AN AMERESCO WHITE PAPER

DRIVING RESILIENCY THROUGH YOUR ORGANIZATION'S ENERGY INFRASTRUCTURE

AMERESCO

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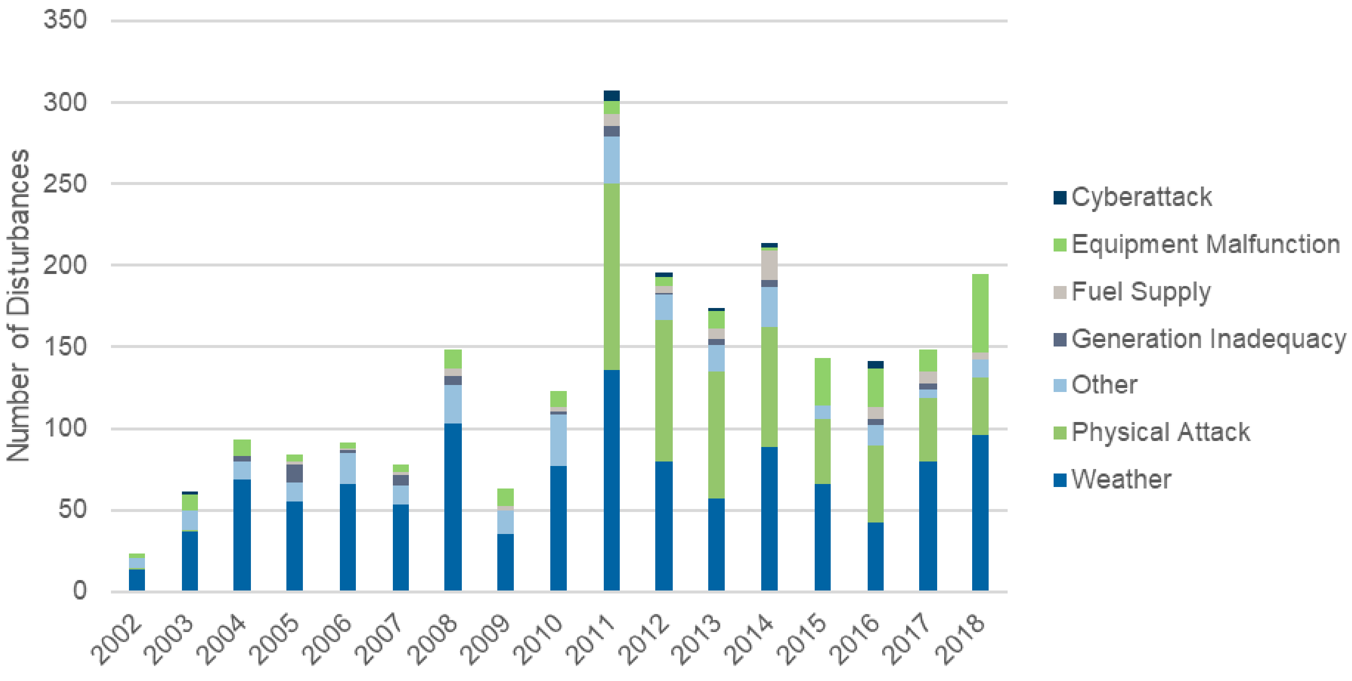
1 INTRODUCTION TO RESILIENCY

Leaders in large corporations, government agencies, and other organizations face numerous challenges in running their day-to-day operations. For them, energy – the lifeblood of many organizations – has historically been seen as reliable, and occasional power outages considered an inevitable cost of doing business. However, these same organizations are starting to view energy and the associated risks and opportunities in a new light as power outages continue to impact their organizations and as new energy innovations make it to market.

In recent years, major weather events, such as hurricanes and wildfires, have exposed vulnerabilities in our energy system that have left many without power for days or weeks, exacting a high cost in terms of lost productivity and quality of life. The sheer number of disturbances in the U.S. electrical system has grown over the past two decades, as shown in the chart below, due to weather, physical attacks and vandalism, equipment malfunctions, cyberattacks, and other causes.

