The Alliance for Industrial Efficiency

Combined Heat and Power and Electric Reliability

Case Studies from Sandy and Katrina

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Forbes

Lessons From Where the Lights Stayed on During Hurricane Sandy

It will likely take several days and possibly weeks before a small army of utility workers finish restoring electric service for customers without power across large swaths of New England and the Mid-Atlantic region, including those still in the dark in the Big Apple.

While the short term focus should remain on restoring power where it was lost, the long-term strategy for avoiding future train wrecks like those that resulted from Hurricane Sandy begins not where electric power was lost but where it wasn't.

Transforming today's unambiguously anemic electric power grid into an electric power grid strong enough to survive the slings and arrows of extreme weather begins by understanding where and why the lights stayed on in New York City.

We all know where the the lights went out. But what about where they stayed on?

That scenario was and still is on full display in Co-op City.

"We decided to invest in an onsite cogeneration plant because we wanted to save money by producing our own electricity and capturing the waste heat to provide our residents with hot water and space cooling," said Herb Freedman, a principal of Marion Real Estate, Inc., which manages Co-op City for the Riverbay Corporation. "We have certainly saved money, but we are also really happy to provide our residents with the added benefit of independence from the power grid."

Located on 330 acres in the Baychester section of the Bronx in northeast New York City, Co-Op City is one of the largest housing cooperatives in the world and the largest residential development in the United States. Indeed, if Co-op City were a separate municipality, it would rank as the 10th largest "city" in New York State. The so-called "city within a city" boasts more than 14,000 apartment units, 35 high rise buildings, seven clusters of townhouses, eight parking garages, three shopping centers, a high school, two middle schools and three grade schools.

It also boasts a 40 megawatt combined heat and power (CHP) plant. CHP, also known as cogeneration, refers to the simultaneous production of electricity and useful thermal energy (heating and/or cooling) from a single source of energy. Unlike central power generation, CHP, a type of clean distributed generation, is sited behind the electric utility meter at or near the point of consumption.

"Hurricane Sandy hit Co-op City about as hard as it hit most anywhere else in New York City, but everybody in Co-op City had power before, during and after the storm," said Freedman.

This article is available online at:
http://www.forbes.com/sites/williampentland/2012/10/31/where-the-lights-stayed-on-during-hurricane-sandy/

William Pentland, Contributor
All electrons are not created equal.
10/31/2012 @ 5:21PM

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Lessons learned from Hurricane Sandy

While much attention is being devoted to where power was lost in New York and its surround this past week during the storm, less focus has been placed on where the power was maintained.

Forbes describes the situation in those parts of the city that continued to be powered during Sandy in an article entitled **'Lessons From Where The Lights Stayed On During Sandy'** with cogeneration emerging with a great deal of credit.

William Pentland writes in Forbes, "the long-term strategy for avoiding future train wrecks like those that resulted from Hurricane Sandy begins not where electric power was lost but where it wasn't."

Located on 330 acres in the Baychester section of the Bronx in northeast New York City, Co-Op City is one of the largest housing cooperatives in the world and the largest residential development in the United States, and one such example of where cogeneration came into play.

The so-called "city within a city" boasts more than 14,000 apartment units, 35 high rise buildings, seven clusters of townhouses, eight parking garages, three shopping centers, a high school, two middle schools and three grade schools, and critically it also boasts a 40 MW combined heat and power (CHP) plant.

"We decided to invest in an onsite cogeneration plant because we wanted to save money by producing our own electricity and capturing the waste heat to provide our residents with hot water and space cooling," said Herb Freedman, a principal of Marion Real Estate, Inc., which manages Co-op City for the Riverbay Corporation. "We have certainly saved money, but we are also really happy to provide our residents with the added benefit of independence from the power grid."

Co-op City's cogeneration plant kept the lights on for its more than 60,000 residents during and after Hurricane Sandy's gale force winds and storm surge. It provides a point of departure for how best to prevent the next Hurricane Sandy from becoming a catastrophe.

"Hurricane Sandy hit Co-op City about as hard as it hit most anywhere else in New York City, but everybody in Co-op City had power before, during and after the storm, " said Freedman.

