STORM RESTORATION

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OVERVIEW

Utilities are under constant pressure to improve how they handle the direct threats storms cause to their operations. Ice storms, wildfires, thunderstorms, tornados, hurricanes and other weather events can cause massive damage to transmission and distribution infrastructure, and they impact utility companies' customers as well as the companies' financial top lines. According to the U.S. Department of Energy (DOE), power outages cost more than $150 billion annually, so it's important for utilities to manage the power grid, not only the safety and comfort of customers, but also for the bottom line. A 2020 hurricane that affected the Gulf States caused weeks of power outages and resulted in millions of man hours and hundreds of millions of dollars in restoration costs.

The Current Approach Needs To Change

Immediately following a storm or other damage-causing event, utilities send crews out to assess the damage to their assets, such as poles, wires, transformers, substations, etc., and then they prioritize restoration activities. Depending on the extent and severity of the damage, to augment existing field maintenance crews, employees with various jobs in the utility take on the role of temporary damage assessors to perform line-of-sight physical inspection of the storm damage and manually call in their reports to the storm headquarters. These damage assessors then physically drive to the next assigned area with suspected damage and repeat this activity until all the damage is accounted for. There are several issues with this approach:

Crew Management
Tens of thousands of workers can show up at once for storm remediation. Staging them and dispatching them in an efficient manner can be very difficult without timely, reliable, accurate information from the field. This results in overpayment, restoration delays, and confusion.

Staging Zones
Getting the right material and resources to the right jobs at the right time is paramount during storm work, so establishing optimally placed staging zones is very important. Without real-time reliable information of what assets need to be repaired in what sequence, it is difficult to optimize staging areas.

Training
Temporary damage assessors have very basic training in the identification of assets, are prone to misdiagnosing issues, and can often miss damage in the field. This can lead to further diagnosis and delays by qualified personnel, and corresponding expensive rework.

Safety
More workers in the field immediately following a weather event increases the chances that things could go wrong. Depending on the type of storm and the cause of the damage, the timeframe following a storm can be an extremely dangerous time to be navigating roadways and trying to gain physical access to damaged areas with numerous hazards present (downed trees, downed wires, standing water on the ground, ice, unexpected fires, etc.).

Access
Damage assessors may have difficulty navigating physical access to gain line of sight to critical issues due to location access issues or infrastructure damage.

Time
This manual, physical approach can take days or weeks, while highly paid linemen are waiting for work instructions, and the human toll is real. The longer it takes to return electricity to service, the larger the impact to the people without power.

Technology
Most of the identification and prioritization of the work is done manually, resulting in higher cost, duplication of effort **and** more errors.

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Once the damage is all identified and assessed, it becomes a massive logistical nightmare to coordinate the work. Hundreds, if not thousands, of poles, transformers, switches, lines, and substations need to be repaired or replaced. Each of these damaged assets can be a collection of work orders that become an entire project, possibly requiring dozens of people, and involve complicated coordinating of critical equipment such as cranes and helicopters. Further, coordinating across remote locations can present logistical challenges such as forcing workers to get to the site via ATVs, air boats, or delivering material on floating craft. Let's not forget that each of the lines and equipment must be **inspected again** before they can be energized.

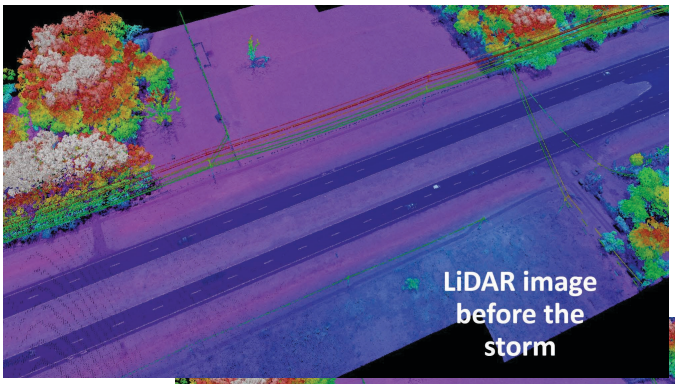
With such monumental challenges coordinating across labor, material and equipment and other expenses after a weather event, the industry is seeking different approaches to solving these challenges.

A Different Path Forward

Fundamentally a combination of three technologies will make the most significant impact on improving storm restoration outcomes—artificial intelligence, drones and LiDAR, which will be used to provide an immediate assessment of damaged assets. Once the rapid, automated damage assessment is complete, work orders are prioritized into work packages and then scheduled for execution. The net impact is that this will allow utilities to restore normal grid operations faster and more safely.

