

MASSACHUSETTS AND ENERGY SECURITY: WHAT ONE STATE IS DOING TO ENHANCE SECURITY THROUGH DISTRIBUTED GENERATION

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ABSTRACT

The events of September 11, 2001, have indelibly marked requirements for a focus on energy generation and use strategies to protect public interests and manage emergency events. Security experts have concluded that current electrical systems could be vulnerable to conventional military, nuclear, and terror attacks. Disbursed, renewable and domestic supplies of fuels and electricity can be used to reduce these risks¹.

As part of a larger state strategy to prepare for and respond to harmful events, Massachusetts is undertaking activities to reduce risk of harm to critical public facilities by considering distributed generation. The state's clean energy fund has begun an initiative to consider fuel cells and solar technologies as part of emergency planning and response. The early lessons from that effort indicate a strong willingness and need for distributed generation but a lack of resources to implement it. These lessons and plans for future activities are shared in this report.

INTRODUCTION

In early March, a powerful winter storm slams the Northeast, covering in it ice and crumpling local electric transmission towers into tangled modern art. The transmission lines for Boston, Springfield, and

Worcester are frozen in the snow. The state's schools and major industries are shut down, because the workforce cannot navigate highways and roads, which are littered with fallen trees and branches. The state's emergency response agencies kick into action, and the governor and her administration plan their damage survey route. Masquerading as a state militia guardsman, bearing arms and bombs under heavy winter gear, an angry anti-government militant heads to the regional emergency response bunker. Unnoticed by all outside the facility in the turmoil of responding to the storm's aftermath, the militant sets off gateway metal detectors and is restrained by emergency officials before harm or loss of life. Local citizens, unaware of the narrowly averted loss of their governor, make their way to schools and other emergency shelters powered by photovoltaics and fuel cells that provide hot meals and warm shelter for homeless families and volunteers working to clear the roads for emergency crews.

Although the scenario above is fictional, it is not difficult to imagine in today's post-9/11 world, complicated by global climate change and national security issues. No longer is the question one of whether or not, but rather of how to build resiliency into our Nation's energy supply, given a bleak economic climate in which state and local budgets are besieged with significant cutbacks. Distributed generation (DG) of renewable energy sources is often cited as a way to diversify the Nation's energy supply and disburse the generation to smaller supply sites. Combined with other energy efficiency practices, the use of DG can contribute to a more resilient power system capable of surviving the stresses of overload, deliberate attacks, and volatile regional and/or international market forces².

As part of a larger state strategy to prepare for and respond to harmful events, Massachusetts is undertaking activities to reduce risk of harm to critical public facilities by considering distributed generation. The state's Renewable Energy Trust, a fund receiving a system-benefit charge from electric bills, with a mission to foster renewable energy market sustainability and to spur growth in Massachusetts's renewable energy sector, has begun activities to consider photovoltaics and fuel cells as part of a strategy to evaluate market opportunities for DG technologies and to enhance the security of citizens of Massachusetts and beyond.

This article provides a background to the Renewable Energy Trust activities and its parent organization, the entities in the Commonwealth considering DG as part of their strategy to ensure public health and

safety, and briefly sets out relevant definitions. The article then details a plan for evaluation and deployment of DG technologies.

BACKGROUND

The Massachusetts Technology Collaborative (MTC) is an independent economic development organization established to promote sustainable economic growth by supporting regional technology-based clusters and by serving as a public policy laboratory for technology-related initiatives. MTC administers the Renewable Energy Trust, which was created by the state legislature to help the Commonwealth shift toward greater reliance on renewable energy resources to meet its needs and to spur development of the renewables sector as an important source of economic growth in Massachusetts.

MTC seeks to be a catalyzing element for innovation by providing research and analysis to better understand economic forces and facilitating collaboration with public, private and academic leaders and decision-makers. It is in this vein that MTC, with its nimble ability to respond to and bring together varied stakeholders, sought to understand and test those activities that may reduce risk of harm to critical public facilities—especially DG.

Seeking to fulfill its renewable energy mission, and at the same time addressing a Commonwealth need, MTC began discussions on security and disaster-related activities with the following state agencies:

The Massachusetts Emergency Management Agency (MEMA) coordinates federal, state, voluntary, and private resources during disasters and emergencies. MEMA develops state emergency readiness plans, trains response personnel, disseminates information, and helps communities recover from disasters. The agency operates the state emergency operations center and is developing a new state strategic plan to address terrorism-related vulnerabilities. MEMA has assisted all 351 cities and towns in developing local Comprehensive Emergency Management plans that identify all critical local facilities (including police, fire, medical, emergency shelters, etc.) and indicate whether those facilities currently have backup generation.

