



THEMATICS
asset management



THEMATICS SAFETY:

***PREPARING FOR THE IMPACTS OF
CLIMATE CHANGE AND KEEPING
PEOPLE SAFE DURING NATURAL
DISASTERS***

SAFEGUARDING OUR FUTURE

The purpose of this paper is to highlight the growing threat of natural disasters to human safety and explore how technological innovation and adaptation are enabling an effective response.

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THE PRIMARY FORCES THAT ARE DRIVING THE NEED FOR HUMAN SAFETY

Increased urbanisation. An ageing and shrinking workforce. Adaptation to climate change. These are some of the long-term structural shifts that we see today and that we anticipate will continue to change the way we live and work in the future.

At Thematics Asset Management, we have identified specific themes that, with the right investment, will help us find solutions to respond to these challenges. We focus on markets that are growing faster than the broader global economy due to a range of long-term, secular growth drivers – contributors to the economy that remain consistent over time rather than based on seasonal or cyclical trends. Our themes include Water, Safety and AI & Robotics.

Take Safety, for example. During hurricane season in the US, a severe storm can knock out the power supply for days and put large numbers of people in extreme danger. One of the adverse impacts of climate change is the intensification of hurricanes in the North Atlantic – and the devastation that these severe weather events can inflict is only likely to increase in the future.

Climate change holds many safety implications. In the summer of 2018, farmers across northern and central Europe – from the Netherlands to Belarus – faced crop failure and bankruptcy following the most intense heatwave and drought for many years. In the US, while climate change is extending the now familiar drought situation in California, decades of poor forest and land management have rendered the state a tinderbox. More and more Californians are living in remote, fire-prone areas of the state, doing too little to make their houses and communities resilient in the face of fire danger.

With human lives at stake, demand is finally increasing for the technologies and services that can help people to find secure locations when their lives are threatened and to keep basic services operational ‘when the lights go out’.

A sense of purpose

From an investment perspective, exposure to themes such as Safety is one thing. Yet, rather than just passively investing in a thematic index, we seek out the businesses that will be at the forefront of these long-term themes. We identify the companies best positioned to benefit from the ‘primary forces’ which are believed to be the root causes of global disruption – namely demographics, innovation, globalisation and scarcity.

We’ve found that our clients respond well to our approach – not only understanding what it is they are investing in, but also gaining a sense of purpose through their investments. When clients invest in Safety, for example, they are investing in companies that participate in the provision of back-up solar-power generation and location-based services – technology that has the potential to save lives. So, it is not only a financial investment; it is something that also contributes to the greater good of society.

This is just one reason why Thematics Asset Management is a signatory of the UN Principles for Responsible Investment, one of the world’s leading initiatives promoting responsible investments.

Over the following pages, we explore the innovations needed when safeguarding human lives during event-driven disasters and highlight some of the companies that we believe are leading the way in developing services and technologies that are providing an effective response.



RESPONDING TO EVENT-DRIVEN DISASTERS, FROM MAN-MADE EVENTS TO CLIMATE CHANGE

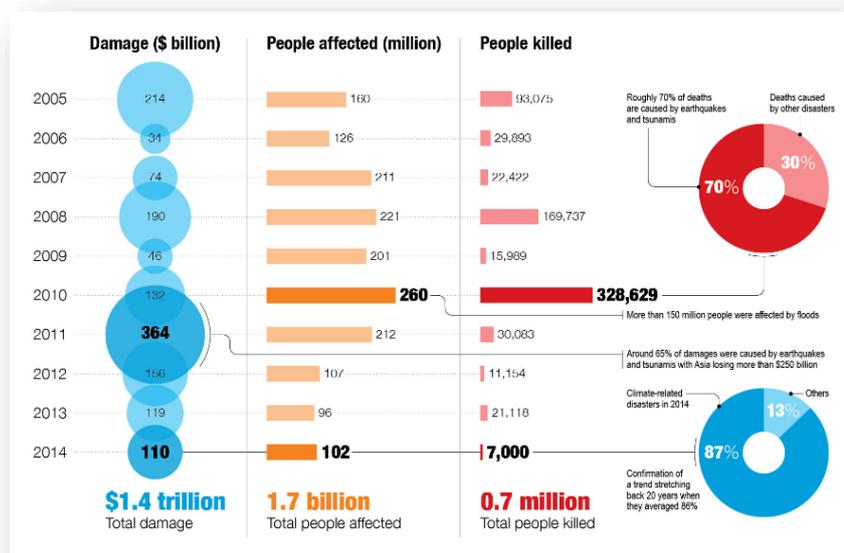
Safety is a primary human need. In psychology and motivational theory, safety is a basic need in Maslow's hierarchy of needs. This includes factors such as security, law and order, protection from elements and freedom from fear.

The concept of ‘human security’ was articulated in the United Nations Development Programme (UNDP) 1994 Human Development Report. Thereafter, it became part of the discourse of international politics, culminating in the creation of the Commission on Human Security in 2001.

Human security debates and policies have tended to focus more on human-made disasters, such as armed conflicts and human rights abuses. Yet the threats that people struggle with following a natural disaster are similar: for example, we experience ‘fear’ during earthquake aftershocks, along with the potential for deteriorating social order. We also experience ‘want’ for the provision of basic services when we lack food, water and shelter.

Natural disasters kill around 90,000 people annually and affect close to 160 million people worldwide¹. Furthermore, they strike all over the world: the Indian Ocean tsunami in 2004, Hurricane Katrina in the US in 2005, the Australian bushfires in 2009, the 2010 Haiti earthquake and the 2010 Pakistan floods. More than 700,000 people died as a result of disasters between the years 2005 and 2014².