To access this Article, go to:
http://www.cospp.com/content/cospp/en/articles/2012/11/lessons-learned-from-hurricane-sandy.html

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02/11/2012
By Diarmaid Williams
International Digital Editor

The New York Times

Dot Earth

How Natural Gas Kept Some Spots Bright and Warm as Sandy Blasted New York City

As New York City and other communities buffeted, flooded or darkened by the remains of Hurricane Sandy consider steps beyond the immediate recovery, officials, business owners and residents would be wise to spend time examining places where the power did not fail. That's the essence of the approach to post-disaster review suggested last week by the meteorologist William Hooke, a senior policy fellow at the American Meteorological Society.

If they do, they'll realize that there's a reliable energy grid in much of the region -- composed of natural gas lines -- that parallels the one using wires to carry electricity. This separate energy system allows businesses to produce electricity themselves in small, highly efficient gas-powered generators at their facilities (and cut urban air pollution and greenhouse gases at the same time). This gas grid helped at least two large energy users -- New York University and Co-op City (a vast high-rise housing complex in the Bronx) -- stay warm and bright because, to a significant extent, they can generate their own electricity and heat.

Matthew Wald, in a Green Blog post today, nicely explains the success at N.Y.U., which went into "island mode," in the words of one university official:

When much of Manhattan south of Midtown was blacked out, the lights were on at most of New York University, as was the heat and hot water. As I wrote in January 2011, N.Y.U. installed a small network of its own, burning natural gas in a unit that not only made electricity but also delivered the heat that would otherwise go to waste for use in heating and cooling. That process is known as cogeneration.

"Our cogen is up and running," said John J. Bradley, the university's assistant vice president for sustainability, energy and technical services, said last week. The system does not cover the entire campus but rather all of the larger buildings and the core of the Washington Square campus....

Of course, the failure of a backup generator at N.Y.U. Langone Medical Center drew far more attention. The hospital had to evacuate all of its patients after Hurricane Sandy made landfall a week ago, and Langone drew some criticism for not moving them out beforehand.

The university's impetus for installing the cogeneration network was to save money and reduce its carbon footprint, but a side benefit is reliability.

In two posts in the last few days on Forbes.com, William Pentland, a writer who is also involved in a business developing such combined heat and power systems (he declares this interest up front), described the Co-op City storm response and, more generally, the merits of the gas distribution system as a means to creating a robust, distributed electricity supply:

Today's electric grid was not designed to survive strong winds, storm surges, falling trees and flying debris and seems ludicrously inadequate for the demands of America's increasingly digital and connected economy. The costs of hardening the electric grid will be vast. One widely cited study by the Brattle Group estimated that the electric utility industry will need to invest a $1.5 trillion to $2.0 trillion in infrastructure upgrades by 2030.

Despite spending epic sums of money on the so-called "smart grid," the electric power grid seems as stupid as it was before spending billions in federal stimulus dollars.

Why throw good money after bad if we have a compelling alternative? And make no mistake about it, we have a compelling alternative to the conventional electric grid. It is commonly called the North American natural gas infrastructure.

I was in an e-mail conversation over the weekend with Pentland and Thomas G. Bourgeois, the deputy director of Pace University's Energy and Climate Center, who's a big fan of cogeneration of both heat and electricity at sites where it is used. He noted other instances around the region affected by the intense storm where so-called "combined heat and power" units kept lights on (I've cleaned up some e-mail shorthand):

One Penn Plaza's co-generation system kept running. Princeton powered dorms and preserved research facilities, whereas N.Y.U.'s research center, served with emergency generators, suffered inestimable losses [*read "Hurricane Sandy's Lesser-Known Victims: Lab Rats"*].

Next Friday New York City kicks off their 80 x 50 process [*a plan to cut greenhouse gas emissions 80 percent by 2050*] . We need a new vision of the electric generation, transmission and distribution system rather than one that moves electricity generated at remote locations, arriving at the point of end use... with a loss of 67 percent of otherwise valuable thermal energy. We need some pilots of operating micro-grids and district systems with combined heat and power that ought to represent the energy system of the future. Go beyond thinking of individual building efficiency to zero-energy blocks or neighborhoods. A vision of optimally creating a suite of resources, Efficiency, photovoltaics, clean distributed generation, demand response, storage, all managed in synch with the larger transmission and distribution system.

As I was mulling this over, I had two thoughts. One was that this vision of a resilient urban energy system integrating existing natural gas distribution lines could easily integrate sources of renewably generated electricity, as well -- for instance, from rooftop solar panels in the boroughs where they make sense. I asked Bourgeois if that made sense to him.