Identify Work

Once the weather event has passed, drones, helicopters, or fixed wing craft outfitted with LiDAR will take to the skies to perform aerial scans of the areas that would have likely accumulated damage. Artificial intelligence will analyze these LiDAR point clouds and provide a damage assessment to the utility, enabling quick deployment of work crews to the most important locations. Below is an aerial LiDAR point cloud that shows a 3D representation of pre- and post-storm.



Once work has been identified, prioritization and execution are just as important.

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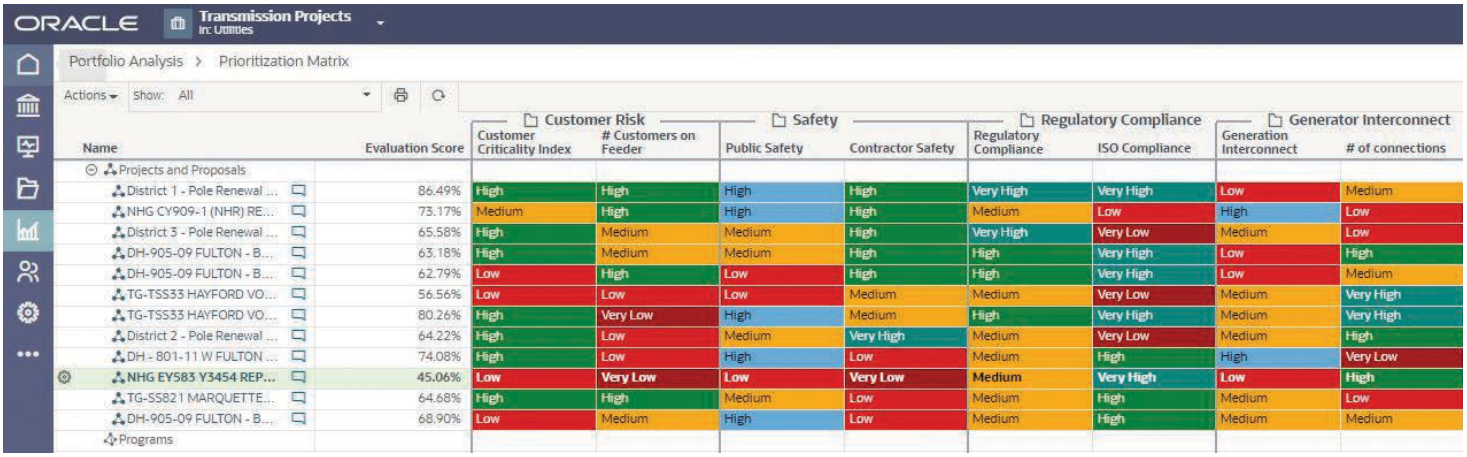
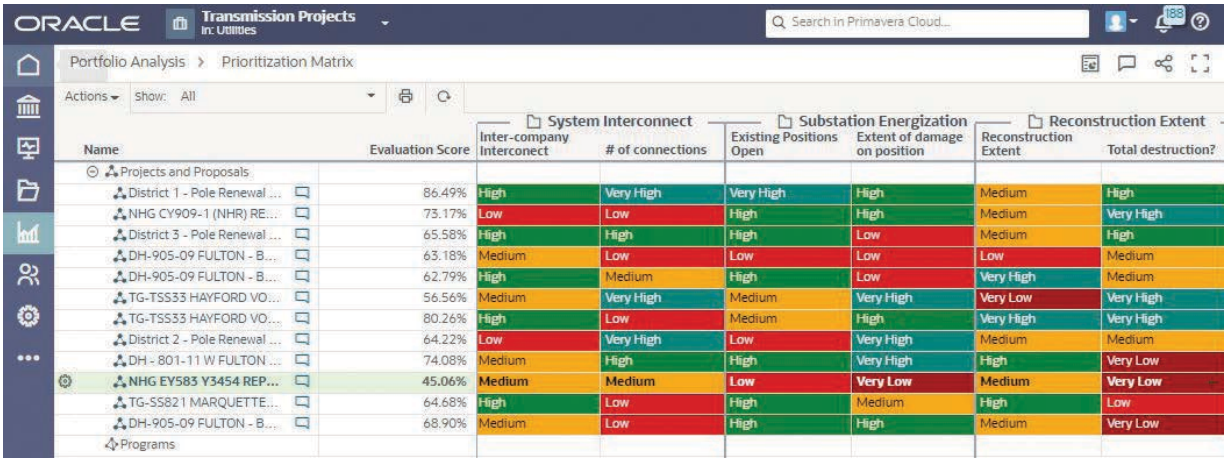
Prioritize Work