The Massachusetts Department of Capital Asset Management (DCAM) is the state building agency, assisting other state agencies with public-building design, construction, and real estate. Its scope of services includes planning, design, construction, repair and improve-

ments, asset management, contractor certification, leasing, and acquisition. Properties under its charge include hospitals, courthouses, prisons, and police stations. The energy team at DCAM provides the initiative with an understanding of the current level of backup capability at critical state facilities, and insight into the state's pipeline of pending projects for security-related on-site generation opportunities.

The Massachusetts Port Authority (Massport) is an independent public authority that administers much of the state's transportation infrastructure. Massport operates three major airports, the region's largest seaport facilities and important surface arteries. Together, these facilities support more than 20,000 jobs and generate more than \$8 billion in economic activity every year. Massport gains flexibility from its status as a self-supporting, independent public authority that receives no state tax dollars.

At a local level, police, fire, and medical facilities and personnel have responsibility for most emergency response, and local facilities serve as emergency shelters. In the larger metro-Boston area, the Boston Emergency Management Agency (BEMA) has responsibility for emergency management response. BEMA operates three centers that dispatch police, fire and emergency management (911) calls for the city. The three centers can serve as backup for each other in emergencies. While public safety departments handle problems on a smaller scale, BEMA responds to large or long-term disasters. BEMA functions as MEMA's local liaison, as well as a liaison to the federal government.

To provide clarity, in a post-9/11 world, to organizations considering new tactics that may include DG technologies, we visualize an improved energy security standard defined using terms of disaster planning: mitigation, preparedness, response, and recovery. Mitigation is defined as "policies and actions taken before an event, which are intended to reduce damage when an event does occur," and can be seen in the example of making buildings more resistant to earthquakes or fire. Preparedness involves implementing mitigation tactics and increasing a society's ability to respond to disaster. For example, such tactics may include development of emergency plans or training professionals and volunteers for improved disaster response. Response is simply seen as those actions, such as warning or evacuation, taken immediately when a disaster strikes, and recovery is defined as longer-term efforts to rebuild both infrastructure and social fabric□.

INITIATIVE TO IMPROVE ENERGY SECURITY

Initial Investigation Results

In response to the events of September 11, MTC began a rapid assessment of opportunities to assist the Commonwealth to enhance the public health and the security of critical public facilities by supporting the use of renewable generation (fuel cells and solar power) to provide high reliability power generation. Parameters confined the investigation within the MTC's legislative mandate, the organizational mission of developing new market opportunities, and the guiding principle of providing maximum benefits to Commonwealth ratepayers. The investigation results are as follows:

- State, federal, and local officials with responsibility for security and disaster response have identified a pressing need for enhanced power protection, driven primarily by three factors:
 - An increased likelihood of a power failure as a result of newly recognized risks of terrorist attacks, including potential attacks on the electric grid or central generating stations. This risk adds to the previously recognized risks of power failure caused by weather, grid failure, and other causes.
 - Increased consequences of power failure resulting from increasing dependence on computers and other electric-powered devices to perform critical functions.
 - Increased recognition that reliability is of paramount importance and that existing back-up power systems (diesels or batteries) may not be as reliable as had been assumed.
- The state, federal, and local officials expressed significant interest in pressing forward with an exploration of the use of renewable generating technologies, including fuel cells and photovoltaics, in a variety of applications, including:
 - Primary emergency management facilities, such as police dispatch centers and central emergency management operations centers. These facilities typically have some back-up generation today, but insufficient redundancy.
 - Secondary emergency management facilities, such as emergency shelters and regional emergency management operations centers. These facilities typically have little or no back-up generation today.

- Private businesses that perform critical functions during an emergency, e.g., fuel pumping stations (which rely on electricity to run pumps). These facilities typically have no back-up generation. Such facilities could potentially be served by portable generation owned by the state emergency management agency, which would deploy these tools at individual communities during response and recovery periods.

Despite their recognition of the need for enhanced reliability, the public officials have little or no budget available for preliminary technical design or capital expenses for on-site generation, and no staff resources for analyzing such projects. The problem is particularly acute at the state and local level, given the Commonwealth's overall budget shortfall.

The officials expressed interest in a partnership arrangement for analysis that could help them build internal support for DG, but they indicated that they require substantial financial support to move forward. In addition, officials recognized that buy-in would be required at all levels of responsibility, from agency heads to facilities managers and community emergency planners, and across all jurisdictions (local, state, regional, and federal).

INITIATIVE PLANNING

Following the assessment of these opportunities for security-enhancing DG, MTC crafted a flexible plan for a funded initiative assisting state and other government agencies to install more secure power technologies.

Study Grants at Selected Public Facilities

MTC will work in concert with an advisory group of interested agency personnel in charge of capital projects and/or facilities management to determine a comprehensive list of facilities critical to public health and safety. MTC will then offer non-competitive grants to state and local agencies to analyze the economic and technical feasibility of installations at about 10 public facilities, such as the state Emergency Operations Center, emergency management regional offices, remote telecommunications sites, and state laboratories.

