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WHITE PAPER

Surviving Hurricanes 2019
A Guide for Businesses

INTRODUCTION

In this document, Generac provides preparation information for the upcoming hurricane season and power outages that will accompany the storms. Hurricanes and tropical storms accounted for the most severe outages in 2017 and 2018, many of those outages lasting for several days.

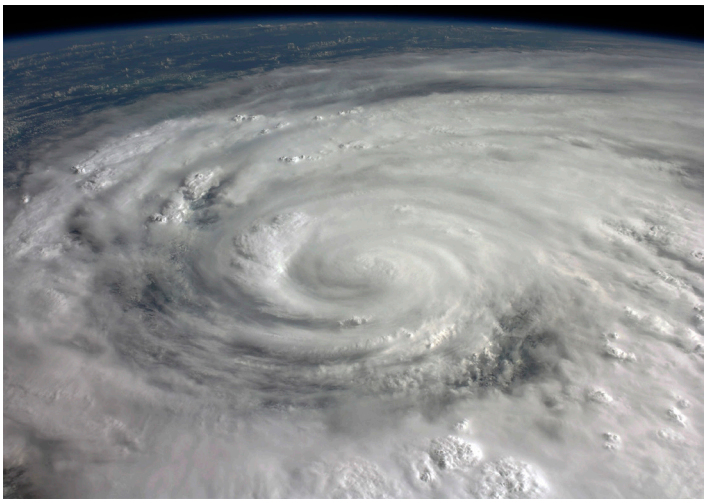
- Hurricane Harvey cut power from more than 1.67 million customers[1] and power restoration wasn't completed in the hardest hit areas near Houston until September 8, which left many without power for 14 days.
- In 2017 Hurricane Maria alone topped the largest outages in US history with 1248 million[2] customers without power, and many still off the grid in 2019.
- Hurricane Irma knocked out power to 6.7 million utility customers in Florida alone, 64 percent of the state, according to the Florida Division of Emergency Management[3]. One hundred thousand of those customers were still without power nine days later.
- Hurricane Florence took out power for 976,000[4] in the Carolinas and Virginia, with the flooding closing as many as 1,600 roads, including all roads in and out of Wilmington, North Carolina for several days[5].

When the power goes out, life becomes significantly more difficult, regardless if it is during a severe thunderstorm or a hurricane. Backup generators give a layer of safety and security not found in the dark.

As backup power experts, Generac aims to provide peace of mind when power is out or unreliable. The aging power infrastructure and growing intensity of severe weather, including hurricanes, can make for uncertainty. Generac works to information needed to help prepare for when the power goes out.

Information in This Document Came From:

- Generac product experts and their experiences with the products talked about and experiences in hurricane weather;
- Government organizations including FEMA, National Oceanic and Atmospheric Association, National Hurricane Center, Ready.gov, Center for Disease Control (CDC) and US Energy Information Administration, Energy.gov
- Education organizations such as Colorado State University.



2019 HURRICANE PREDICTIONS

High-Activity Era

NOAA has determined the Atlantic remains in a period of increased hurricane activity. Every 25-40 years, a "high-activity era" produces "more, stronger and longer-lived storms," dating back to the 1800s (and likely earlier, however tracking or recording abilities were not reliable before then). It is part of a natural, cyclical pattern; a period of decreased activity usually follows, often lasting a similar amount of time.

The current high-activity era began in 1995, according to NOAA. During this time, the number of major hurricanes produced in the Atlantic nearly doubled since the last low-activity period (1971-1994). There has been an average of two hurricane landfalls in the Atlantic per season during this time.

NOAA experts watch several global climate patterns that drive the development and strength of hurricanes during a high-activity period, including Atlantic Multi-decadal Oscillation (AMO) and El Niño/Southern Oscillation (ENSO) influences.

2019 Hurricane Predictions

Even though it is a high-activity era, each year can be different in how much activity is seen. Every year, predictions for the upcoming hurricane season are released between April and June, before the hurricane season officially begins June 1. These predictions consider many things:

- El Niño/La Niña
- Sea surface temperatures
- Wind shear

These factors help determine if it will be a busy hurricane season or a calm one. However, these remain predictions. No matter the prediction, it is important to prepare as if a hurricane will affect your area.