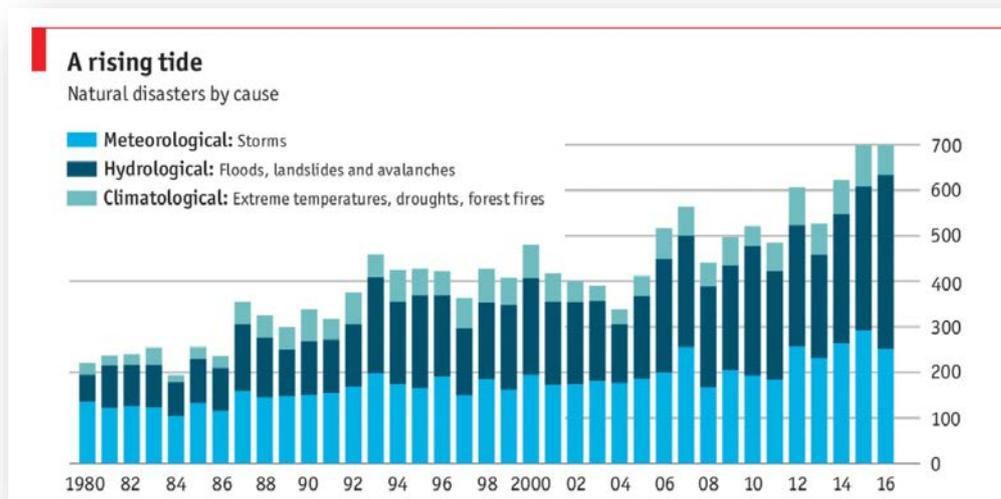
The impacts of natural disasters on people and society in affected areas are immediate and overwhelming. In 2017, the American Red Cross delivered more relief support than it had in the previous four years combined, responding to 242 significant disasters in the US alone².



▲ ABOVE: The impact of natural disasters on humans (Source: WHO)

¹ https://www.who.int/environmental_health_emergencies/natural_events/en/

² <https://www.weforum.org/agenda/2018/01/4-ways-technology-can-play-a-critical-role-in-disaster-response/>



▲ **ABOVE:** Natural disasters by type/cause (Source: Munich Re)

Of course, man-made disasters can inflict similar havoc and confusion. Since terrorists brought down New York’s twin towers on 11 September 2001, there have been significant amounts of time, money and resources invested in finding better ways of communicating with people to keep them safe when major incidents occur.

Whether it’s at the country, federal, state or municipal level, people need to be alerted when something serious is happening around them. They need to know when it’s time to seek cover or move to another location – whatever they have to do to keep safe. After all, the whole purpose of human safety is to protect people.

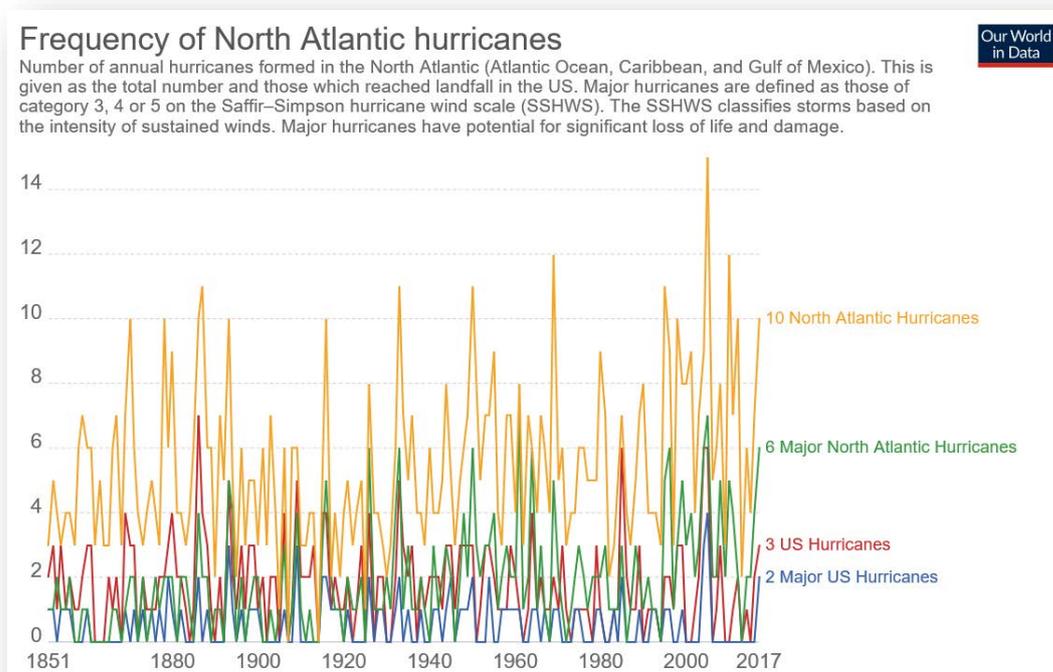
Open communication is vital. When a natural disaster strikes, first responders must be ready to deploy anywhere on earth, at a moment’s notice. For them and other public safety personnel, every second counts, and reliable connectivity is imperative to maintain seamless communication services.

The positive way to think about all of the above is to consider that, with every occurrence of a natural or man-made disaster, we get the opportunity to test our responsiveness and the applicability of our communications technology. These incidents fuel innovation in human safety and security, driving the need to find new ways to keep people safe – before, during and after the event.