Electrical Grid Disturbances in the U.S., 2002-2018



The continued aging of grid infrastructure in the U.S., compounded by a lack of investment in new systems, will only lead to greater downtime; in fact, the American Society of Civil Engineers gave the U.S. electrical grid a rating of C- in its 2021 Infrastructure Report Card, asserting that "While Utilities are taking proactive steps to strengthen the electric grid through resilience measures, weather remains an increasing threat. Among 638 transmission outage events reported from 2014 to 2018, severe weather was cited as the predominant cause."

These challenges, however, have emerged concurrently with a paradigm shift in organizations' ability to leverage their own infrastructure and energy assets to manage and mitigate these risks. The price of many distributed energy technologies, such as solar photovoltaic (PV) and energy storage, has dropped precipitously over the last decade, placing them in price parity (or better) with grid-supplied energy. Utility regulators and lawmakers across North America continue to move away from the traditional centralized utility business model by introducing new policies that allow customers to build and control their own energy infrastructure. And new financing instruments can reduce organizations' dependence on capital or taxpayer funds to pay for important infrastructure upgrades and shift risks to lenders and solutions providers, thereby allowing organizations to focus on their core missions.

This white paper explores ways in which government agencies, companies, and other organizations can leverage their energy infrastructure to minimize the adverse impacts of major events – in other words, to become more resilient. To date, much of the interest in resiliency has been limited to a few key sectors; however, as addressed throughout this white paper, a wide range of organizations, public and private, are beginning to understand that they can use their energy infrastructure to become more resilient in budget-sensitive ways. With a smart approach to resiliency that integrates innovative technological solutions, contracting structures, and participation in broader energy markets, organizations can often become more resilient in ways that fit within their existing capital and operating budgets for energy and infrastructure in order to better achieve their long-term missions and values.

2 DEFINING RESILIENCY

Resiliency cannot be achieved through a standalone technology or service. It is achieved through a thoughtful consideration of an organization's mission, the risks it faces in maintaining that mission, its existing infrastructure, and its long-term planning efforts.

The U.S. federal government defined resiliency as "the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions… [including] the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents" in Presidential Policy Directive 21[1] in 2013, which advanced the need for more resilient government infrastructure. In practice, definitions of resiliency vary from one context to another; however, it is generally agreed that resiliency refers to an organization's ability to maintain operations through infrequent, major events.

Over the past few years, utilities have been working towards improving reliability, but the need for resiliency has moved to the forefront. The difference between reliability and resiliency is that, whereas resiliency addresses infrequent, large-scale events, reliability addresses frequent but less significant events. For example, a tree branch that falls onto a power line and causes a temporary disruption to a confined area of the grid represents an example of a reliability concern – one that also merits attention, but is different from the set of issues that utilities face in rebounding from a single large event that affects an entire region.

[1] *Presidential Policy Directive 21: Critical Infrastructure Security and Resilience aims to foster collaboration and proactive measures among federal agencies, the private sector, and the public in addressing cyber and physical threats to critical infrastructure in the U.S.*

3 RESILIENCY AS AN APPROACH FOR RISK MITIGATION

Many of the first organizations to think about resiliency in the context of their energy infrastructure did so in reaction to major weather events, such as Superstorm Sandy and Hurricane Irene. Today, many are starting to think proactively about resiliency, driven by their interest in risk management and mitigation on several fronts (such as mission-critical operational risk and business risk) as well as other organizational priorities such as energy management and climate commitments.

Mission-Critical Operational Risk

Mission-critical facilities, such as military bases and hospitals, have been among the first movers on resiliency, in part because of the importance of their operations to human health and national security. Although cost is a factor for these types of organizations, they are often willing to invest more in resiliency because they recognize that a lack of resilient infrastructure can have catastrophic impacts on their operations. During Hurricane Harvey in 2017, for example, 20 of Houston's 120 hospitals had to close, interrupting care for many area patients. Investments in resiliency for mission-critical facilities can help these types of organizations prepare to face similar events with less disruption in the future.

Business And Revenue Risk

Efficiently-run companies in many instances operate their facilities around the clock, so they understand that any power outage can quickly add up to significant lost revenue. In August 2016, Delta Airlines suffered a five-hour power outage at its Atlanta operations center, causing it to cancel or ground over 2,000 flights, with a resulting loss of $150 million as a result; any company that has experienced such an outage will readily understand the need to invest in resilient technology. Moreover, facilities whose operations require constant heat or refrigeration, from industrial plants to grocery chains, can readily estimate the cost of production losses or spoiled inventory as a result of outages. On a national scale, U.S. businesses suffer losses of over $27 billion annually to power outages, according to an estimate from E Source. More resilient power systems controlled at a distributed level can significantly reduce these business and revenue risks.