In April, Colorado State University's Department of Atmospheric Science said it may be a quieter than normal hurricane season, predicting 13 named storms, five of those turning into hurricanes and two growing into major hurricanes (Saffir-Simpson Category 3 or above). Last year, 15 named storms developed and eight turned into hurricanes, two being major storms.

The Colorado State researchers believe the water-warming El Niño is forecasted to develop in the Atlantic this summer, which could suppress some storms' growth.

The National Hurricane Center and NOAA have not shared their 2019 Hurricane Season predictions at the time of publication of this guide.

These predictions are still early and conditions can change by the time hurricane season begins on June 1. Colorado State University and NOAA will update predictions at the start of the season, and will likely update again mid-summer.

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WHAT'S NEW IN 2019

A New Hurricane Scale

Earlier this year at the 2019 American Meteorological Society's annual meeting, AccuWeather debuted their new hurricane rating system. There have been calls from various groups to update the current system, the Saffir-Simpson scale, which only rates hurricanes based on sustained wind forces (top wind speed). Recent storms have showed that hurricanes with lower wind speeds cause more damage than what they're categorized as due to slow movement and a large amount of rainfall.

AccuWeather's RealImpact™ Scale for Hurricanes (AccuWeather RI™)	**Saffir-Simpson Hurricane Wind Scale**
Debuted in 2019	Created in the late 1960s and expanded in the 1970s
To be used for the first time during the 2019 hurricane season	The most popular scale used by weather networks and government organizations
Measures hurricanes on a scale of 1 to 5, with 5 being the most "strenuous" • There is also a "Less than 1" rating to "provide insight on hurricanes and tropical storms that don't rise to a Category 1 on the Saffir-Simpson scale" but may "still cause substantial destruction, injury or loss of life."	Measures hurricanes on a scale of 1 to 5, with 5 having the highest wind speed
Includes flooding, rain, high winds and storm surge as well as total economic impact from the storm to determine category	Based on the sustained wind speed of a hurricane • Hurricanes reaching Category 3 and higher are considered major hurricanes with the potential for significant loss of life and damage

What This Means

According to AccuWeather, the RI scale would differ at times from the Saffir-Simpson scale.

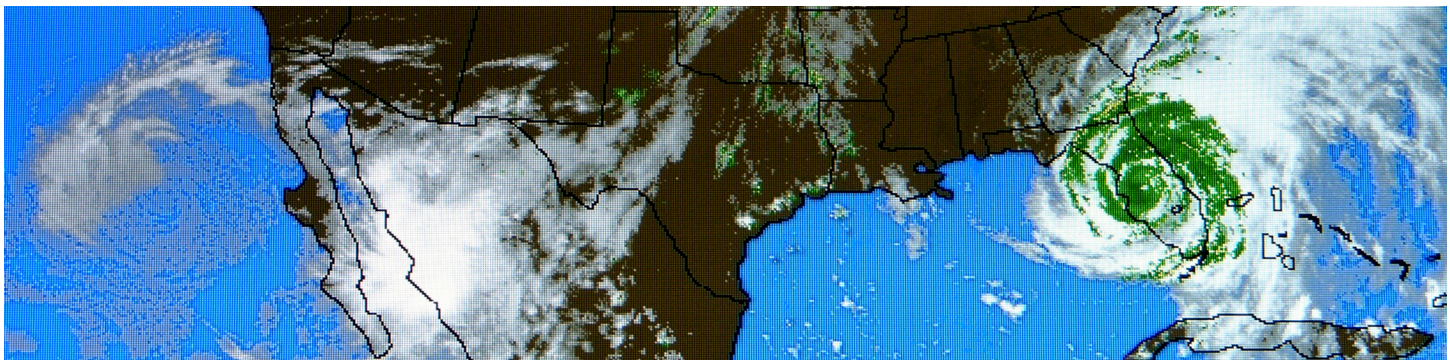
For example, NOAA listed Hurricane Harvey as a Category 4, but RI says it would have been a Category 5 because of the economic impact on the Houston region.