THE IMPACT OF CLIMATE CHANGE AS MANIFESTED THROUGH HURRICANE INTENSIFICATION

Adaptation to climate change is one of the long-term structural shifts that we see taking place today, and that we'll increasingly need to face tomorrow. It permeates the theme of human safety and securing human lives during a natural disaster.

For instance, consider the fact that while 2017 was the hottest year for the Earth's oceans, in 2018 oceans trended even hotter: April-June ocean heat content was the highest on record³. Indeed, there's compelling evidence to show that the devastation wrought by Hurricane Florence on the east coast of the US in 2018 was made all the worse because of climate change. It had created a warmer and moister environment that paved the way for heavy rainfall and flash flooding⁴. It was the wettest tropical system ever to strike the US eastern seaboard⁵.



▲ ABOVE: Hurricane frequency, 1851-2017 (Source: Our World in Data, Hurricane Database)

From an investment perspective, there are obviously economic consequences of not directing funds towards climate change mitigating options. A key question to ask is what does climate change mean for property in hurricane risk areas – both from the perspective of insurance companies and for production facilities affected by floods and droughts?

³ <https://edition.cnn.com/2018/09/19/us/climate-change-hurricane-florence-wxc/index.html>

⁴ Kevin Trenberth, a senior scientist at the National Center for Atmospheric Research <https://edition.cnn.com/2018/09/19/us/climate-change-hurricane-florence-wxc/index.html>

⁵ https://www.cnn.com/us/live-news/florence-flooding-north-carolina/h_6eb5ac354605218f1e3f648f7d197684

Florence tracked an unusual path for a hurricane so early in the season. It was outside of the climatological norm to have a storm of this type of intensity at this particular latitude – yet it is consistent with some studies that show storms are intensifying further towards the pole⁶.

The economic consequences for insurers, real estate and local businesses located in the affected regions are enormous. As financial returns are a direct consequence of the performance of the underlying companies and projects, climate change cannot be ignored when analysing financial assets, with potential underperformance for those who underestimate the related risks.

Moreover, the 2017 Atlantic hurricane season was the costliest on record – there was a total of at least \$282 billion in damages, the majority of which was caused by the devastating storms of Harvey, Irma and Maria⁷. These storms displaced hundreds of thousands of people, brought down key public infrastructure and created resource shortages.

It's the potential cost in terms of human loss of life that we are particularly concerned with here. With hurricanes set to intensify in the years to come, questions are raised about what can be done to keep people safe and potentially save lives.

Over the next few pages, we'll look at two cases studies of companies that are innovating in this area. One is a leading global supplier of backup power systems and battery storage; the other leads the way in mass notification and critical event management.

Interestingly, both companies are already moving beyond the seasonal demand of hurricanes and have begun to innovate in other areas that can capture secular growth too.

⁶ <https://www.theverge.com/2018/9/10/17844258/hurricane-florence-atlantic-storm-category-four-intensity-unusual>

⁷ <https://www.nationalgeographic.com/news/2017/11/2017-hurricane-season-most-expensive-us-history-spd/>

CASE STUDY, EVERBRIDGE: RESPONDING TO NATURAL DISASTERS AND OTHER CRITICAL EVENTS

Everbridge is a provider of critical event management software to governments, corporate clients and the healthcare industry. Among other things, its software-as-a service (SaaS), cloud-based products allow customers to send two-way messages to employees during crises, monitor physical assets that may be impacted by weather or plan for supply chain disruption to preserve business continuity.

The business was founded in 2002, essentially to improve critical communication during incidents like 9/11, hurricanes and other public safety events. Existing mechanisms for mass notification simply weren't good enough and there was a critical need for improvements when major incidents struck, man-made or otherwise.

The ability for companies to communicate, manage and respond to critical events has come a long way in a few short years. Everbridge has led the evolution, taking the core foundation in mass notification technologies and broadening out with a complete suite of tools that organisations can use during the most important, pressure-filled situation.

Location-based data

The purpose of the Everbridge solution is to protect people and save lives. A critical event will trigger the solution to automatically send out pre-configured messages to pre-defined modes of delivery based on dynamic, last-known location data. It is able to track this data based on known home or office locations, Wi-Fi access points, badge activation and a number of other means.

For example, if there is a so-called 'active shooter' in a school, the Everbridge solution could enable the safety professional in charge to send specific instructions to students and teachers in the building. At the same time, they could send a different set of instructions to those in the surrounding area, and different instructions again to those at home, with confirmation of message delivery and two-way communication capability. The solution can also alert the local authorities to enable timely action.

Short-form messaging

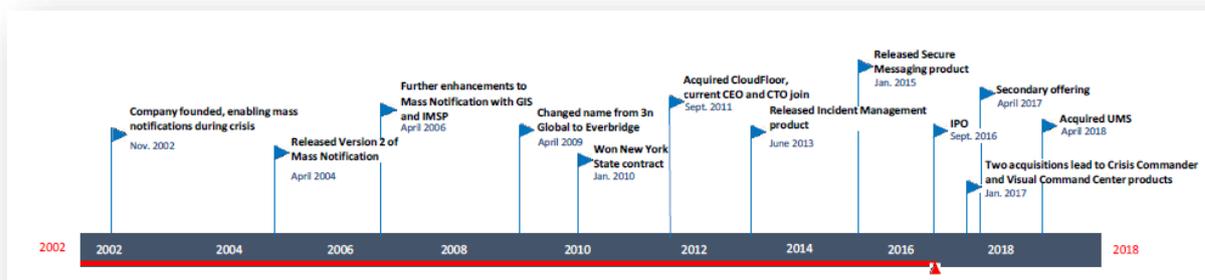
Customers of the Everbridge solution can send messages to millions of recipients across different modalities such as voice, SMS and email. The company delivered two billion communications in 2017 alone. And it's the company's technology that makes the Everbridge solution unique.