He said yes, emphatically.

Bourgeois is on the run, like lots of people right now, so his full reply, as he explained apologetically, is somewhat "stream of consciousness." But, to me, it's worth reading in full. I've posted it as a standalone Slideshare document: "A Systems Approach to Resilient and Sustainable Urban Energy Supply."

Mayor Michael R. Bloomberg had already expressed strong support for expanding natural gas supplies to the city, mainly to reduce the use of heavy oil in heating. (Read this report on natural gas and city air pollution prepared for the mayor's Office of Long-Term Planning and Sustainability for more.)

Of course, as I've written repeatedly, natural gas should be harvested responsibly. And urban gas lines and the larger pipelines from national supplies to New York City need to be carefully built and maintained. [*There were natural gas leaks in some flooded areas in the aftermath of the storm, and some coastal communities saw gas distribution systems disrupted.]

But given the role natural gas played in keeping the lights on in otherwise darkened parts of the city after this storm, it's clear that this resource can play an important part in building a robust, resilient and flexible electricity and energy grid for the city and region.

| Resources |

- "Combined Heat and Power, a Clean Energy Solution" (U.S. Department of Energy and Environmental Protection Agency, August, 2012)

- "Combined Heat and Power Microgrids for New York City" (New York State Energy Research and Development Authority presentation, June 2012)

To retrieve this article: http://dotearth.blogs.nytimes.com/2012/11/05/how-natural-gas-kept-some-spots-bright-and-warm-as-sandy-blasted-new-york/

NOVEMBER 5, 2012, 6:11 PM ***By*** ***ANDREW C. REVKIN***

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KEEPING THE LIGHTS ON: INDUSTRIAL ENERGY EFFICIENCY

Each year, America's utilities and factories send enough heat up their chimneys to power all of Japan. But with existing, proven technologies, we can harness that waste energy, dramatically cut electricity costs, and make our industries more competitive.

According to Oak Ridge National Laboratory, significantly increasing our industrial energy efficiency could create up to 1 million jobs.[1] Further, improving the efficiency of our power generation could result in more than $200 billion in private investment over 10 years, according to a study by the Industrial Energy Consumers of America, an organization that represents many of the country's largest manufacturers.

WHAT IS INDUSTRIAL ENERGY EFFICIENCY?

HARRAH'S

Harrah's Rio All-Suites Hotel and Casino installed the first CHP system on the Las Vegas Strip in 2004. It now generates 40 percent of the electricity, 60 percent of the hot water, and 65 percent of the heat needed by the hotel-casino.

Industrial energy efficiency uses waste heat left over from regular industrial processes to generate additional electricity or to heat or cool nearby buildings. This can be accomplished using a suite of time-tested technologies such as combined heat and power (CHP), waste heat recovery, district energy, and thermal storage systems. In fact, America's first commercial power plant, opened in 1882, used the excess steam generated from producing electricity to heat neighboring buildings.[2]

With rising energy prices affecting companies large and small, using waste heat and recycling their energy can reduce costs and give businesses the flexibility to invest the savings elsewhere. For example, Lorin Industries in Michigan has recycled its waste heat since 1943 and added capacity in 1990. The system saves the company $540,000 per year, and the newest addition paid for itself in just four years, largely due to the significant decrease in the company's need to purchase electricity during more costly peak hours.[3]

Improving Reliability and Performance: *The 2003 Northeast Blackout*

Companies save money and secure a highly reliable power source when waste-heat CHP systems are deployed. These energy efficiency technologies can ensure the lights stay on, even in the face of a catastrophic blackout. On Aug. 14, 2003, large portions of the Northeast and Midwest lost power. An estimated 50 million people were left without electricity for approximately four days. Without power, many manufacturers and other businesses were unable to maintain operations, leading to idle factories and lost sales. Government estimates place the blackout's impact on the U.S. economy at $4 billion to $10 billion.[4] However, many of the affected region's 491 facilities and factories with CHP were able to continue

operations without access to electricity from the commercial grid. Although some lost power for a few minutes or hours, many came back online quickly and were able to operate normally through the rest of the blackout.[5]

Entenmann's Bakery in Bay Shore, N.Y., has a CHP system that uses four natural gas-burning reciprocating engines to produce 5.1 megawatts (MW) of electric power. The bakery initially installed the system because of substantial losses associated with power outages at food processing plants. In normal operations, the system supplies the daily base-load power, and Entenmann's sells the excess electricity back to the local utility. During the 2003 blackout, Bay Shore was heavily affected, yet Entenmann's Bakery stayed fully operational.