IMPORTANT: There will likely be reports from news stations that include both measurement systems. While the category numbers may differ, it is important to listen to local authorities when they issue evacuation orders or other safety precautions.

How to Know if a Storm is Dangerous: What to Listen For

When meteorologists begin mentioning "developing" conditions for a possible tropical storm or hurricane, it is not time to panic. From June 1 to November 30, conditions are ripe for the development of hurricanes and for those storms to hit the Atlantic and Gulf coasts. However, not every storm monitored will hit the United States. When a meteorologist begins tracking a storm, it is not guaranteed to hit. Many storms are monitored while still developing off the Western African coast, but many factors come into play to determine if those systems will reach the United States, and if those systems will be hurricanes or if they melt away.

On the next page, are hurricane terms that are often used when monitoring a storm system likely to turn into a hurricane. It's important to understand them and know when to start preparing or evacuating homes, as well as when a system will not be a threat.



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HURRICANE TERMS TO KNOW

Advisory: Official message issued by storm warning centers with details on location, intensity, movement and precautions for storms.

Direct Hit: Locations that experience the center and eye wall of a hurricane.

El Niño, La Niña, ENSO: El Niño and La Niña are warming and cooling phases of a recurring climate pattern in tropical Pacific (aka El Niño-Southern Oscillation or ENSO). The pattern shifts every two to seven years, creating disruptions in temperature, wind and precipitation. These changes affect the number and intensity of hurricanes.

Flash Flood: A rapid flooding in low-lying areas that may be caused by heavy rain as seen with many hurricanes and tropical storms.

Flood Warning: Issued when a flood is imminent or already happening.

Hurricane/Typhoon/Cyclone: A cyclone, typhoon and hurricane are all the same type of storm – a tropical cyclone that has reached 74 mph or more – just given different names based on where in the world it hits.

Hurricane Eye: The center of a hurricane.

Hurricane Eye Wall: Extreme winds surrounding the Hurricane Eye. An Extreme Wind Warning can be issued as the Eye approaches.

Hurricane Warning: Issued 36 hours in advance of expected hurricane force winds (sustained at 74 mph). The warning may stay in effect if dangerously high water or dangerously high water and waves continue, even if winds dip below hurricane force.

Hurricane Watch: Issued 48 hours in advance of possible hurricane force winds (sustained at 74 mph or higher). Hurricane preparation becomes more difficult when winds reach tropical storm force.

Indirect Hit: Locations that do not experience a direct hit from a hurricane or tropical storm, but do experience the hurricane force winds.

Landfall: When the Eye of the storm meets with the coastline.

NOAA: National Oceanic and Atmospheric Association, an agency within the Department of Commerce that works to understand and predict changes in climate, weather and oceans. The National Weather Service (NWS) is a branch under NOAA.

Real Impact Scale: Developed by AccuWeather and used for the first time during the 2019 hurricane season. Measures storms on a scale of one to five based on flooding, rain, high winds, storm surge and economic impact.

Saffir-Simpson Hurricane Wind Scale: Most popular and recognized hurricane rating system, created in late 1960s and expanded in 1970s (shown on the next page). Measures hurricanes on a scale of one to five based on sustained wind speed.

Storm Surge: An abnormal rise in sea level due to a hurricane or other severe storm. This is often the greatest threat to loss of life and property damage.

Storm Tide: A combination of normal high tide and storm surge, measuring the total seawater level during a storm.

Tornado Warning: Due to the high winds and cyclical nature of hurricanes, tornadoes can form. A Tornado Warning may be issued before, during or after hurricanes. A warning means it may occur within 36 hours.

Tropical Storm: A tropical cyclone with maximum sustained wind speed ranging from 39 to 73 mph.

Wind Shear: Strong high-atmospheric winds typically found during El Niño that blows the tops off storms, decreasing the likelihood they turn into tropical storms or hurricanes.