First, it can target its audience precisely, so it can identify which country a recipient is located via their SIM card and send them a message in their native language. Second, it uses short-form message notification, which is more efficient than some other technologies.

It's one of the reasons why it managed to secure an agreement with multiple global telecoms companies, which says that, in the event of other carriers shutting down, Everbridge's solution would be one of the last that can exchange messages through 4G or 5G.

Expanding its horizons

Everbridge became a public company on 16 September 2016. It was founded on its mass notification solution but has expanded its offering to include critical event management, which provides a platform that integrates all aspects of crisis assessment, management and response.



▲ **ABOVE:** Everbridge: a company timeline (Source: company data, Baird)

The company has also completed a number of acquisitions to add to key technologies and expand geographically. For instance, it brought IDV Solutions into the fold in January 2017. Its visual command centre product helps to visualise external threats and their potential impact on a customer’s people and assets.

Meanwhile, in April 2018 it acquired Unified Messaging Systems (UMS), a Norway-based provider of countrywide mobile alerting. This leader in critical communications provision in Europe has the unique ability to message the mobile phones of anyone connected to a carrier’s mobile phone towers.

FLORIDA'S STATEWIDE HURRICANE PREPAREDNESS SYSTEM IN ACTION

Since 2016, Everbridge has supported communities and businesses across Florida as hurricanes Hermine, Matthew, Irma and Michael made landfall. During Hurricane Irma, for example, the Everbridge system was used to share safety information, weather updates, sheltering instructions and evacuation directions throughout the course of the storm, with over 20 million messages sent to residents⁸.

It also provides an integration for the Florida Special Needs Registry. Counties can leverage this integration to help citizens with special needs sign up for assistance with transportation and shelter during emergencies.

“The State of Florida is a model example of a state government’s proactive coordination and readiness when mass mobilization or evacuation is required,” said Imad Mouline, CTO of Everbridge. “Reliability and scalability of critical communications are essential during such events, both for individuals at risk and for businesses and organisations to address disruptions to their daily operations.”

For example, on 10 October 2018, Hurricane Michael made landfall on Florida’s Gulf coast. It was a Category Five storm, causing 59 deaths and \$25 billion in damage⁹. While there’s only so much that can be done to protect buildings and infrastructure, embracing new technology and safety will certainly have an impact on limiting the loss of life.



▲ **ABOVE:** Hurricane Michael, October 2018 (Source: Everbridge)

Scott Warner, who works with Bay County Emergency Services, said: “Hurricane Michael devastated the Mexico Beach area. Communications were down everywhere and we had to find alternative ways to get messages out to people. We needed to tell them where the pod sites were, where people who were moving around could find shelter and just get the food and water information out to the public.”

⁸<https://www.everbridge.com/newsroom/article/state-of-florida-expands-everbridge-relationship-for-coordinated-statewide-hurricane-preparedness/>

⁹https://www.bbc.co.uk/news/world-us-canada-47991658?intlink_from_url=https://www.bbc.co.uk/news/topics/cn7pgq7159jt/hurricane-michael&link_location=live-reporting-story

There can be a variety of related hazards with a hurricane, from tsunamis to fires to inland flooding – those are just the natural ones – and many areas might not have access to the internet or network TV and radio stations. However, it's essential that, when disaster strikes and it's time to evacuate, everybody knows what to do.

Kimberly Prosser, Director of Emergency Management for Brevard County, commented: "It's very important that those residents who have special needs are considered when there is an emergency. If there's an evacuation, they need special assistance to be taken to shelters that are prepared for them. We were actually the first county in the state to pioneer the use of Everbridge as our special needs registry."

In July 2019, the Florida Division of Emergency Management (FDEM) signed a five-year extension of its state-wide mass notification platform, AlertFlorida, to bolster Florida's ongoing hurricane preparedness efforts. Managed by FDEM and operated by Everbridge, AlertFlorida distributes critical information to residents, businesses and visitors across the state. It is deployed in 64 of Florida's 67 counties, at no cost to individual jurisdictions.

OPPORTUNITIES IN CRITICAL EVENT MANAGEMENT SOLUTIONS

The Everbridge platform also extends to higher education. For example, all of Florida’s public colleges and universities are now eligible to leverage the AlertFlorida contract to keep their students safe and campuses running smoothly.

Florida is one of several states to have entered into a statewide contract with Everbridge. New York, Connecticut, and Vermont have also rolled out Everbridge Mass Notification to their entire populations. In addition, its public warning product supports countrywide deployments in Australia, Sweden, the Netherlands, the Bahamas, Singapore, Greece, and several states across India.

Public safety challenge

Everbridge’s deployment of Iceland’s national alerting system went live in September 2019 – ahead of the EU’s June 2022 deadline for all European countries to have a population-wide alerting system.

Sometimes known as ‘the land of ice and fire’, Iceland is a place of natural hazards as well as natural beauty. It has more than 30 volcanic systems, many of them active, and is at risk from both volcanic eruptions and tsunamis.