Bakeries and other food processing operations need reliable electricity to avoid spoilage during power outages.

Improving Reliability and Performance: *Hurricane Katrina, 2005*

Industrial energy efficiency systems can also support lifesaving systems and operations. Mississippi Baptist Medical Center in Jackson, Miss., is a 646-bed urban hospital with 3,000 employees. It has a 4.3-MW natural gas CHP system, installed in 1994, that allowed the hospital to stay open during Hurricane Katrina. It was the only hospital in the Jackson area to be 100 percent operational during the storm and its immediate aftermath, which allowed it to treat a large number of people and provide food and housing for displaced patients. Under normal circumstances, the CHP system meets almost all of the hospital's electricity needs and more than half of its chilled water needs, which has led to an estimated cost savings of $738,000 annually.[6]

To retrieve this article: http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Fact_Sheet/PEW-1471_CHP_GENERAL_Clean_Energyr8.pdf

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April 2012

Jessica Lubetsky
Senior Associate, Clean Energy Program, Pew Charitable Trusts

CHATSWORTH, Calif., Nov. 2, 2012 (GLOBE NEWSWIRE) -- Capstone Turbine Corporation

(www.capstoneturbine.com) (CPST), the world's leading clean technology manufacturer of microturbine energy systems, announced today that its microturbine systems continued to operate during and after Hurricane Sandy slammed into the eastern seaboard this week.

News agencies reported on Tuesday morning that a peak total of over eight million electrical utility customers were in the dark. The Northeast was hardest hit, but significant outages occurred in northern Ohio, and sporadic outages occurred as far away as northwest Indiana and northern Georgia. In some regions, power failures were nearly total. Governor Andrew Cuomo said that 90% of Long Island families were without power Tuesday. One of New Jersey's utilities reported that 86% of its 1.1 million customers were without power Tuesday morning, and that figure was still 86% early Wednesday.

On the contrary, all indications that Capstone Turbine has received from its customers and local distribution partners are that installed Capstone systems continued to operate seamlessly during and after the worst storm to strike the East Coast in decades. Capstone applications that weathered the storm ranged from shale gas installations to luxury hotels, office buildings, data centers, health care facilities and industrial customers from Virginia to New Jersey and New York to Massachusetts.

Some installations played critical roles during the crisis that downed power lines and left millions of people without power for days. Salem Community College in Salem County, New Jersey is a Red Cross Disaster Relief Shelter. The site consists of three Capstone C65 microturbines that provide heating, cooling and emergency power to the critical facility. During Hurricane Sandy, the shelter was fully operational as it was continuously powered and heated by the on-site microturbines.

Capstone Mid-Atlantic distributor E-Finity Distributed Generation, LLC was able to continue its critical operations during Hurricane Sandy despite losing utility power for close to 24 hours utilizing a Capstone C65 liquid fuel turbine. The unit was able to maintain E-Finity's remote monitoring system and data center to help dozens of customers monitor and control their Capstone systems during the storm.

E-Finity was able to continue to support Capstone users like Solers, Inc., an innovative information technology software solutions provider for the U.S. government in Arlington, Virginia whose technical experts partner with the Department of Defense, intelligence community and other federal agencies. The site utilizes five C65 Secure Power turbines that provide dedicated power to its data center. "Despite multiple power outages at the facility, the data center never lost power and was able to seamlessly continue its critical business mission," said Jeff Beiter, E-Finity Distributed Generation's Managing Partner.

It was the same story in the oil and gas shale plays where Capstone microturbines have been installed as emergency power or standalone power for various natural gas production and transmission facilities throughout the Marcellus and Utica Shale Plays. With the impending storm, several critical gas utility sites switched away from their local utility feed to their Capstone microturbines to ride out the storm, while other sites, where Capstone microturbines are their sole source of electric power, were left un-phased during the event. "The reliability of Capstone microturbines prevented these facilities from being taken offline and allowed the gas suppliers to continue to serve their customers uninterrupted throughout the height of the storm," added Beiter.

