Hurricane Sandy Reconstruction: Rebuild the Smart Way

Microgrid & Energy Storage Solutions

Smart Grid Solutions
Smart Grid Solutions

Rebuilding the electric power system should incorporate the use of smart grid solutions — information and communications technologies, such as smart meters and high-tech sensors, to isolate problems and bypass them automatically. These technologies allow quicker recovery from extreme weather and other outages.

In much the same way as new information and communications technologies are reshaping how we work, learn, and stay in touch with one another, these same technologies are being applied to the electric grid, giving utilities new ways to manage the flow of power and to expedite restoration efforts.

By integrating information and communications technologies into the electric grid, utilities can not only minimize the extent of an outage, but also immediately identify those impacted, shunt electricity around downed power lines to increase public safety, and enable faster restoration of services.

For example, when disturbances are detected in the power flow, modern circuit breakers can automatically open or close to help isolate a fault. Much like a motorist using his GPS to find an alternate route around an accident, this equipment can automatically re-route power around the problem area so that electricity continues to flow to other customers.

Smart Grid solutions also enable utilities to deliver more power efficiently, when and where it is needed, and protect the electric grid from cyber-attack.

Microgrids and Energy Storage

When power interruptions occur, microgrids, including energy storage and back-up generation systems, can ensure continued operation of critical facilities.

A microgrid is a localized grouping of electricity generation, energy storage, and electrical loads (anything that uses electricity). Where a microgrid exists, loads are typically connected to a traditional centralized grid. When the microgrid senses an outage, the microgrid disconnects from the central grid and uses its own generation and storage capabilities to serve the local electrical load. Moreover, in critical situations microgrids can direct power to high priorities.

Microgrid generation resources can include natural gas, wind, rooftop solar panels, diesel or other energy sources. A microgrid’s multiple generation sources and ability to isolate itself from the larger network during an outage on the central grid ensures highly reliable electric power.

The effectiveness of microgrids is further enhanced through energy storage. Storage systems not only provide backup power while the microgrid’s generation sources are coming online, they can also be used to regulate the quality of the power and protect sensitive systems like hospital equipment that may be vulnerable to power surges during restoration efforts.

Microgrids offer additional advantages. Byproduct heat from generation sources such as microturbines can be used for space heating and water heating, and surplus power from microgrids can be sold to the central grid or stored for later use. In combination with energy storage and energy management systems, microgrids can also provide ancillary services to the broader electric grid such as voltage and frequency regulation. Microgrids also reduce dependence on long distance transmission lines— reducing transmission energy losses.

Also of increasing importance, microgrids can mitigate the effects of cyber-attacks by segmenting the grid around the critical elements of our national infrastructure.

Hurricane Sandy was the most devastating storm to hit the northeast United States in recorded history. Rebuilding after the storm will be a formidable challenge.

Sandy’s devastation left 132 people dead; more than 8 million people in 16 states lost power; New York’s subway tunnels were inundated with water; 305,000 homes in New York City and 72,000 homes and businesses in New Jersey were damaged or destroyed; sewage plants in New York City were crippled with hundreds of millions of gallons of sewage flowing into waterways; and four New York City hospitals shut their doors.

As the massive rebuilding effort gets under way, decision makers should rebuild the smart way — ensuring that reconstruction funds maximize the deployment of technologies to mitigate future power outages and ensure continued operation of critical facilities. Resilient and reliable power is critical for first responders, communications, health care, transportation, financial systems, homeland security, water and wastewater treatment, emergency food and shelter, and other vital services.

When smart technologies are in place, power outages are avoided and lives, homes and businesses are protected. A good example is the deployment of microgrids. As reported in the MIT Technology Review, “Local power generation with microgrids showed the benefits of reliability during Hurricane Sandy…. The Food and Drug Administration’s White Oak research facility in Maryland… switched entirely over to its on-site natural gas turbines and engines to power all the FDA buildings on the campus for two and a half days…. Princeton was able to switch off the grid and power part of the campus with about 11 megawatts of local generation…. Similarly, a cogeneration plant at New York University was able to provide heat and power to part of the campus…. A 40-megawatt combined heat and power plant in the Baychester section of the Bronx was able to provide electricity and heat to a large housing complex.”

The 400-plus member companies of the National Electrical Manufacturers Association and our staff of experienced engineers and electroindustry experts, spanning more than 50 industry sectors, stand ready to assist industry and government officials at all levels involved in this historic rebuilding effort. Presented here is a summary of key technologies that can contribute towards the goal of a more resilient electric infrastructure to mitigate future loss of life, property and essential services.

Back-up Generation

A staple of the data center industry, back-up generators can maintain vital services during general power outages for first responder facilities, traffic signals, gas stations, high-rise elevators in eldercare facilities, and other critical services.

Traditionally, diesel and natural gas generators are used to provide long-term back-up generation. When combined with energy storage such as batteries, motor/generators or flywheels, high quality, continuous power can be provided without disrupting even the most sensitive medical and electronic equipment.

Wiring, Cabling and Electrical Components that Can Stand Up to Storms

For critical equipment, cabling should be used that is resistant to long-term submersion in water, as well as oil and other pollutants potentially present in flood waters that may have an effect on less robust insulation materials. In addition, there are classes of transformers, switches, and enclosures that are designed to be submersible. Initial equipment installation can be more expensive than non-submersible equipment, but can pay for itself in subway systems and substation environments that are susceptible to flooding. In addition, “spacer cable” technologies reduce tree caused interruptions.

Relocation or Repositioning of Equipment

Another smart use of rebuilding funds is relocating or repositioning of equipment or power lines. In light of the devastation caused by Hurricane Sandy and other recent floods and storms, it is time to evaluate the location of critical infrastructure and identify situations where investing money today will reap benefits by protecting equipment from future storms.

A simple cost-effective idea is to elevate standby generators at sites prone to flooding to higher elevations. This concept is particularly important when installing new equipment and substations.
When smart technologies are in place, power outages can be avoided and lives, homes & businesses protected.

The 400-plus member companies of the National Electrical Manufacturers Association and our staff of experienced engineers and electroindustry experts, spanning more than 50 industry sectors, stand ready to assist industry and government officials at all levels involved in rebuilding “after the storm.”

Contacts

- Government Relations: kyle.pitsor@nema.org, 703-841-3274
- Operations and Technical Services: john.caskey@nema.org, 703-841-3233
- Policy and Communications: chuck.konigsberg@nema.org, 703-841-3292
- Press Contact: joseph.higbee@nema.org, 703-841-3241

Useful Links:

- Administration request for emergency funds: www.whitehouse.gov/sites/default/files/supplemental__december_7_2012_hurricane_sandy_funding_needs.pdf.pdf
- Electricity Restoration: www.nema.org/afterthestorm
- Smart Grid Return on Investment (ROI): www.nema.org/Smart-Grid-ROI

About NEMA

NEMA is the association of electrical equipment and medical imaging manufacturers, founded in 1926 and headquartered in Arlington, Virginia. Its member companies manufacture a diverse set of products including power transmission and distribution equipment, lighting systems, factory automation and control systems, and medical diagnostic imaging systems. Worldwide annual sales of NEMA-scope products exceed $120 billion.