

Whitepaper  
2018

# Utility Outage Prediction 2.0

Embracing Advanced Analytics  
& Machine Learning Solutions

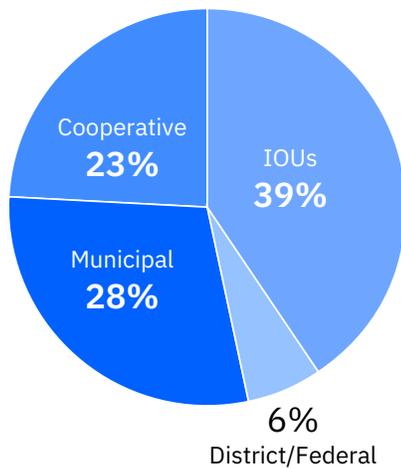
Research by:



## We asked 150 energy providers about their approach to weather forecasting and outage predictions.

Here's how the demographics break down:

Company type:



### Size by customer accounts:



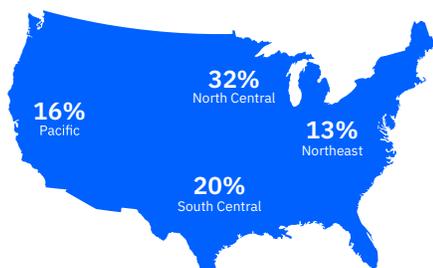
- 24% over 2M
- 17% fewer than 25K
- 14% 50K-100K
- 13% 500K-1M

### Miles of above ground distribution lines:



- 39% fewer than 10K miles
- 24% more than 50K miles
- 13% own 10K-20K miles

Region:



The ability to access information about incoming weather is available today, but just knowing that a storm is coming is not enough. During the first half of 2017, the United States experienced 5 weather and climate disaster events with losses exceeding \$1 billion, according to the National Centers for Environmental Information (NCEI). The days of gathering antiquated weather information from a local news forecast have passed, and utilities must reconsider traditional approaches to preparing for adverse weather. Utilities have a duty to increase the resiliency of their aging infrastructure, and this includes an improved understanding of how, when, and where adverse weather will impact their service territory at the neighborhood level. Determining the connection between weather and its impact on the utility system can be elusive without a data-driven predictive solution.

Using more cognitive, cloud-based solutions—such as outage prediction models—gives utilities the opportunity to take a proactive stance against impactful weather. The U.S. Department of Energy (DOE) reports that between 2003 and 2012, roughly 679 power outages occurred because of weather events. Data from various studies estimated that out of the 27 major blackouts occurring in the U.S. from 2002 to 2017, only four were due to non-weather problems.<sup>1</sup> Those, weather-related outages cost the U.S. economy \$18 billion to \$33 billion annually. Therefore, it is critical for utilities to determine the level of impact weather can have on their system and take the appropriate actions in advance of both major storms and everyday changes in weather patterns. This reality introduces a key question for energy providers: How can predictive analytical tools create operational and financial benefits for their organizations?

Footnote

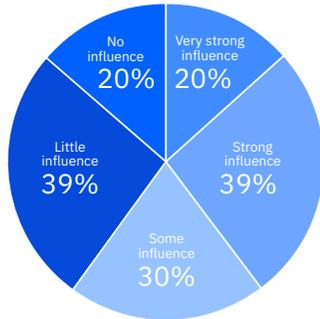
1. <http://blogs.edf.org/energyexchange/files/2018/05/Comments-of-Public-Interest-Organizations-AD18-7-FINAL.pdf>

Most utilities say adverse weather impacts operational decisions at their organizations (89%). Adverse weather has a strong influence on 39% of utilities and very strong influence on 20%.

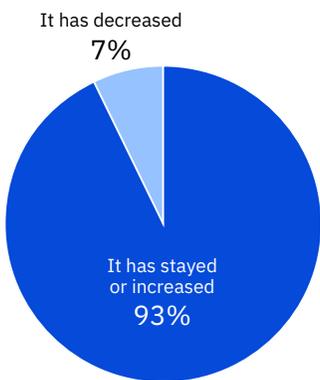
Utilities that proactively mobilize without an outage prediction model can get it wrong; most either over or under prepare.