Energy Management

By moving away from exclusive reliance on grid power and toward distributed generation, organizations can exert greater control over their energy costs and to also create a hedge against fluctuations in energy prices. Innovations in technology and project finance have opened up new ways for them to take advantage of distributed generation in cost-effective and low-risk ways. Long-term, fixed-price contracts for power from solar PV and CHP are now comparable in price or cheaper than grid electricity in many cases.

Beyond these value propositions, a newer market is also developing wherein demand response[2] programs that compensate resiliency-focused assets for providing transmission and distribution system grid services (such as frequency regulation) offer additional opportunities for organizations to generate revenue and further drive down their energy costs.

[2] *Demand response refers to utility programs that call on customers to reduce their energy usage during periods of high energy demand in order to balance the grid; customers often receive compensation for the service of reducing demand through these programs.*

Climate / Decarbonization Initiatives

Many organizations, particularly large corporations and the federal government, have aggressive carbon reduction targets. A number, including BMW, Coca-Cola, Google, and Nike, have gone as far as setting targets for 100% renewable energy. Investing in renewable energy technologies such as solar-plus-storage provides an opportunity for these companies to increase the resiliency of their facilities while simultaneously meeting their climate targets.

Emergency Services

During major events, public facilities such as K-12 schools and public universities become temporary shelters for those affected. Resiliency-minded municipal and state authorities have installed systems such as combined heat-and-power (CHP) and solar-plus-storage at key facilities to support emergency efforts. For example, during Superstorm Sandy in 2012, a CHP system installed at New Jersey's Salem Community College allowed the campus not only to provide its own critical loads but also to serve as the only Red Cross emergency shelter in Salem County. These investments not only protect public infrastructure but also transform them into support facilities when emergencies occur.

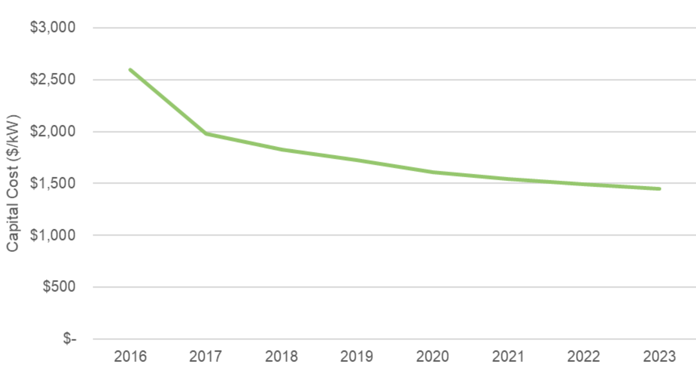
4 TECHNOLOGIES DELIVERING RESILIENCY BENEFITS

An organization's energy infrastructure is the starting point for boosting resiliency. The key technologies that organizations can leverage to improve resiliency are described below:

Solar PV

The costs of solar PV have dropped considerably over the last ten years and will likely continue to do so, opening the technology up to a wider customer and geographical base in the process. Although most PV systems are grid-tied, control technology can enable a distributed PV system to "island" during an event to provide power to the site when the grid is down. And unlike traditional fuel-based backup generators that are only called on during emergencies, solar PV systems can provide energy cost savings over their entire time. Pairing solar PV with energy storage creates a powerful solution for resiliency by storing and dispatching solar energy through major events, even when the sun is not shining.

Solar PV Capital Costs, Commercial Sector (Mid Scenario), U.S., 2016-2023



Energy Storage

Like solar PV, battery energy storage systems – lithium-ion based, in particular – have dropped significantly in cost, creating new opportunities for organizations to manage energy in response to grid conditions and to store bulk energy for use during power shortages. As utilities launch dynamic pricing schemes and expand on demand response programs, additional revenue streams are emerging that will help pay for battery energy storage systems that also provide resiliency benefits. "Plug-and-play" systems, or pre-programmed energy storage systems that can optimize distributed resources without significant integration costs, promise to unlock new opportunities for customers to take advantage of distributed generation and boost resiliency. In addition, energy storage's short construction timeline, small footprint, and modular design allow for projects to be scaled readily to meet a wide range of customer types and applications.