Cory Glick, President of Reliable Secure Power Systems (RSP Systems), Capstone's distributor for New York and Connecticut, indicated that all Capstone units in his area were performing as designed with several customers continuing to conduct business despite experiencing heavy storm damage. "One very critical site that was hit hard by the storm was a data center on West 17th Street in New York City known as Public Interest. Public Interest has a C65 dual mode microturbine that worked perfectly by seamlessly picking up the data center load when the utility suddenly blacked out. The servers never went down, and the site is still running today thanks to the Capstone turbine. Another very critical site that performed flawlessly was the Christian Health Care Center located in Wyckoff, New Jersey, which is a 292-bed assisted living facility that never lost power thanks to the onsite Capstone product," added Glick.

"RSP Systems' Capstone business had been gaining momentum in recent months before this week's storm, with several new installations under construction for marquee customers like DHL and the Palace Hotel in midtown Manhattan," stated Glick. I fully anticipate that this terrible storm will only add to customers' interest in onsite distributed generation as a way to not only save on their annual energy bills but also to protect them against prolonged utility outages like we are seeing right now as many people in the area will be without power for a week or more," added Glick.

Joel R. Wilson, CEO of OP Energy Systems, a company that currently owns and operates two Capstone installations for Class A office buildings in Manhattan, reported that both sites were fully operational and without incident. "The Capstone microturbine product continues to be our most reliable distributed generation solution. We have experience with both reciprocating engines and other microturbine brands over the years", said Wilson. "In fact, we recently closed another round of growth capital and are in the process of replacing our older less reliable distributed generation equipment with new Capstone product. OP Energy is currently in the process of installing nine C65s at a 37-story office building located at 110 E. 59th Street and five C200s at a 41-story office building located 666 5th Avenue," added Wilson.

"Users around the world continue to adopt Capstone microturbines because they want the high reliability and low emission benefits of our distributed generation products," said Darren Jamison, Capstone President and Chief Executive Officer. "Hurricane Sandy is a tragedy that has had a terrible loss of life and property, but I'm proud of the performance of our Capstone product that successfully kept our customers in business during this crisis. It's unfortunate that in many cases it takes a major event like this to get people to start to think differently about how to reliably deliver their energy needs and change traditional utility buying habits," said Jamison.

"This storm is a great example why buying energy the way your parents did and your grandparents did may not be the best solution from both a cost and reliability perspective as customers who have embraced on-site distributed generation technologies like microturbines were much better prepared to weather this storm than customers that continue to rely solely on traditional centralized power plants, sub-stations and poles and wires," added Jamison.

To retrieve this article: http://finance.yahoo.com/news/capstone-microturbines-power-hurricane-sandy-123000047.html

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MINUTEMAN NEWS CENTER

Status of operations at Fairfield University due To Hurricane Sandy

Fairfield University officials announced today (Wednesday) that classes are cancelled for Thursday, Nov. 1, but administrative offices will remain open and employees who can should report to work. A decision about classes on Friday, Nov. 2, will be made by 2 p.m. on Thursday, Nov. 1.

There were no injuries reported on campus, and damage was moderate, and due to downed or damaged trees. There has been no damage reported to campus buildings, however a few cars sustained damage.

While power is on at the University due to our co-generation heat and power plant, we are cognizant of the situation in the Town of Fairfield and access to area services due to the power outages and damage in residential areas. We also are taking into consideration the situation in the entire region that may impact our students' ability to return to campus. Therefore we believe it in the best interest of our students to cancel classes on Thursday and continue to monitor the situation.

A limited number of University events may still take place through the weekend, while others are cancelled or postponed.

- The Fairfield men's basketball team takes on the University of Bridgeport in an exhibition game at the Webster Bank Arena in Bridgeport on Friday, November 2. Game time is 7 p.m. For additional information on athletic event schedules, visit **www.fairfieldstags.com**
- The performance by the National Circus of the People's Republic of China Cirque Chinois will be held as scheduled at 8 p.m., Friday, November 2 in the Regina A. Quick Center for the Arts. Tickets are still available.
- Performances of "An Enemy of the People" by Henrik Ibsen presented by Theatre Fairfield will also take place at 8 p.m., Thursday, Friday and Saturday, Nov. 1-3, and at 2 p.m. on Saturday and Sunday, Nov. 3 and 4. The performances are scheduled in the Black Box Theatre at the Quick Center for the Arts.
- The National Theatre Live presentation on Thursday, November 1, and the Young Artist performance on Sunday, November 4, are both being postponed to later dates yet to be determined.

