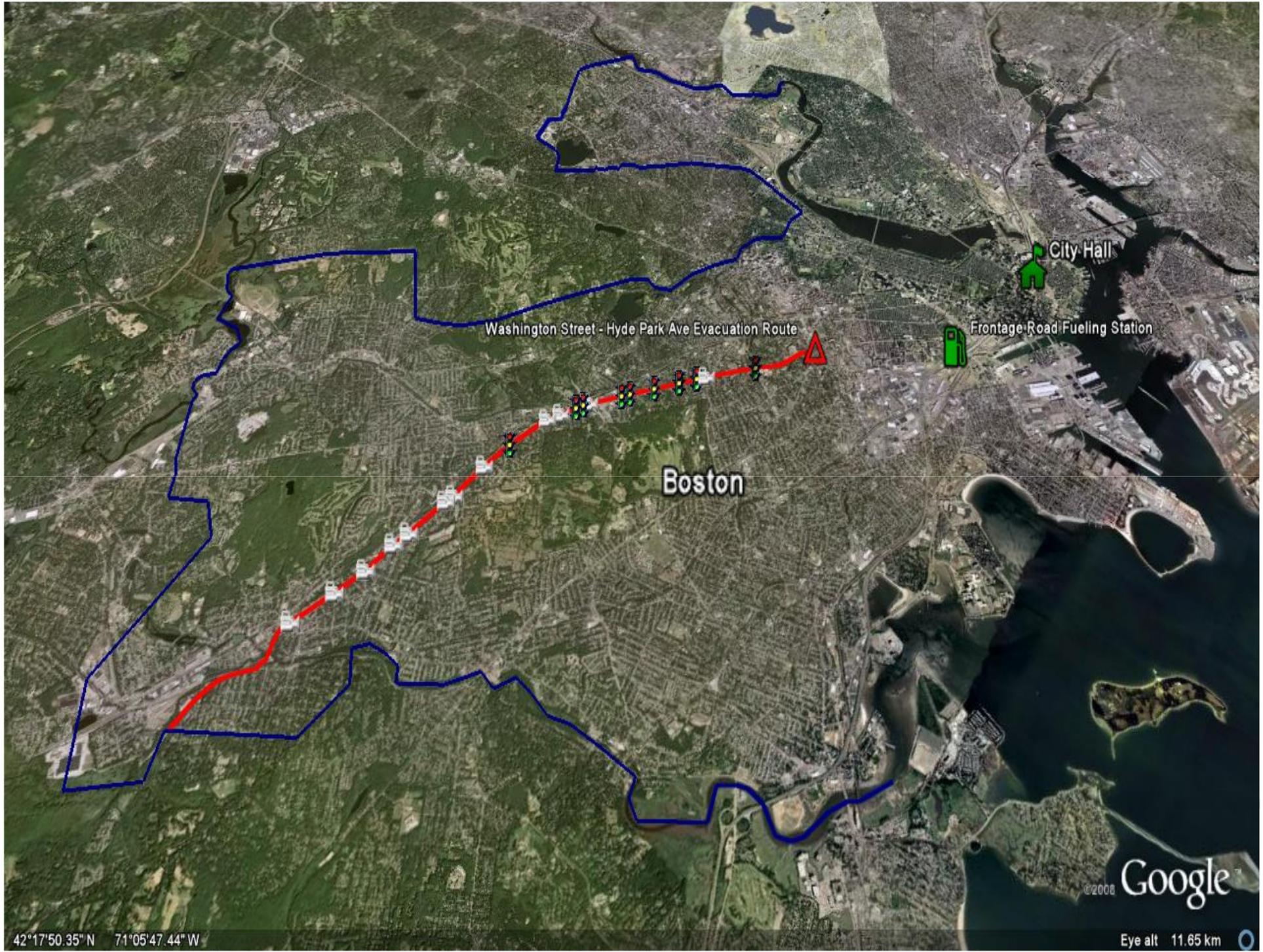
- **Large facility solar electric backups**
- Solar thermal systems for shelter facilities
- Portable generators
- Water purification systems
- Water pumping systems
- Vehicle anti-idling chargers
- **Communication repeaters**
- **Variable message boards**
- **Lighting and traffic control**
- Fold-out panels for ad hoc charging
- Remote sampling and environmental monitoring
- Solar powered vehicles

Evacuating Boston During a Power Outage

- City of Boston has more than two dozen designated evacuation routes
 - Most lead from the City's center to major interstate arteries
 - Currently marked by fixed signage
- The Boston Transportation Management Center has direct control of half the city's signalized intersections
 - Allows transportation engineers to switch signals in response to traffic variations
- The management center has a backup power supply that allows continuous operations in a power outage
 - However, in a blackout, most intersections in the City will not function

Evacuation Route Pilot Concept

- Provide off-grid functionality to critical evacuation infrastructure along one City evacuation route
- Grid-connected PV systems will provide continuous benefits during non-emergency operations
- City chose the Washington Street – Hyde Park Avenue route due to the critical nature of the route and the existing fiber optic data connection to City Hall Transportation Management Center
- Boston applied for and received \$1.343 million from U.S. Department of Energy to develop the solar evacuation route pilot



Washington Street - Hyde Park Ave Evacuation Route

City Hall

Frontage Road Fueling Station

Boston

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42°17'50.35" N 71°05'47.44" W

Eye alt 11.65 km

Evacuation Route Component Technologies

- 21 solarized intersections
- 50 kW solar fueling station backup
- 27 LED-solar street lights along route
- 5 solar variable message boards
- 10 solar radio repeaters

Solar Traffic Lights and Intersection Infrastructure

- Solarized intersections

- The City is procuring an engineering firm to design systems at each intersection along the route
- PV and battery capacities will depend on intersection loads
 - Anticipated to be between 500W and 1kW
- Final system designs will have to balance costs against hours of autonomous operations

Frontage Road Fueling Station PV Backup

- The City's main emergency vehicle fueling station requires backup power to operate during a power outage
 - The Department of Public Works will install a 50kW system on the roof of the building that houses the existing backup system
 - This system will net meter and displace grid power during non-emergency operations

Solar Street Lights

- LED-solar street lights along route
 - In the event of a evacuation many city residents will need to leave the city on foot
 - Most commuters take public transit into the city meaning evacuating the city's daytime population would largely be on foot
 - LED-solar street lights will provide off-grid lighting along the route
 - A number of companies offer integrated off-the-shelf systems for solar street lighting

Solar Variable Message Boards

- During an evacuation, emergency personnel need to communicate to residents which routes to take out of the city
 - Boston currently has static signage along all its evacuation routes
 - Solar variable message boards will allow the city to direct traffic flow in real time during an evacuation event

Solar Powered Radio Repeaters

- The city maintains a network of radio repeaters that is used by emergency responders
 - The city will identify the repeaters that have the greatest coverage
 - Solar and battery backup systems will be added at those sites to provide continuous operations in the event of a grid failure

Building Emergency Infrastructure Resiliency and Energy Assurance Planning Capacity

- The Evacuation Route is a cross-cutting project that coordinate across several city agencies and cabinets
 - Emergency response agencies are already thinking about climate adaptation...but with a different frame of reference
 - How can we learn to speak the same language?
- Introduces resiliency and renewable technologies to many city departments that would not typically be involved in sustainability planning
- Opportunity for project-based city resiliency policy development
 - Boston is now working on a city-wide energy assurance plan
- Successful pilot could lead to city-wide rollout funded with Department of Homeland Security support

Thank you

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