When asked about their predictive efforts to improve responses to adverse weather, approximately 60% of utilities agree that their prediction models need improvement.

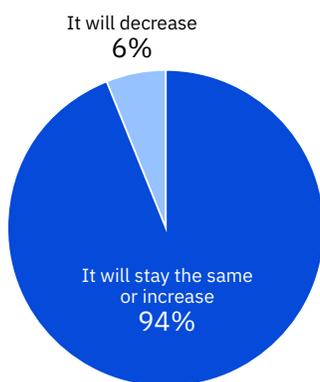
**Figure 1:**  
Adverse weather's level of influence on operational decisions



**Figure 2:**  
Adverse weather change in operational decisions' influence over past 3 to 5 years



**Figure 3:**  
Expected change in adverse weather influence over next 3 to 5 years



## Storms impact communities and their utilities

When adverse weather hits, it affects a community in many ways: dangerous road conditions make commutes longer, local schools cancel classes, and trees fall on powerlines. The NCEI reports that during 2017, the U.S. experienced a rapid succession of powerful weather and climate events, which followed a near-record number of billion-dollar disasters that impacted the U.S. in 2016. Utilities play a huge role in helping communities recover quickly from severe weather events, which requires both time and money. Below are statistics showing how utilities allocate resources to respond to adverse weather conditions and how well they think they are doing it.

Regardless of location, most utilities say adverse weather impacts operational decisions at their organizations on some level (89%). Adverse weather has a strong influence on 39% of utilities and a very strong influence on 20%.

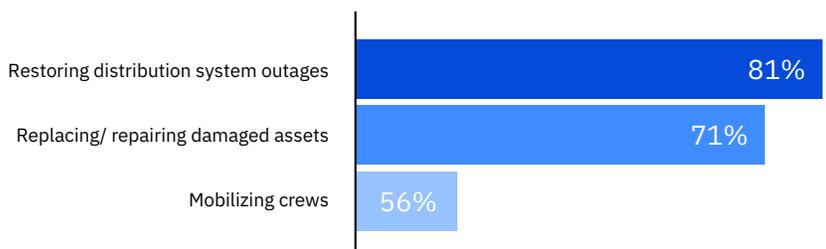
Adverse weather conditions are making their mark on utility operations. With the increase in severe weather activity and its impact on the economy over the past 10 years, utilities do not expect things to get better in terms of weather and its impacts. Ninety-three percent of utilities report that the impact of severe weather on their operational decisions has at least stayed the same over the past 3 to 5 years.

Looking ahead, utilities see more of the same: Approximately 94% expect adverse weather to have the same or greater impact on their operational decisions; just 6% expect adverse weather's influence to decrease over the next 3 to 5 years.

We know that adverse weather influences utility operations, but what are the key area affected? The connection between weather and power outages has been a problem for decades, and restoring power to the grid after a storm is critical. Restoring distribution system outages is utilities' top operational cost for adverse weather (81%). Utilities also focus on replacing and repairing damaged assets (71%) and mobilizing crews (56%).

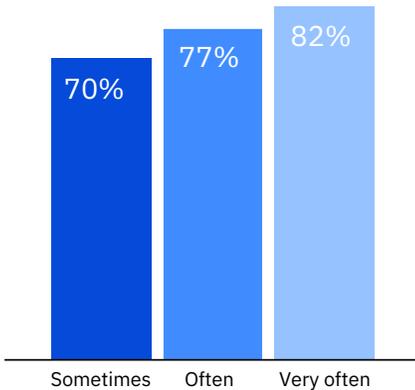
With budgets and operational efficiency at risk, utilities must respond to adverse weather conditions just like any other business. Given the main priority is restoring system outages, utilities must position themselves to respond to adverse weather to achieve that goal.

**Figure 4:**  
Top three operational costs for adverse weather



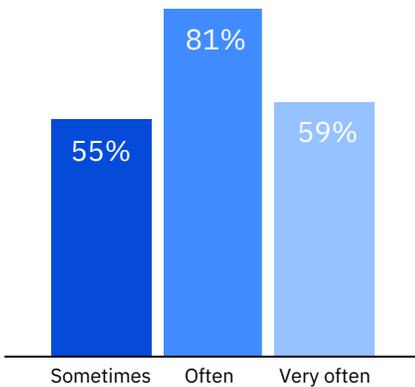
**Figure 5:**

Our organization regularly needs **FEWER** materials than expected (compared to how often we proactively mobilize).