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SAFFIR-SIMPSON HURRICANE SCALE

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months

WHY SHOULD ORGANIZATIONS CARE ABOUT HURRICANE RISK

Natural Disaster Impact		
Immediate **40%** of small businesses won't reopen	One Year **25%** more small businesses will close	Three Years Later **75%** of businesses without a continuity plan will fail

Source: 2014 data from the Federal Emergency Management Agency (FEMA) and US Department of Labor

If your organization is vulnerable to hurricanes, it is important that you understand your risk, develop a preparedness and mitigation plan and tack action. According to FEMA, it is important to first identify your risk. The agency reports that 80 percent of a building's value is in its equipment, inventory and other contents. Depending on your type of organization, the agency says you should expect that either 50 percent of your inventory is unsellable or that 50 percent of your computers or other equipment has been damaged during the event.

To address if your business is ready, you need to identify potential impact on your systems/structure, staff, vendors, suppliers as well as your organization itself. After identifying the potential risks, it is important to decide on solutions that will help reduce risk.

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BEFORE/DURING/AFTER CHECKLIST

Before:

- Get a backup generator
- Review emergency plans if the power goes out for an hour up to multiple days
- Review emergency plans for evacuation
- Check insurance policy/coverage
- Conduct maintenance on backup generator
- Check the landscaping for any trees that should be trimmed, clear gutters, etc.
- Turn off electricity to the facility
- Use hurricane shutters or board up windows and doors with 5/8 inch plywood

During:

- Monitor updates with a radio or television

After the Storm:

- If there is severe damage to the facility, leave immediately and contact local officials
- Check for gas leaks. If there may be a gas leak, leave immediately and contact a professional to check the line, report it to local authorities
- Report downed power lines to the utility company and local police and fire departments
- Report losses to insurance
  – Take photos of the property
  – Make a list of any missing or damaged property
- Wear protective gear while cleaning
- Consider contacting contractors to clean up large debris
- Keep receipts for possible reimbursement programs through insurance, city or US government programs
- If power is out, unplug all major appliances before turning the electricity back on to minimize possible surge damage
- If the facility flooded, have a professional electrician check the residence before turning electricity on

SUMMARY

Preparation well in advance and immediately before a hurricane can help limit damage, keep workers safe and get you back to business more quickly. While developing a hurricane emergency plan, assign roles to team members. Also, it is important to establish communication procedures and to compile a list of important phone numbers. Make plans for securing materials and back up your business data. You may want to review your insurance policies to see if you are covered for water or flood damage.

Being prepared is an ongoing process of improvements. Processes should be reviewed and checked regularly. Preparing to a standard will provide a uniform and consistent basis for developing and implementing action plans within the organization and proper preparedness will help your corporation minimize loss of revenue, data, or productivity. The disruption of operations for a few hours or a few days can deeply affect your organization internally and externally. Making the choice to prepare today can protect your corporation tomorrow.

1. *Hurricane Harvey Event Analysis Report. 2018, Hurricane Harvey Event Analysis Report.*
2. *Schmidt, Amanda. "Which Storms Top the List for the Most Power Outages in US History?" Which Storms Top the List for the Most Power Outages in US History?, AccuWeather, www.accuweather.com/en/weather-news/which-storms-top-the-list-for-the-most-power-outages-in-us-history/70003178.*
3. *Hodge, Tyler, and April Lee. "Hurricane Irma Cut Power to Nearly Two-Thirds of Florida's Electricity Customers." Hurricane Irma Cut Power to Nearly Two-Thirds of Florida's Electricity Customers - Today in Energy - U.S. Energy Information Administration (EIA), U.S. Energy Information Administration, Dec. 2017, www.eia.gov/todayinenergy/detail.php?id=34232.*
4. *Panettieri, Joe. "Hurricane Florence Power Outages: 976,000 In North and South Carolina So Far." ChannelE2E, 16 Sept. 2018, www.channele2e.com/technology/business-continuity/hurricane-florence-power-outages/.*
5. *Stradling, Richard, and The News & Observer. "Hurricane Florence Closed 1,600 Roads in NC; Soon All but One Will Be Open Again." Greensboro News and Record, 11 Apr. 2019, www.greensboro.com/news/state/hurricane-florence-closed-roads-in-nc-soon-all-but-one/article_4325a402-df75-56f7-ab63-fcc0877b7b1e.html.*