Transmission and distribution each have different restoration prioritization criteria. While Transmission's focus is primarily on re-energizing substations via at least one line position, distribution is focused on analyzing priority based on feeder networks, placing higher priority on feeders that supply a higher number of customers or more critical facilities. The illustration above shows that no matter the prioritization scenario, work packages can quickly be analyzed, scored and a resulting priority assigned across hundreds or thousands of projects.

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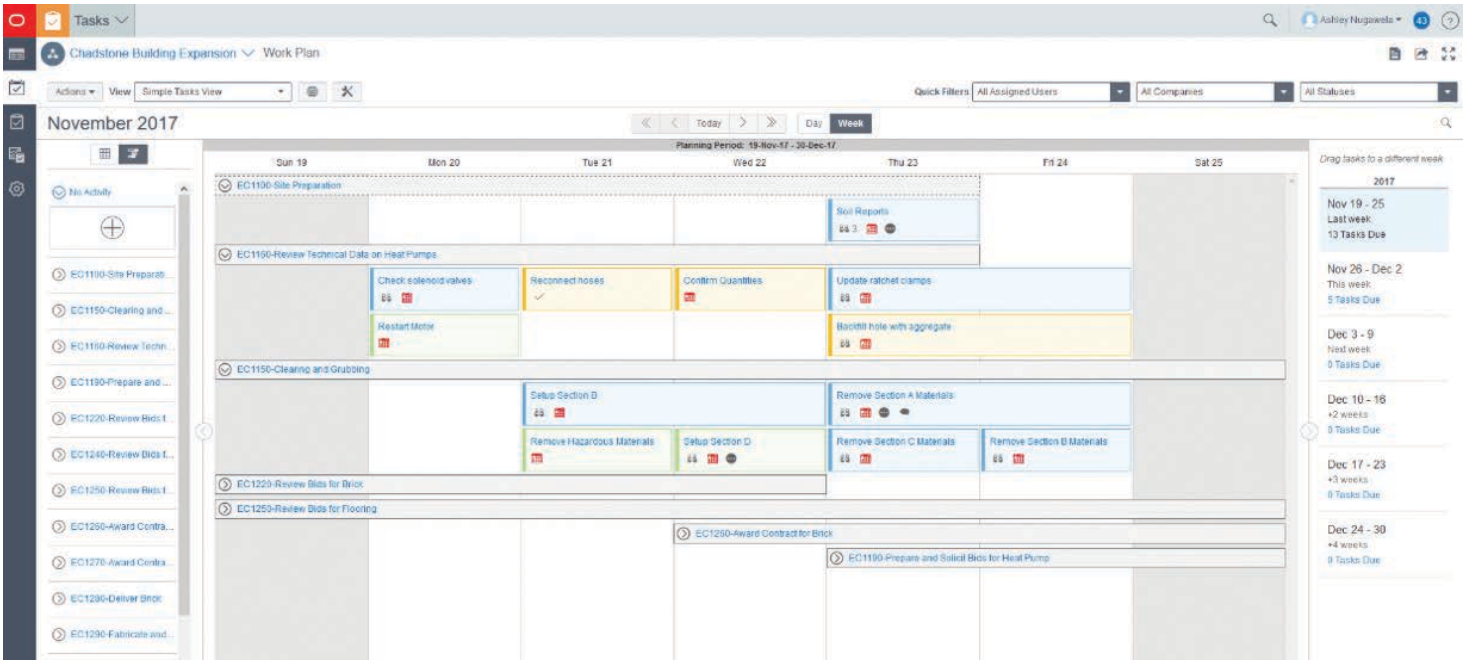
Execute Work



Once work is prioritized and processed through the Outage Management System, work can be quickly assigned to crews simply by dragging and dropping each activity, as shown in the illustration above. This allows resources to be optimized and crews to be deployed efficiently to the right locations, resulting in a smooth, safe, and efficient restoration.

CONCLUSION

Storm restoration is a vital capability that utilities need to continue to improve. By automating damage assessment, focusing on reducing the time for storm restoration, utilities can achieve cost reductions, improved customer satisfaction and reduced safety incidents. Fundamentally, technology is the key element that will enable this transformation.

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