**Figure 6:**

Our organization regularly needs **MORE** materials than expected (compared to how often we proactively mobilize).



## Answering the call: Mobilizing the storm

Utilities respond to adverse weather conditions in different ways. Variations can be due to different types of weather, budget allocation, access to information, and access to resources. Proactive mobilization can be simply having enough resources on-hand ready to go after the damaging weather clears and more advanced prep by prepositioning linemen, vehicles, and resources in anticipation of where the severe weather and its larger impact is expected within a utility service territory.

Our survey shows that approximately one-third of respondents say they often or very often use proactive mobilization; two-thirds of the respondents are not proactively mobilizing on a regular basis. Proactive mobilization can offer significant benefits should adverse weather impact a utility's grid, but the survey results show it can be difficult to get proactive mobilizations right. Of the utilities that proactively mobilize often, 77% report they regularly overestimate the amount of materials they need. With utilities that proactively mobilize very often, more find that they miss the mark with materials (82%).

Also, utilities that proactively mobilize often may not have enough information on how to efficiently allocate resources, so they can be underprepared.

## Data-driven decisions: New considerations to prepare for storms

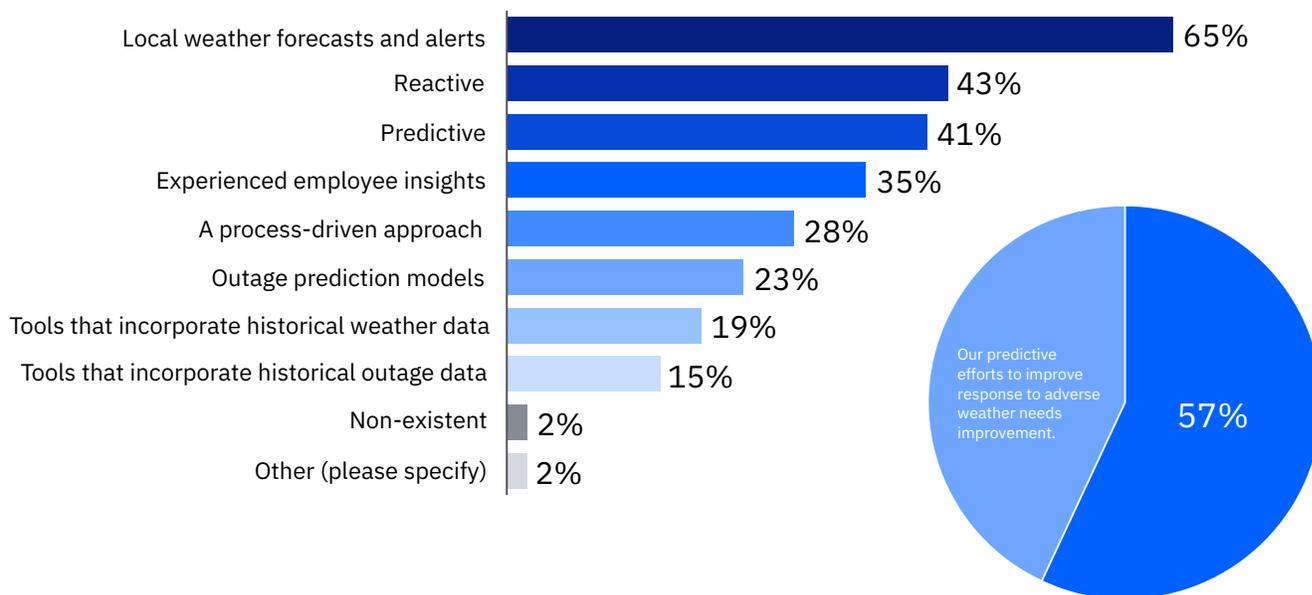
From tight budgets to public perception, utilities have little margin for error when preparing for storms. There are many different preparation approaches to take in the face of adverse weather: Reactive approaches involve assessing damages and outages during or after a storm has occurred; predictive approaches involve emulating potential damages and power outages from severe weather based on forecast information prior to a storm.