Microgrids

Microgrids enable an energy user (or several contiguous energy users) to optimize multiple energy assets and island from the grid during power disruptions through sophisticated control technology. Through a microgrid, energy users can have the best of both worlds by remaining connected to the grid most of the time while also ensuring a power supply during outages. There is no fixed suite of technologies that constitutes a microgrid; today, many legacy microgrids are powered by diesel generators, though natural-gas powered CHP and a variety of solar-plus-storage solutions are becoming increasingly common power solutions. The combination of distributed generation plus microgrid controls can help optimize performance and cost for large energy users pursuing more resilient energy infrastructure.

Combined Heat-and-Power (CHP)

Many large energy users have on-site generators, powered by natural gas, renewable gas, diesel, or other fuels. CHP systems go beyond traditional on-site generation by recovering the waste heat created by turbines and reciprocating engines for valuable end uses, such as hot water, that can be used for industrial applications, wastewater treatment, personal use, etc. The result is a much more efficient system that also reduces an organization's dependence on utility-supplied electricity for its energy and hot water needs. (Tri-gen systems add chilled water capability that can be used to supply air conditioning and refrigeration.)

Given today's relatively low natural gas prices across many parts of North America, CHP is an attractive and efficient alternative for large-scale industrial customers. Organizations with consistent, year-round demand for electricity and hot water (such as hospitals, universities, wastewater treatment plants, and others) are the strongest candidates for CHP. By investing in an on-site system, organizations can boost resiliency, and CHP's efficiency compared with on-site power alternatives can help reduce emissions as well.

Demand Response

Demand response programs allow utilities to avoid the high costs of starting up offline plants or adding distribution infrastructure only required for infrequent peak usage conditions by paying customers to reduce electricity usage during those periods. From a customer standpoint, demand response provides yet another means by which customers can gain increased control over and generate revenue from their energy infrastructure. In addition, participating in demand response programs reduce the likelihood of grid outages, thereby increasing the reliability of the power supply overall.

Software and Services

A wide array of additional software and services can be layered on top of energy infrastructure to ensure optimized performance (depending on priorities around cost, business operations, carbon reduction, etc.) and to ensure that systems perform reliably during an outage. Examples of applications include (but are not limited to):

- Intelligent load management, which enables systems to participate in demand response and other utility programs.
- Power conditioning, which ensures assets and equipment are not exposed to damaging fluctuations in power quality.
- Grid services, such as frequency regulation and ancillary services, which can provide distributed energy systems' owners with compensation in exchange for the benefits they provide for overall grid stability.

The level of control and sophistication is best determined on a case-by-case basis depending on the nature of the energy infrastructure and customer objectives. Additionally, many aspects of operating and managing systems that provide resiliency can be outsourced to a third party if needed.

The above technologies provide resiliency while also delivering both cost and environmental benefits. While other technologies, such as diesel generators, have been used for backup power, today's organizations are opting for the solutions outlined above for cost management and less impact on the environment.

5 EVALUATING INVESTMENTS IN RESILIENCY TECHNOLOGY

Making the business case for resiliency-driven projects can seem more complicated than for single energy projects, as the added generation/storage capacity and controls for islanding may lead to additional costs. However, the high cost of outages and lost revenue can quickly justify these incremental investments for resiliency. One major event often leaves decision-makers with no question about the value of investing in resiliency.

The decision of whether or not to invest in infrastructure that enables a customer to become more resilient ultimately sits with the key decision-makers within an organization (i.e., CEOs, CFOs, energy managers, key personnel in accounting and treasury, and others). However, the following considerations serve as a useful starting point for decision-makers considering such investments.

Defining Resiliency in the Context of Your Specific Organization

The first step for organizations interested in resiliency is to define resiliency as it applies to their priorities. For municipalities, the objective may be to ensure a continuation of services (water, sewer, street lighting, etc.) during a weather emergency. For hospitals, the objective may be to minimize the disruption of patient services. At industrial sites, the objective may be to avoid the loss of revenue. These discussions will help the organization “right-size” the investment, covering at least their essential needs in the case of a power outage.