▲ **ABOVE:** Iceland’s (L) ‘Northern lights’ and (R) Eyjafjallajökull volcano eruption (Source: Everbridge)

In 2010, when the Eyjafjallajökull ice cap erupted and sent ash clouds all over northern and western Europe, 500 people on the island had to be evacuated overnight. More recently, falling glaciers have caused mini tsunamis in a lagoon in the southeast of the country and in the Vatnajökull National Park, where the Bárðarbunga volcano erupted in 2014.

Developing its advanced warning systems in line with developments in mobile communications and digital technologies, the Icelandic government introduced Everbridge’s location-based SMS alerting system in 2019. The granularity of location-based SMS means the Icelandic authorities are able to reach the right people at the right time – and to plan disaster relief and recovery efforts more efficiently and effectively.

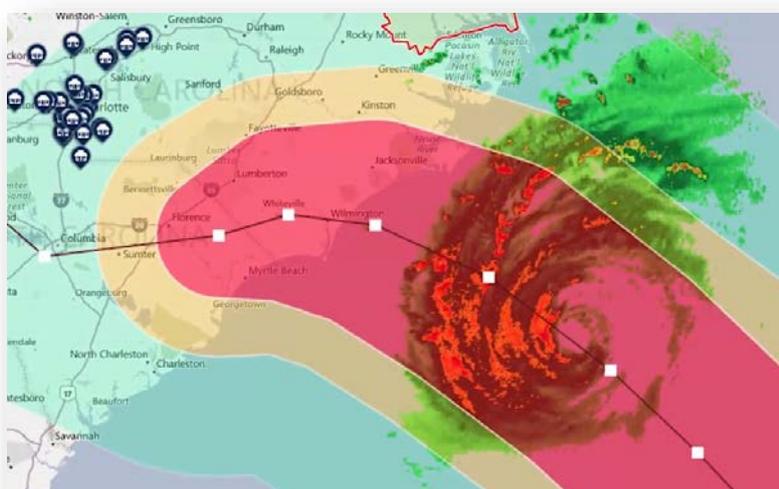
Iceland’s recent initiative puts it ahead of European regulation. Article 110 of the European Electronic Communication Code (EECC), the 2018 EU Directive, requires all member states and countries in the European Economic Area (EEA) to introduce systems for transmitting public warnings via mobile technology by 2022.

THE INVESTMENT PROPOSITION

There's plenty to glean from Everbridge's success in Iceland. Just consider the use cases for location-based public alerting systems. While many EU countries do not have volcanoes, earthquakes or severe flooding, there will be several that will experience regional wildfires or are at risk from local man-made threats such as a hazardous material release.

Location-based SMS can provide sophisticated and rapid solutions for governments to contact everyone at risk within minutes of an emergency. In Iceland, this is often required on a national basis, but it can also be used for a specific location. Moreover, public warning systems need to be able to reach everyone – not just citizens, but visitors from overseas too.

In these situations, sending out a one-way message isn't enough. A public warning system should be capable of receiving responses from people at a specific location to assist with the recovery effort and to provide vital information to the search and rescue services.



▲ **ABOVE:** Location-based SMS tracks communities before a hurricane makes landfall (Source: Everbridge)

In terms of the company's strategy, turnover and future prospects, Everbridge is looking at accelerating revenue growth – the result of a combination of organic development and strategic acquisitions – and an expanding addressable market worth over \$40 billion in 2020¹⁰.

Most companies are managing critical events with a range of technologies, many of which are developed in-house, but Everbridge is establishing itself as a clear leader in the critical event management space. It benefits from a growing awareness of the need to have a complete system to manage critical events.

Meanwhile, the EU has legislated that over the next few years every country should implement a mass notification system, which represents a \$100 million plus market opportunity¹⁰. At the time of writing, Everbridge is the only company to have already successfully deployed a countrywide implementation in the region, putting it in a strong position to capture more of this opportunity.

¹⁰ JP Morgan North America Equity Research, 06 February 2019. www.jpmorganmarkets.com

CASE STUDY, GENERAC: MANAGING THE SUPPLY OF POWER RESPONSIBLY DURING A CRISIS

Generac is a manufacturer of automatic, stationary standby and portable backup power generators. Its generators are used in residential, commercial, industrial and telecommunications markets.

The company has been around since 1959, pioneering the first affordable back-up generator. However, since becoming a public company following its IPO in 2010, the product range has since expanded into people's homes, businesses and in mobile applications across the globe. It offers single engine back-up and prime power systems up to two megawatts (MW) and paralleled solutions up to 100 MW, using a variety of fuel sources to support the power needs of its customers.

Its use cases have traditionally been associated with hurricanes, severe weather and public safety power shutoffs (PSPS), which can cause long-term, widespread power outages. And although they tend to be seasonal in nature, the menace of Hurricane Dorian in September 2019 serves as a reminder of the potential hazards for human safety and the subsequent need for protection.

Lights go out

According to the National Hurricane Center, the most active part of the hurricane season is from mid-August to mid-October. Between the PSPS program in the western US to combat wildfires and severe weather across the Midwest, it's no surprise power outages are peaking nationally in September and October.

Outages during these months are also often the longest and most widespread as they're frequently caused by hurricane damage and other severe weather. In 2018, Generac recorded 633.7 million power outage hours across the US.

"The country's aging utility grid is vulnerable in extreme weather, and Mother Nature hit all corners of the United States last year, causing outages across the country," said Russ Minick, chief marketing officer for Generac. "When the power goes out, life becomes significantly more difficult. Homeowners need to stop and take a minute to determine what they need to prepare for the next power outage, regardless of how it is caused."