Grants are to be used to assess the feasibility of installing on-site

generation in security-related applications at specific facilities. Given the expected small value of the grants and constraints on staff at applying agencies, the solicitation application process will be simple and straightforward. The solicitation process will accommodate both applications to assess a single facility, and applications to assess multiple facilities that are under the control of a single agency, such as DCAM.

MTC staff will conduct outreach to identify target facilities and to encourage them to apply for funding. Funding will be available to any eligible facility that submits an application, on a first-come, first-served basis, for projects that meet the eligibility criteria.

Successful grantees will plan to participate in a preliminary feasibility study at each site to determine the threshold feasibility. A standard questionnaire or survey tool will be completed for each site to determine particular site characteristics and applicability for a variety of renewable energy products. For those sites for which the application of a renewable energy technology will clearly advance the agency's ability to avert or respond to disaster, an approximate project cost will be determined.

Solicitations for Grants for Design and Installation

At a later date, a second solicitation will be issued for grants for detailed design work and installation of on-site generation in security-related applications. Because the dollar value of these grants will be much greater, the application process will be more rigorous.

Although there will be a single solicitation, funding will typically be released in two stages: first for design work and second, if criteria are met, for installation.

Additional analysis is needed to determine the level and nature of the installation funding. It may be that information that would be helpful in making this determination would be gathered through the feasibility studies—therefore, the design and installation solicitation should be finalized and issued after those studies are conducted.

Outcomes of the program, outside of enhanced security and disaster-response capabilities, will include data on distributed generation applications, so MTC will prepare case studies of projects undertaken. Based on a rigorous methodology, the case studies will describe project major elements, present technical performance data, document costs and benefits, and highlight critical lessons that can be applied to similar projects in the future. Case studies will be widely disseminated as part of ongoing market development efforts.

Close accounting of the costs and benefits of individual project

activities, as well as of the cumulative impact of the activities funded by this initiative, is to be conducted to measure effectiveness and help to continually refine the program. Monitoring of program costs and benefits will include both those items that are immediately quantifiable (e.g., incremental costs and energy savings, quantifiable environmental improvements), as well as those that will require reporting on subjective measures, including social indices (e.g., project and program information dissemination, visibility).

Anticipated reporting activities will include regular, planned progress reports, which will discuss project activities; rationale for investments and interventions; problems; barriers; partnerships and other leverage; and future activities. Reporting will not end with funded installations but will continue into the projects' operational life. This process might include monthly or quarterly energy production reporting, as well as semiannual or annual reports of project operations as a regular part of ongoing project monitoring.

OUTCOMES & CONCLUSIONS

As the electric marketplace continues to evolve, the argument for DG will so continue to be made on economics. It is fundamentally clear that purchasers of electricity need to evaluate associated benefits, and costs, associated with any purchase of power. In the end, the Commonwealth will realize the greatest benefits through projects demonstrating value beyond simply cost per unit of energy generated. These benefits will need to be incorporated into value propositions for DG.

By building collaborative relationships with the public agencies and quasi-public authorities of the Commonwealth, and through prompt development of a funded initiative to explore the value of various renewable technologies, MTC has begun a pilot program to establish the use of distributed generation as part of a strategy to protect lives and properties and to respond to disasters with a diverse set of energy generation tools. This pilot program will test applications for renewable DG and give further insight into its viability.

The presentation of these results will include reporting on the lessons learned and the development plan for broadening the base of agencies participating in the initial program design. As the initiative gains headway through renewable energy generation installation, development of a high quality, broadly accepted framework of standards for the

use of DG would provide government and end-users with a better means of responding to disasters, natural and man-made. With the industry and stakeholders working together, this framework will ultimately lead to the adoption of DG technologies in a cost-effective manner. Meetings with the potential partnering organization are ongoing, at the time of this writing. While no firm commitments have yet been made, these organizations continue to express strong interest in implementing DG projects at their facilities or sites.

References

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ABOUT THE AUTHOR

Raphael Herz leads programmatic efforts within Massachusetts Technology Collaborative to serve Massachusetts consumers and businesses needs efficiently, effectively, and economically, through shaping public policies, and private and public initiatives in the area of fuel cells and distributed generation systems. One such initiative currently under Raphael's purview seeks to improve the Commonwealth's security by harnessing benefits from distributed renewable resources. Raphael has been with the organization for several years, with heavy involvement in the Trust's \$54 million Waste-to-Energy grant program. He is a graduate of the South Carolina Honors College, at the University of South Carolina, and earned a Master's Degree in Environmental Management from Duke University. Mr. Herz may be reached at herz@masstech.org.