At the beginning stages, organizations should also set expectations around the extent to which the resiliency initiative should also optimize for energy cost savings, environmental benefits, or other related priorities. The approach will be highly organization-specific, touching on issues such as balance sheet, financial position, and climate commitments. These early discussions will set the organization on a successful path toward a viable resiliency project.

Although collaboration across departments is essential and all stakeholders need to be involved in the earliest stages of a project, assigning a resiliency “champion” within an organization can significantly increase the project’s chances of success. The higher level the champion, the more likely a project will be viable. Many projects fail to get off the ground because key stakeholders are not involved in the process before important decisions are made. A high-level champion will have the visibility into potential pitfalls and the authority to push through challenges involving a project’s complexities.

Assess Existing Asset Portfolio and Site Potential

The business case for resiliency is strongest when it builds on existing assets or piggybacks on infrastructural investments the organization is planning to make in the near future. Some of the key questions to ask include:

- *Is existing generation (diesel, natural gas, fuel oil, etc.) aging? If so, the case for installing more efficient CHP or solar-plus-storage becomes stronger.*

- *Does the site afford sufficient space for a solar array and/or energy storage battery? Rooftop, ground-mount, or other solar configurations may be suitable options. Battery energy storage may be difficult to install indoors (e.g., inside commercial high-rise buildings in dense urban areas) due to fire code restrictions, so organizations with vacant outdoor space are best positioned to install batteries for resiliency.*

- *Based on the above questions, does the facility have the potential space and on-site generation ability to meet most or all of its critical demand? If so, the site may be a candidate for a microgrid.*

Availability of Governmental and Utility Incentives and Programs (Federal, State, Local)

A number of states promote investments in resiliency directly and indirectly. Direct programs supporting resiliency have emerged in the wake of major hurricanes and other events and provide grants and other incentives for resiliency; examples include New York's NY Prize program and Maryland's Resiliency Hub Grant Program. In addition, many states have appointed Chief Resiliency Officers to assess a state's vulnerabilities and lead programs to boost resiliency in energy infrastructure and other areas, in part through partnerships with large energy users.

Other programs indirectly support resiliency by providing incentives for the aforementioned distributed generation technologies. A good example is the federal solar investment tax credit (ITC), which currently provides significant tax rebates on the cost of solar PV and even energy storage systems tied to solar in many cases. Utility-administered programs for energy storage and solar PV in California and Massachusetts have driven significant investments in those technologies, as have state-driven incentives such as Maryland's energy storage tax credit.

Organizations can leverage these types of incentives to improve the economics of resiliency projects.

Availability of Monetization Pathways in Energy Markets

Given that emergency power systems designed for resiliency may only be called on in rare circumstances, investments in those resources can become more attractive if system owners establish monetization pathways in dynamic energy markets. For example, battery energy storage systems designed to power a facility through a major outage can also be used to shift a customer to cheaper off-peak power if time-of-use (TOU) pricing is in effect. TOU and other dynamic pricing schemes are being rolled out at the utility level across North America, offering an opportunity for various types of distributed generation and storage to help customers boost resiliency and manage energy costs simultaneously.

Large organizations may also have the ability to monetize their energy assets by participating in wholesale energy markets at the independent system operator (ISO) level. ISOs, which oversee competitive energy markets in much of the U.S. and Canada, continue to create new incentives for large energy users to operate in ways that enable the ISO to manage the grid more effectively (e.g., through demand response programs).

Utilities and state governments are also in the process of deploying programs that provide additional compensation for electricity supplied from renewable energy and energy storage systems. In Massachusetts, New York, and Hawaii, solar-plus-storage systems receive more generous incentives than standalone solar systems. Some states, such as Illinois and Hawaii, are beginning to develop microgrid services tariffs that would compensate microgrid developers for the additional benefits they provide to overall grid stability and renewable energy integration. These programs provide yet more ways for organizations to maximize the value of their distributed energy infrastructure.