Most utilities do not use outage prediction models. They still heavily rely on local weather forecasting, which can lead to reactive approaches. According to our survey, 65% of utilities use local weather forecasts and alerts for weather forecasting and outage prediction. Being reactive is the second most practiced approach among utilities (43%). While 41% report using a predictive approach to weather forecasting and outage prediction, only 23% of utilities use an actual outage prediction model to aid their decisions.



“We use a couple of different pieces of information to predict outages from adverse weather,” said a customer business manager from a Northeast investor-owned utility. “We watch the weather coming in and look at those forecasts of local news stations, but it’s really nothing internal in terms of tools or applications we use.”

**Figure 7:**  
Current approaches to weather forecasting and outage prediction



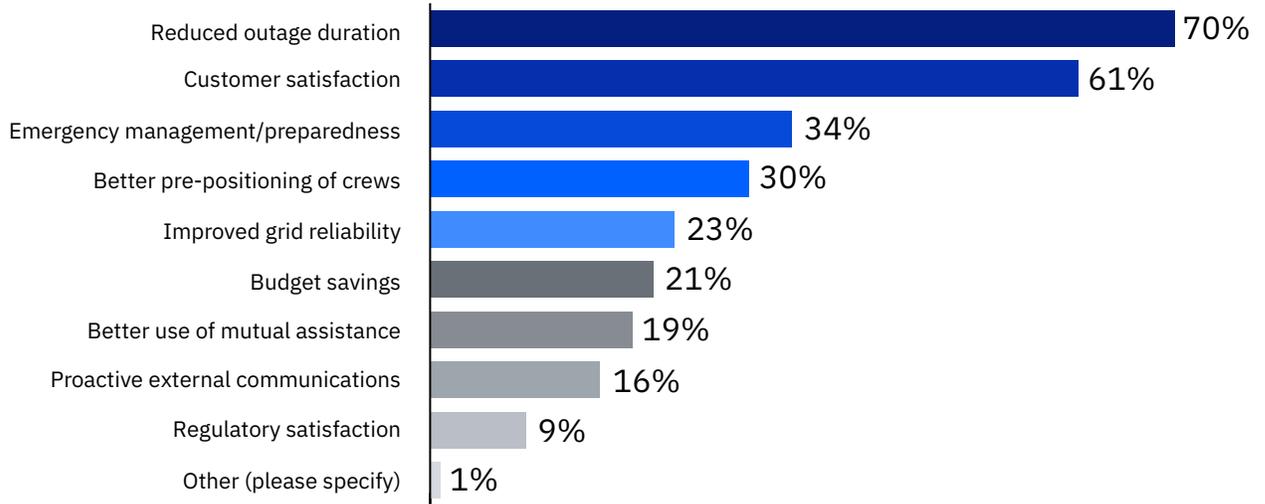
**Figure 8:**  
Agreement on the importance of predictive efforts for response to adverse weather

The fast-paced digital nature of today’s economy drives consumers to always be connected to the grid. If an outage occurs, utilities have a small window to restore power before customers get upset and regulators seek answers. When asked about their predictive efforts to improve response to adverse weather, 57% of utilities agree they need improvement and need to consider more predictive efforts.

A more predictive, data-driven outage prediction solution can remove some of the uncertainty around how utilities prepare for adverse weather conditions. Most respondents believe that data-driven outage prediction tools will reduce outage duration (70%) and improve customer satisfaction (61%). Emergency management and preparedness (34%) and better pre-positioning of crews (30%) are also top benefits. Even with its promise, every new technology faces challenges. Budget constraints are a top challenge for utilities to use more predictive, data-driven tools (52%), and utilities are hesitant about relying on predictive models (50%). Another top challenge is securing a business case ROI for an outage prediction tool (36%). As a strategy development manager from a West Coast investor-owned utility noted, “I think organizations are hungry for predictive tools, but you have to establish a degree of credibility. They have to believe it is worth the investment.”