A list of the status of other University events is available on the institution's website: **www.fairfield.edu**

Additional helpful information:

Power is available to the majority of buildings on campus due to the University's construction in 2007 of a combined heat and power plant that permits the institution to produce its own electricity, and with the byproduct, heat and cool the majority of campus buildings. The University is currently operating independent of the power grid. Two areas of campus are not served by the co-gen plant and are currently without power: The Townhouse student residences and the Early Learning Center. Over 400 students residing in the townhouses were evacuated Monday and accommodated on campus.

Members of the public may use the facilities of the University's Quick Recreation Complex, but must provide their own towels and toiletries. The complex will be open from 7 a.m. to 9:30 p.m.

Currently (Wednesday, 31) approximately 900 students remain on campus in their residence halls, and dining services are being provided in the Barone Campus Center. On Saturday, Oct. 27, classes scheduled for Monday and Tuesday were cancelled and students who could were encouraged to go home.

The approximately 300 students who reside at the beach were evacuated by Sunday, October 28, when the mandatory evacuation order was issued by the Town of Fairfield. Students either went home or were absorbed into University housing. Approximately 100 students who resided at the beach stayed on campus.

Based on information provided by the Town of Fairfield, it is likely that the beach area will be uninhabitable for an extended period of time. Students who reside at the beach are being provided with the following options:

1. If students can commute from home, they are being encouraged to do so

2. A limited number of students may take advantage of empty beds in campus residences or they may make arrangements to stay on campus with friends.

3. Students who need assistance for housing should contact the Office of Residence life.

The University will be asking faculty and staff, and area alumni who have space available for a student in their home, to contact the Office of Residence Life.

Fairfield is also working with officials of the Town of Fairfield to accommodate their requests for assistance. The University has also opened its doors to assist the Sacred Heart University's men's and women's basketball teams who will be practicing on Fairfield's campus.

University officials will continue to monitor the situation.

For the latest Fairfield University updates on Hurricane Sandy, visit the website, **www.fairfield.edu**, or follow Fairfield University on Twitter (@FairfieldU), or on Facebook (**https://www.facebook.com/FairfieldUniversity**).

To retrieve this article: http://www.minutemannewscenter.com/articles/2012/11/01/fairfield/news/doc5092a6d656fed649039295.prt

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November 1, 2012
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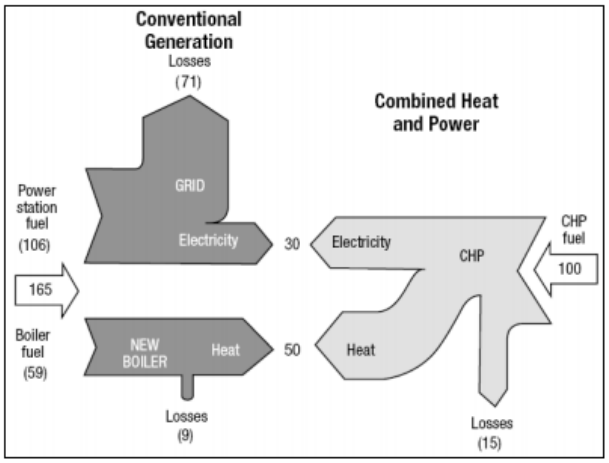
CHP (Cooling, Heating, and Power) AT THE MISSISSIPPI BAPTIST MEDICAL CENTER



In the early morning of August 29, 2005 the most destructive hurricane in United States history made landfall on the Mississippi Gulf coast. The impact of the hurricane was felt most by the states of Louisiana, Mississippi, and Alabama. The hurricane resulted in the destruction of 302,000 homes, $125B in damages, 2.7M power outages, and 1193 deaths. The hurricane, however, shed light upon the advantages to having an on-site CHP system. The independence provided by the CHP system allowed MBMC to continue operation relatively unaffected. As soon as power reliability became a factor MBMC performed a load shed, switched off of the power grid, and continued operation in turbine-only mode. MBMC was the only hospital in the Jackson metro area to remain nearly 100% operational. After approximately 50 hours, the power reliability issue was addressed and MBMC connected to the power grid and returned to normal operation.

To retrieve this entire report: http://www.southeastcleanenergy.org/resources/reports/CHP-MBMC.pdf

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Mississippi State University
Louay Chamra
Keith Hodge

MIT Technology Review

Microgrids Keep Power Flowing Through Sandy Outages

Local power generation with microgrids showed the benefits of reliability during Hurricane Sandy.