Availability of Local Energy Resources

Distributed generation relies on local renewable and non-renewable energy sources to provide resiliency benefits when the electricity grid undergoes an outage. In most populated parts of North America, local solar resources are sufficient to provide distributed renewable energy, especially when paired with battery energy storage. Natural gas infrastructure tends to be less vulnerable to hurricanes than power lines, so CHP may be a more attractive option than grid-supplied electricity for sites with access to low-cost natural gas supplies. Organizations interested in resiliency can leverage a portfolio of solutions that makes the best use of energy resources available to a particulate site.

Financing Considerations

Despite the considerable capital costs associated with installing on-site generation, an organization may not have to finance investments in resiliency out of pocket in many cases, opting instead for a range of financing instruments described below.

Energy Savings Performance Contracting (ESPC)

Under an ESPC, an energy services company (ESCO) provides a guarantee for energy performance by undertaking an investment-grade audit of a customer's facility and using a range of energy conservation measures to retrofit a building, often achieving 20-30% savings or more in the process. The ESCO in many cases finances the retrofit, which can be repaid through the resulting energy savings in a budget-neutral manner over the course of an approximately 15- to 20-year contract. The result is a facility with more efficient systems from day one without any need for capital from the building owner.

Power Purchase Agreement (PPA)

Under a PPA, a system developer folds all of a project's costs into a contract with a set rate per kWh for power produced. While this is a common financing structure for solar PV, the model is also being increasingly applied to solar-plus-storage projects. Solar PPAs are dropping in cost as component costs drop and the market scales, with large-scale corporate PPAs often contracting at prices near or on par with electricity from the local grid.

Design-Build-Own-Operate-Maintain (DBOOM)

The trend toward on-site generation is growing as organizations look to focus less on maintaining facilities and more on pursuing their core missions. DBOOM offers a structure in which the developer of a system, such as a CHP plant, will not only design and build a system but also maintain ownership of and provide O&M services for it over the course of a long-term contract. The arrangement transforms capital expenses for on-site generation systems into operating expenses and shifts many of the project risks to the third-party operator, an arrangement that is preferable for many types of organizations.

Public-Private Partnership (PPP)

Under a PPP, public authorities partner with third-party developers to build an infrastructure project financed by the developer and repaid through a pre-determined set of criteria, either through a project's "availability" (e.g., a bridge that remains functional through a contract period) or through project revenues (e.g., through tolls that pay for highway construction). The arrangement allows the public authority to reduce appropriations for infrastructure projects and allocate many of the project's risks to the private-sector partner. The PPP model has been used in the public sector for many years and is increasingly being applied to energy-related projects, such as solar PV and CHP.

Through financing instruments like these, investments in resiliency can be better optimized for an organization's operational particulars and financial position.

Developing and Refining Methodologies to Determine the Value of Resiliency

Many organizations today see improved resiliency as an inherent benefit to their organization given the exposure they face to potential outages and therefore pursue projects without analyzing the value of resiliency in detail. However, some are beginning to develop standards for cost-benefit analysis relating to resiliency in order to better understand the value that resiliency-supporting solutions can offer them. In many instances, they find that resiliency is either undervalued or not valued at all when considering a project's value to an organization.

As a general rule, it is easiest for organizations to determine the value of investments in resiliency when the related technologies and their applications are simple and provide clear and direct financial benefits. For example, if a single manufacturer evaluates the resiliency value of installing a CHP generator for its single facility, the resiliency value is primarily calculated by determining the value of each hour of downtime if production is curtailed and weighing that against the cost of the CHP system.

In contrast, it can be harder to articulate the value for a non-commercial organization, such as a university campus. However, doing so is equally important, and there are a number of ways to determine that value. As an example, a university could measure the value of resiliency by imagining a scenario in which it lost power for five days. That university might determine the value of resiliency by calculating the cost of impacts such as disruptions to the academic schedule, water/mold damage to facilities lacking air conditioning, or others.

For many organizations, non-economic factors, such as the risk of death or catastrophic impact to an organization's core mission, will also make resiliency a higher priority. However, using economic impacts as the starting point for determining the value of resiliency can, in many cases, provide a standalone justification for making the investment.

6 CASE STUDIES

Marine Corps Recruit Depot (MCRD) - Parris Island, Parris Island, South Carolina

Located on the South Carolina coast, MCRD Parris Island is a critical part of the U.S. military's portfolio, providing training for 19,000 Marine recruits each year. Before it selected Ameresco to undertake a comprehensive upgrade of its energy infrastructure, the 8,000-acre facility relied on a steam plant powered by No. 6 fuel oil at the end of its useful life as well as expensive temporary boilers, an arrangement that carried considerable reliability risk as well as unnecessarily high energy costs.