Where homes are prone to extended utility outages due to severe weather, or an aging grid, a home standby generator can be a safe play, as it can sense utility failure and turn on automatically. And because it is powered by natural gas or propane, it's the safest and most convenient solution for long-term backup power.

Trouble in Paradise

In October 2019, nearly two million Californians were hurt by a planned PSPS by Pacific Gas and Electric (PG&E), a private utility company. Customers received just 24 hours' notice for a shutoff that lasted up to four days, during which grocery stores sat empty, cleared of basic supplies, and schools were closed¹¹.

¹¹ <https://www.thenation.com/article/california-wildfire-power/>

The residents of Paradise, California, displaced the previous year by massive fires that destroyed their town and killed dozens, found themselves without electricity once again. Thirty thousand of those affected had medical needs that required access to electricity, putting them in harm's way.



▲ **ABOVE:** People watch from a safe distance as a California fire burns (Source: Generac)

Indeed, PG&E was also blamed for the deadly California fires in 2017¹². Subsequent lawsuits led the publicly traded company to declare bankruptcy in 2019 (a process that, at the time of writing, is still ongoing). It is the sole provider of gas and electricity for much of Northern California, so the vast majority of consumers in the region do not have an alternative source of power.

California was never much of an addressable market for Generac because of the absence of major power outage events. But all that changed with PG&E's bankruptcy and the deadly fires in 2018. Essentially, utilities like PG&E have threatened to turn the power off on as many as 5.5 million households, whenever winds exceed 25mph and the weather is hot and dry¹³.

Given the intense public focus on the potential for widespread and more frequent power outages, Generac has investing in marketing to the region, including a California-focused infomercial, billboards and targeted digital and mail campaigns. It is rapidly gaining strong brand recognition and believes California could add over \$100 million to its revenues by 2023¹³.

Cleaner, greener future

Although Generac has traditionally been in the 'not-so-green' generator business category, it has been moving quickly in the opposite direction in recent years. A large majority of Generac's generators are diesel or gasoline powered, making them heavy CO2 emitters.

However, new renewable generators are a rapidly emerging business unit at Generac. Renewable generators and battery storage technology not only allows for cleaner, greener products, but also reduces the reliance on diesel and gasoline.

¹² <https://www.bbc.co.uk/news/world-us-canada-49982236>

¹³ Bank of America Merrill Lynch Equity Research, 05 September 2019

In March 2019, Generac acquired a Vancouver-based start-up company called Neurio, which has developed a proprietary home energy monitoring system. Neurio is the leading energy data company focused on metering technology and sophisticated analytics to optimise energy usage.

Six weeks later, Generac acquired Pika Energy of Portland, Maine, which was founded by a group of MIT engineers. Pika is a leading manufacturer of smart storage solutions and smart batteries, and has a deep knowledge of power electronics. While Pika had strong technology, it did not have a well-developed global supply chain, which is one of the main things that Generac had to offer as an acquirer – as well as an established brand, distribution and strong financial resources.

Then, in September 2019, Generac launched a new battery offering, PWRcell, which is a fully-integrated solar energy storage system. The cell boasts exclusive technologies including expandable battery capacity and on-board power monitoring and management as standard.

It consists of an integrated ecosystem of components, including an expandable battery pack, inverter and advanced sensors assembled in Vietnam. Each component is specifically engineered to seamlessly install and work together. The batteries are 8.6 kWh and the system can expand up to 17.1 kWh¹⁴.

PWRcell is equipped with Generac PWRview technology, an easy-to-use home energy monitoring system that tracks home energy use and provides powerful insights into the home's electricity consumption. With the intuitive PWRview app, data is processed into useful information that allows homeowners to make smarter decisions regarding their use of energy, lowering usage to extend the amount of time the home can run on PWRcell-provided energy

All of which means that Generac now has 150 employees dedicated to breaking into the solar-plus-storage market.

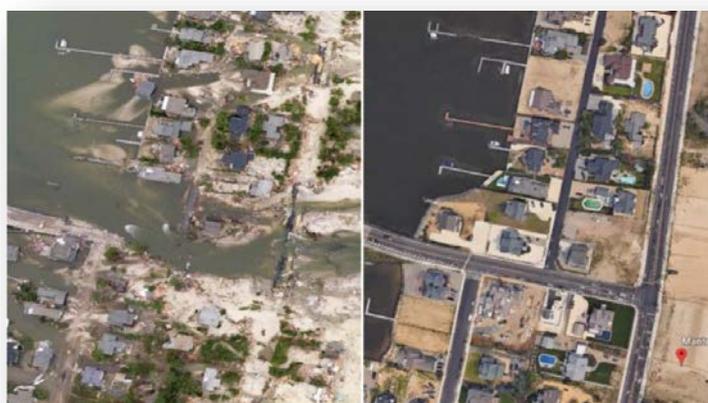
¹⁴ <https://www.solarpowerworldonline.com/2019/09/battery-and-energy-storage-highlights-at-spi-2019/>

REBUILDING RESILIENCE AFTER THE STORM

Superstorm Sandy was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season. According to the National Hurricane Center, it was directly responsible for at least 147 deaths in the north-east of the US, Canada and the Caribbean.

Sandy made landfall on 29 October 2012 and left a trail of destruction in its wake. The storm flooded numerous roads and tunnels, blocked transportation corridors and deposited extensive debris along the way. Tidal surges over 12 foot above normal created catastrophic damage. Around 60,000 residents of New York City public housing were affected by the storm¹⁵.