The widespread power outages in the wake of Hurricane Sandy cast light on the weakness of a completely centralized electric power system and spotlighted the benefits of distributed power generation.

A number of locations reported that on-site power generation and the ability to operate independently of the grid allowed organizations, such as colleges and businesses, to stay at least partially online during the worst of the storm.

In many cases, back-up diesel generators are sufficient to keep businesses, such as stores and even data centers, operating during grid outages. People have been putting gasoline generators into service for their homes, too.

Microgrids are different in that they allow organizations to operate in "island" mode, or independent of the grid, for long periods. The two hurricanes in the east coast over the past two years and other heavy storms, including one approaching the northeast today, could generate more interest microgrid technologies, says Peter Asmus, an analyst at Pike Research.

"Smart grids are about reacting to storms and outages and limiting the amount of power outages. Microgrids are about stopping power outages from the get go," Asmus says. "I think these storms are going to build interest."

The Federal Drug Administration's White Oak research facility in Maryland, for example, has gone onto island mode dozens of times since setting up a microgrid, according to building contractor Honeywell. During Sandy, the local grid failed and the campus facility 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.

Campus or military bases are considered good candidates for microgrids, particularly if there is a strong need for back-up power. Princeton University typically gets its electric power from both from the local grid and an on-site cogeneration facility that supplies electricity and steam for heating.

During Hurricane Sandy, Princeton was able to switch off the grid and power part of the campus with about 11 megawatts of local generation, according to a report in the Daily Princetonian. By Wednesday night of last week, Princeton coordinated with local utility PSEG and reconnected to the grid, according to the report.
Similarly, a cogeneration plant at New York University was able to provide heat and power to part of the campus during Sandy in Manhattan, according to a report in the New York Times. The university invested in a cogen system, which are typically an efficient way to generate electricity and heat, to save money and reduce the university's carbon footprint, but reliability proved to be a benefit during the outage, a university representative said.

Because of the low price of natural gas, cogeneration or gas turbines are often used for local generation and microgrids. But fuel cells that run on natural gas were also tested during Sandy.

The 23 stationary fuel cells from UTC Power installed in New York and New England were able to keep operating during the storm. A handful of those units were able to provide power when the grid went down and, as of yesterday, two were still running in "grid-independent" mode, according to the California Fuel Cell Partnership.

Local power generators and microgrids can also be used to provide electricity service to residential customers. During power outages from Sandy, 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, according to a report in Forbes.

The natural gas distribution infrastructure is largely underground, making it more resilient to strong storms in places like the Northeast U.S. where most power lines are on poles. (See,Smart Meters Help Utility Speed Sandy Restoration.)

Microgrids in developed countries face a number of obstacles, including the upfront costs and regulatory barriers. And it's not clear that business owners and real estate managers will start to plan for more severe storms, which are an expected outcome of climate change. (See, Climate Change Likely Makes Storms Like Sandy Worst.)

But Sandy was a harsh reminder of the dangers of massive power outages and the merits of using distributed generation to provide power independently of the grid.

To retrieve this article: http://www.technologyreview.com/view/507106/microgrids-keep-power-flowing-through-sandy-outages/

Nov. 7, 2012
Martin LaMonica
MIT Technology Review

Combined Heat & Power Saver/Savior at TCNJ

CHP Proves More Reliable When Battling Hurricane

It's been a couple of weeks since Hurricane Sandy hit the eastern seaboard of the US, causing power outages for over 8 million utility customers. "When the hurricane warnings became more and more threatening, we couldn't take any chances," said Lori Winyard, Director, Energy and Central Facilities at TCNJ. "Combined heat and power allowed our central plant to operate in island mode without compromising our power supply - or educating students." TCNJ was able to continue in "island mode," off the grid until their 26 kV line was repaired by the utility company.

A Combined Heat and Power (CHP) system (or cogeneration) can effectively and reliably generate useful heat and electric power "on site" using less fuel than a typical system that generates power only. CHP systems offer tremendous opportunities for customers with predictable and consistent heat and power needs (particularly large commercial, industrial, and institutional facilities), providing potential for significant economic savings and reductions in fuel consumption and greenhouse gas emissions. Now the other advantage comes to light, reliability.