These solutions were all bundled in a contract with a 22.5-year performance period, generating $6 million in annual energy savings, a 35% reduction in overall energy use, a 25% reduction in water use, and a 75% reduction in utility energy demand. These savings will enable the site to reduce annual carbon emissions by over 40,000 metric tons annually. In addition to installing these measures, Ameresco will maintain an ongoing role in operations and maintenance services as well as provide ongoing repair and replacement for all the measures except for the CHP plant.

The need to improve resiliency at MCRD Parris Island aligned with the Navy's core mission of preparing trainees for service. Major weather events

(Source: Ameresco)

The U.S. Marine Corps selected Ameresco to deploy a diverse set of distributed generation technologies to upgrade its facility, including a 3.5 MW CHP plant capable of producing all the steam required for the installation, 6.7 MW of solar PV, a 4.0 MW/8.1 MWh lithium ion battery energy storage system, a microgrid control system (MCS), and additional generators and energy efficiency improvements, for a total of 10 MW of on-site electrical generation. The MCS is the key to improving resiliency at the site as it allows staff to island from the local grid when the power goes down and deploy its other generation with minimal impact to operations.

can significantly impair even a large military base's operations, and, through its work with Ameresco, MCRD Parris Island has significantly reduced the risk that a future event will detract from that mission.

The projects also helped to address concerns around cybersecurity and grid attacks by placing more control over energy in the hands of MCRD Parris Island's operations staff, mitigating the impact of a potential cyberattack on the local grid. Much of the project was financed through a $91 million self-funding energy savings performance contract (ESPC), delivering these benefits with minimal capital outlay from the Navy itself.

Portsmouth Naval Shipyard, Kittery, Maine

(Source: Ameresco)

The Portsmouth Naval Shipyard, encompassing 297 acres, is one of four remaining naval shipyards in the U.S. Its primary purpose is the overhaul, repair, and modernization of Los Angeles-class submarines, therefore serving an important role in national security. Prior to overhauling its energy infrastructure, the shipyard was suffering from outdated combustion turbine generators that were overloaded whenever the utility grid failed. Despite the presence of on-site backup power in the form of diesel generators, the traditional load shedding systems in place kicked in too slowly to avoid serious gaps in generation capacity at the site, often causing the shipyard to slow or delay its submarine repair operations.

Through a three-phase project with Ameresco, the shipyard received upgrades to its steam, power, and control systems. Its power generation now comes from two 5.2 MW Solar Taurus 60 gas turbines, paired with heat recovery systems that provide a significant portion of the site's hot water needs. In addition to repowering its generation system, the shipyard also installed a microgrid control system through a partnership with General Electric's Grid Solutions business with fast load shed technology and a 500 kW/580 kWh battery energy storage system from SAFT that provides the immediate bridge to meet critical loads during a grid outage. As a result of these investments, the shipyard can island from the grid in a much smoother manner than it had in the past, mitigating lost production hours during power outages.

Additionally, these improvements will provide a range of other long-term benefits as well. Because the system can switch to on-site much more quickly than in the past, it now avoids preemptive dispatching of on-site diesel generation as well as the associated cost and emissions. By switching to more efficient cogeneration technology coupled with battery energy storage, the shipyard has also created a hedge against energy market volatility. Over time, the shipyard may be able to leverage its battery to generate revenue in the ISO-New England ancillary services market, further enhancing the business case for the project overall.

7 CONCLUSION

The threats to the utility grid will only continue to intensify due to aging systems, increasingly powerful weather events, and other attacks, posing mounting challenges to large energy users. Fortunately, distributed energy technologies and solutions, such as microgrids, that were once considered out-of-reach are now attainable for government agencies, campuses, and companies across many sectors thanks to new innovations and rapid cost decreases, enabling them to reduce costs and carbon emissions simultaneously. Organizations that articulate the true economic benefit of resiliency and start to invest in resiliency today will be better prepared to withstand major grid outages and, ultimately, support their crucial missions in the long term.