Some people were without electricity for three weeks or more, meaning they lost access to elevators, heat, hot water and ultimately peace of mind. Joy Sinderbrand, vice president of the Recovery to Resiliency program at the New York City Housing Authority (NYCHA), said: “Following that we did work on an emergency basis. Over 90%, or over 300 developments, had some kind of damage. The efforts to get these buildings back online were done with as much urgency as possible.”



▲ **ABOVE:** Satellite image of Mantoloking, New Jersey (L) after Sandy hit and (R) in 2017 (Source: Google Earth)

To help the relief efforts, NYCHA sought funding from the Federal Emergency Management Agency (FEMA) for permanent repairs and infrastructure upgrades that would help ensure the safety of New York City residents. The grant was to help make a variety of repairs and infrastructure improvements to NYCHA’s public housing facilities to mitigate the many issues a natural disaster like this could bring.

It included the installation of more than 300 Generac Industrial Power natural-gas-fuelled emergency power generators at 33 public housing complexes throughout the city¹⁵. “Having natural gas generators really went hand in hand with our experience after Superstorm Sandy,” said Sinderbrand. “Natural gas turned out to be the best resilient energy source. In addition, it aligned with the agency’s mission to reduce oil dependency and the pollution that comes with oil use.”

Sinderbrand added that the continuous fuel supply available through underground piping was specified to not only reduce refuelling costs, but also ensure each site’s fuelling infrastructure would not be compromised by future flooding events.

¹⁵ <https://www.generac.com/Industrial/professional-resources/information-resources/case-studies>

Power of partnerships

A project of this size requires key partnerships. NYCHA teamed up with Navillus Contracting, Lakhani & Jordan Engineers, Kanta Electric and Generac Industrial Dealer Central (IDC) Huntington Power Equipment. Huntington Power won NYCHA's bid to procure backup generators with its proposal of 327 Generac Industrial Power natural-gas-fuelled generators for the application, citing how easy it is to work with compared to diesel fuel and referencing its environmental friendliness.

"Diesel fuel requires constant maintenance to be considered a reliable fuel source, and refuelling during an extended outage can be challenging," said Keenan Nolan, a sales engineer at Huntington Power. "During Superstorm Sandy, New York City experienced power outages for as long as 15 days. Natural gas generator owners ran with no issues while diesel clients quickly ran out of fuel, or the fuel was unreliable and they shut down and had no power."

To further ensure that NYCHA's diverse needs and the complexities of each application site were met, contractors involved in the project laid out plans for a number of applications featuring single-generator as well as paralleled generator solutions. Generac's Modular Power Systems (MPS) eliminated the need for third-party switchgear previously required by traditional paralleling systems.

These MPS solutions were selected to manage the noteworthy task of meeting natural gas fuel pressure requirements at seven inches of water, while bringing as much as 1000 kW online in less than 10 seconds during a power outage¹⁵. Once the requirements of each site were identified, contractors and Generac Industrial Power staff worked to produce specialised solutions incorporating a variety of unique features.

These included vibration isolators, multiple breakers and US Environmental Protection Agency (EPA)-certified engines to support non-emergency operation capabilities, should local demand response programs be initiated. Demand response provides NYCHA with a by-product revenue stream.

"The utilities pay NYCHA when there is a need for buildings to come off the grid," said Sinderbrand. "That money will fund the maintenance of these generators and will allow NYCHA to continue with the safety program."

Putting safety first

The first generator installations took place in August 2017 at the Ocean Bay Apartments in Far Rockaway, New York. This particular site employs seven individual natural gas gen-sets ranging from 200 to 350 kW – NYCHA said all 33 developments should be completed by 2022¹⁵.

Thanks to FEMA's funding and the collaborative efforts of NYCHA, Generac Industrial Power and Huntington Power Equipment, these flexible and innovative solutions are helping NYCHA not only replace its pre-existing infrastructure, but also increase New York City's resiliency one apartment complex at a time.

"This is about really having the infrastructure in place so that our residents know that if there is an emergency, a natural disaster, that they will be safe," said Sinderbrand. "They will be safe to come back to their homes and they will have access to their homes, and that is something we can't put a price on."

OPPORTUNITIES IN BACK-UP POWER AND STORAGE

Generac's backup power solutions help to mitigate a variety of issues that a natural disaster can bring. And its customisable products have extended into a broad range of sectors, from agriculture and telecoms to education and healthcare.

When hospitals are not functioning due to an outage, for instance, they place the lives of patients, staff and visitors at risk. Just ask the hospital patients in Venezuela, following a five-day nationwide blackout in March 2019 that plunged doctors into darkness¹⁶. Half the country's hospitals have no back-up generators: new-borns could no longer be kept safe in incubators (many reportedly died), 95% of dialysis machines ceased operating and patients with needs as diverse as oxygen and insulin faced life-threatening interruptions to their treatment¹⁷.

On life support

In 2004, the Community Hospital of Watervliet, in the US state of Michigan, installed a Generac generator system to provide enough electricity to power the entire hospital in the event that utility power would become unavailable. As one of the primary hospitals in the area, it needs to be able to offer emergency health care around the clock, 365 days a year. It was imperative that emergency and life safety systems remained fully operational in the event that utility power was lost.

Generac's Gemini twin-pack generator provided the solution. Alone, either generator can carry the most crucial aspects of Community Hospital's load, meeting all National Fire Protection Association (NFPA) requirements.