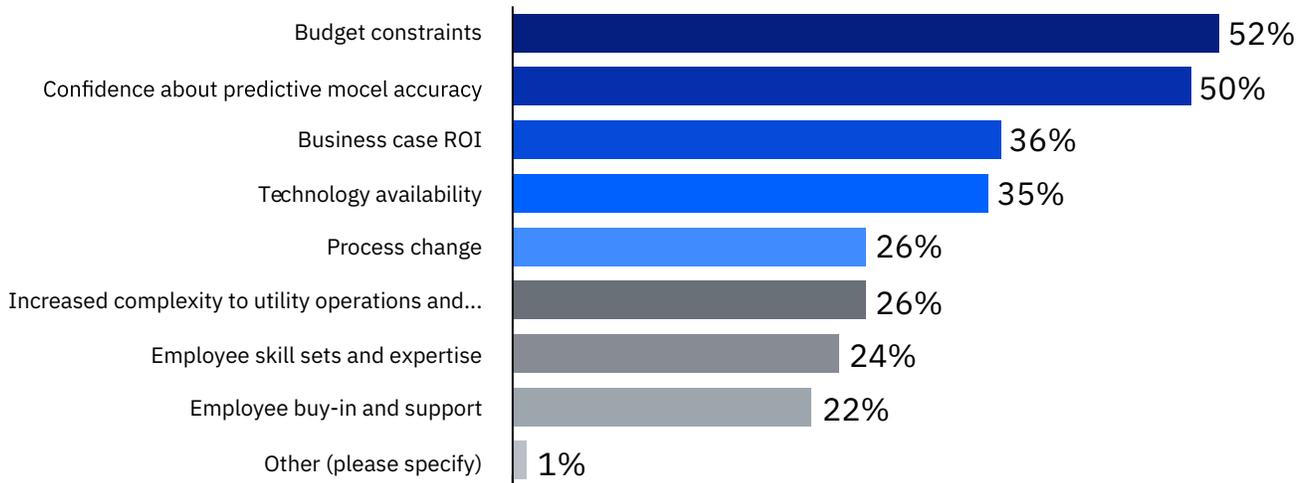
**Figure 9:**

Top benefits of more predictive, data-driven outage prediction tools



**Figure 10:**

Top challenges of more predictive, data-driven outage prediction tool



## Recommendations

Severe weather is not going away, and will continue to cause system outages. Fortunately, utilities have access to more data than ever before from internal and external sources to help them leverage the available outage prediction technologies. If this helps improve operational efficiency and keeps the customer happy, it is a win-win for today's utility operators.

Here are a few recommendations to consider for your organization's adverse weather plan:

- **Local weather forecasts are not enough.**  
Generic weather forecasts may not address the specific weather thresholds that are important to your organization. Thirty inches of dry snow may be no problem, but 3" of wet and heavy snow may be a major outage event. Fifty miles per hour of wind in the winter is not likely to bring trees down, but if it occurs in the summer with full foliage, there is likely to be some branches damaging your infrastructure. Data-driven outage prediction models help relate weather conditions to actual impact and outages using machine-learning techniques to help minimize errors and help increase certainty and confidence.
- **The costs of getting weather impact wrong are high.**  
You make mobilization decisions all year long on impactful weather events. If you over-mobilize for an event, money was spent that could have been used elsewhere. If you under-mobilize, the outages take longer to restore resulting in additional restoration expense and risk of customer dissatisfaction. This could lead regulators to impose financial penalties, and your reputation could suffer. It's not just the biggest storms that have the high costs. The smaller, more routine and seasonal weather events can add up over time.
- **Confidently prepare and respond to adverse weather.**  
While it is good to prepare for storms, it is important to prepare intelligently. As we saw in the survey, utilities that are preparing regularly for storms, often do not get it right. There are opportunities to improve your organization's response to adverse weather by integrating predictive models into your overall strategy. Data-driven weather prediction can help you more accurately assess incoming weather and map potential outages.

To explore ways in which your organization can improve your preparation for the next round of adverse weather, contact The Weather Company

[biz.weather.com/request-a-demo.html](http://biz.weather.com/request-a-demo.html)

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