Distributed energy resources like gas turbines, and gas reciprocating engines are becoming increasingly competitive with grid power on both a cost and reliability basis. When they are fueled by natural gas their emissions are much lower than traditional diesel-fueled standby generation and the surplus of shale gas in the US is keeping natural gas prices low. As an added benefit, the natural gas "grid" of pipelines is more storm resistant than the electric grid.

As proponents of combined heat and power (CHP) and methane-based "Bio-Power" plants, Concord is responsible for over 15 onsite generation plants in operation today. "The public sector and utilities should seriously consider programs to rapidly deploy distributed energy resources. Onsite generation is a short term complement to the massive planned upgrades to the transmission and distribution grid," said Michael Fischette, Concord's CEO, "Both are necessary to ensure reliable power. Through direct investment, engineering assistance for utility customers, loans or other financing options, and changes to local building codes, our power generation infrastructure can be better equipped to literally weather the storm."

About Concord Engineering

Concord Engineering is a full-service engineering, engineering consulting, construction management and commissioning firm. For more information, visit www.concord-engineering.com .

The article can be found at this link: http://www.marketwatch.com/story/combined-heat-power-saversavior-at-tcnj-2012-11-14

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Cogeneration & On-Site Power Production®

College of New Jersey defied Sandy through cogeneration

The College of New Jersey has acknowledged the importance of combined heat and power in maintaining its campus and facilities despite the fury of Hurricane Sandy a couple of weeks ago.

The college's system allowed it to operate independently of the power grid, which was affected to the extent that it caused outages for over 8 million utility customers.

"When the hurricane warnings became more and more threatening, we couldn't take any chances," said Lori Winyard, Director, Energy and Central Facilities at TCNJ. "Combined heat and power allowed our central plant to operate in island mode without compromising our power supply."

Joe Sullivan, Concord's Vice President, Energy Policy and Development became concerned when he saw a 26 kV line down in the aftermath of the hurricane. "As former facilities director for TCNJ, I contacted Lori right away to see how their power fared during the hurricane.

It was great to hear that due to their central plant being powered by CHP, they didn't have any issues and could concentrate on what they do best, educating students."

TCNJ was able to continue in "island mode," off the grid until their 26 kV line was repaired by the utility company.

The above article can be found at the following link: http://www.cospp.com/articles/2012/11/college-of-new-jersey-defied-sandy-through-cogeneration.html

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November 15, 2012
Diarmaid Williams

Opinion: What Hurricane Sandy Should Have Taught Us

Surviving a superstorm safely, with no loss of power, heat, and light, is within our abilities

We need to build more power plants closer to where people live and work, cutting down the distance between production and consumption. The classic utility grid relies heavily on a small number of really big generators in remote locations connected to where people live and work by a latticework of power lines that are vulnerable to extreme weather. While we can ill afford to do without distant power sources, we need a better balance between near and far.

This does not mean siting nuclear power plants on vacant lots in your town or mine. By their nature, nukes can only be remotely located. The risk of a nuclear accident may be acceptably small, but the consequences are too great to ignore.

Similarly, coal-burning power plants are suited only to distant locations due to an alphabet soup of pollutants -- despite the most stringent pollution controls and safeguards.

What is the answer? A combination of something old and something new. Cogeneration systems -- the "something old" -- are part of the answer. They literally co-generate electricity and heating or cooling from one fuel source for their onsite customers.

Cogeneration was all the rage for much of the 1980s and 1990s, before falling into disfavor. They have risen once more with a new moniker: "combined heat and power", or CHP.

CHP systems can be small enough to fit in the basement of a hospital, or big enough to power a college campus. (Princeton's cogen unit spared its campus from any loss of heat or light while Sandy raged.) Because CHP deployments produce steam heat or cooling plus electricity, they need to be close to their thermal customers.

As to the "something new," solar photovoltaic (or PV) is ideal for siting within clusters of utility customer structures, thus reducing -- if not eliminating -- the need for power lines connected to a weather-threatened grid.

Indeed, most solar systems are located literally on top of a customer's home, business, school, parking lot, and so forth. To be sure, not much -- if any -- solar power is generated during a hurricane. But when the sun comes out the next day, the solar PV system (assuming it survives the storm as most clearly did) starts generating kilowatt hours for otherwise-beleaguered homeowners.

The above article is an excerpt from the Opinion piece by R. William Potter. The full text of the article can be found at the following link: http://www.njspotlight.com/stories/12/11/14/what-hurricane-sandy-should-have-taught-us/

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R. William Potter