However, with two units, it provides redundancy. So, if one unit is undergoing maintenance, the second gen-set will provide coverage of the load up to 375 kW, which is sufficient for all of the hospital's critical load, as well as most of its operations¹⁵. Also, with each generator having its own paralleling switchgear on the generator frame, a separate room for conventional paralleling switchgear isn't required, saving the hospital important space and money.

Fast-forward 15 years and – in 2019 – the generators are still providing the peace of mind they were when they were first installed. “On average, we see about two outages a year,” said Kenny Ashley, Facilities Supervisor of Lakeland Hospital Watervliet. “We have had great performances from the generators when they have kicked in. It is a very smooth process for the most part.”

¹⁶ <https://www.bbc.com/future/article/20191023-what-would-happen-in-an-apocalyptic-blackout>

¹⁷ <https://www.crisisgroup.org/latin-america-caribbean/andes/venezuela/darkest-hours-power-outages-raise-temperature-venezuela>

THE INVESTMENT PROPOSITION

As highlighted previously, the Generac story extends well beyond the Atlantic hurricane season. Approximately 70% of power outage events are weather driven, but not all of them are hurricane-driven. This is a key reason why Generac has been able to sustain double-digit growth in its home standby business – despite the fact that the last major power outages resulting from hurricanes were in the summer of 2017¹³.

Since then, the incidence of non-hurricane driven power outages has been well above trend. This is likely due to the ageing US power grid – one of the key secular growth drivers for the company. From an ESG investing perspective, too, the company can have a positive impact on the quality of life of households, while offering energy resiliency for hospitals, schools and other institutions that can be subject to power outages.

In terms of critical telecoms generators, Generac has half of the market for telecom generators and it has seen strong growth in this area over the past 18 months¹³. The rollout of 5G will require hardening of networks to facilitate critical technologies including autonomous vehicles and drone delivery, and the company's management sees the potential for increased market share and revenue generation – not just in the US, where it is the primary supplier to all Tier 1 carriers, but also internationally.

And in terms of back-up solar storage, California is mandating that all newly constructed homes have solar power by 2020¹³. Generac sees a potential annual doubling of the backup solar storage market from 2017-23 as the solar storage market catches up with the installed base, which overwhelmingly resides in California. Given its distribution network, Generac has some inherent advantages in the solar storage market, while many of the traditional solar distributors are also expressing interest in the home standby category. The clean energy investments in both Pika Energy and Neurio in 2019 aim to capitalise on this opportunity.

Multiple growth catalysts

Innovation is a key long-term driver for Generac, particularly around 5G, clean energy and energy storage. Incremental growth opportunities beyond the more seasonal storm demand could result in a revenue growth above 5% for the next three years¹³. And there are a series of catalysts that can propel the company's growth and stock value over the next 18 months, which include:

1. **The California Home Standby opportunity:** There is lower market penetration in this area, with backup power representing just 2% of the installed base, while demand continues from PSPS to prevent wildfire damage, as well as outages resulting from a poor energy grid.
2. **Power management strategy:** There are new product rollouts in energy storage solutions and connectivity in 2019 and 2020, with plans to scale the offering to 2022 as the company breaks into the energy storage and solar power management sectors.
3. **Market penetration gain and replacement cycle tailwinds:** There is continued commercial backup power penetration with a strong dealer network, targeted national marketing and data analytics capability.
4. **Telecom infrastructure investment:** 5G is expected to create several new markets that will require very high levels of reliability, such autonomous drones, cars and robots, which is driving the increased need for backup power at telecoms tower sites.

INVESTING IN TOMORROW'S WORLD, TODAY

The world, sadly, isn't getting any safer. Every day around the world, people are potentially at risk from terrorism, natural or man-made disasters and severe weather events, some of which occur as a result of climate change.

As we've seen in this paper, the rise of mass notification and localisation technology is helping us to respond more effectively to the increasing threats posed by intensifying hurricanes and other major critical events. Meanwhile, portable energy generation and smart supply management can be a lifeline when the grid fails and the lights go out.

Both case studies in this paper highlight companies that are creating innovative responses to some of the threats posed to human beings. And they are but two examples. Many more opportunities exist across an investable universe in safety that we estimate is worth upwards of \$600 billion, with a combined market cap of more than \$4.5 trillion that is growing at a rate of 11% annually¹⁸. Ultimately, securing the future means investing in the future, today.

Over the past decade, rapidly advancing technological change has become vitally important. Many of the technologically enabled safety features are practically invisible to us, yet they secure our everyday activities – from travel to online shopping, energy production to social networking. There are intangible resources that underpin the framework of our human safety found in almost every aspect of our world today.

That is why safety is a top priority for individuals, CEOs, heads of financial institutions and government leaders. And it will continue to be driven through urbanisation, increasing regulatory oversight, innovation and globalisation, because risks today don't respect borders and can appear anywhere in the world in real-time.

Safety is everywhere, all of the time.



Frédéric Dupraz

Frédéric is Co-Manager of the Thematics Safety Fund and is a founder and owner of Thematics Asset Management. Prior to this, he was the co-manager of Pictet Security, a long-only global thematic equities strategy.



Matthieu Rolin

Matthieu joined the Thematics Safety Fund as Senior Portfolio Manager in August 2019. He has 15 years of investment experience, most recently at Aviva Investors where he was responsible for a global thematic fund.

¹⁸ Thematics Asset Management, 31 July 2019 (Safety universe average sales 10-year CAGR).

Additional Notes

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