PACIFIC DATA INTEGRATORS

Grid Health 360

How LiDAR technology is replacing fixed cycles with a proactive vegetation management strategy.

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Introduction

In the United States, the five-year average of power outages tripled from 2000 to 2014[1] and shows no sign of slowing. Larger populations have combined with more extreme weather to produce a nightmare of utility maintenance efforts.

Tree arcing not only contributes to the growing number of outages, but it can also start fires.[2] This makes tree maintenance programs a top priority for utilities who value preventative measures.

While trimming trees may sound like an easy fix, utilities know better. Thousands of miles of power lines, plus differing growth rates for different varieties of trees, mean it is difficult to schedule maintenances for power lines when they need it.

This is why Pacific Data Integrators created Grid Health 360, introducing a predictive vegetation management solution to the utility sector.

Vegetation Management

Vegetation Management

Vegetation management programs work to proactively identify and remove overgrown or unhealthy vegetation that is in close proximity to power lines. Such hazardous vegetation can spark fires and can cause interruptions in electricity when trees fall on or grow into power lines.

Vegetation management may include tree pruning, herbicides, brush removal, weed control, and hazardous tree removal.[3] It is an essential responsibility of utility industries to protect their customers against fires and outages.

Due to strengthening weather patterns,[4] a spotlight has been placed on vegetation management with customers demanding that utilities do more to prevent blackouts and fires. This pattern is only expected to continue.

Most utilities send crews to inspect power lines every few years. In California,[5] lines are inspected much more frequently.

The Dangers of Subpar Vegetation Management

When vegetation management works, no one hears about it. Every morning customers wake up, flick a switch, and turn on the lights. Once in a while utility workers will show up in the neighborhood, trim some trees, and be on their way.

When vegetation management fails, everybody talks about it. Fires, blackouts, massive government fines…this is one area where investing in a proactive, preventative program can literally save billions of dollars.

Power Outages

Vegetation is the leading cause of power outages. It caused the Northeast Blackout of 2003[6], which affected 50 million people in Canada and the U.S. and started the trend of increasingly strict vegetation management regulations.[7]

The Northeast Blackout cost billions of dollars[8] due to accidents, loss of life, extended periods with-

out power, and a massive loss of productivity. It is the perfect example of how costly a power outage can be.

While vegetation management cannot completely prevent wind, ice storms, and hurricanes from causing power outages, ensuring there are no trees/branches in close proximity to power lines hugely decreases the risk.

Fires

Utility-caused fires have made national headlines two years running. While there are other factors at play (drought being one of them), the ultimate responsibility to avoid these catastrophes falls on the shoulders of utilities.

Most fire ignitions coming from electric infrastructure are less than a quarter of an acre, according to the California Public Utilities Commission[9]. But 25 percent of these ignitions are caused by contact between vegetation and electrical equipment, which is entirely avoidable!

While it's true that most of these fires are small, California has seen massive blazes that remind everyone fire is not something to be taken lightly. The number of acres burned, lives lost, and buildings consumed has no precedent. Even worse, in the fall of 2017 electrical equipment was responsible for 17 out of 21 major Northern California fires.[10]

It will take a major overhaul of the current vegetation management system to prevent future catastrophes such as these; not only to prevent a loss of life and property, but also to preserve the utilities themselves as the liability for wildfires is easily in the billions.[11]

When these costs are more than the insurance cap and surpass amounts the company can afford to pay, it leads to crippling debt that must be passed onto the customers, or even to bankruptcy.

Fines & Stock Prices

After a blackout or fire, utility companies see three reactions. First is a drop in customer satisfaction.[12]

Secondly, there may be fines if the utility is found to be at fault. The Galvin Electricity Initiative estimates that Americans lose $150 billion every year due to outages.[13] Part of this cost is passed onto utilities.

Thirdly, after the fallout of fines and customer dissatisfaction (and sometimes simply from the fear of these penalties), utilities' stocks drop. The *NY Times* reported that one utility lost more than half its market value after a massive fire, and its stock dropped 20 percent in a single day.[14]

In recent decades we have seen utility fines of over $1 billion.[15] This highlights how likely it is that when catastrophic damages costs occur, utilities can be faced with fines that exceed their insurance limit. Again, this has the potential to lead to plummeting stock prices, the inability to make bond payments, and/or insolvency or bankruptcy.

This is all the worst case scenario, but the United States has seen many such worst case scenarios in the 21st century.

California Utilities Face A Larger Burden

The 2017 California wildfire season saw 9,000 fires, 43 deaths, and 1.2 million acres destroyed.[16] It was the most destructive season on record, although it may soon be surpassed by 2018.

These fires were spawned from a plethora of factors. Years of drought plus global warming have created conditions where fires spark easier and spread faster.

Warmer weather has also created a bark beetle epidemic. While these insects are native, a lack of freezing temperatures has allowed their population to explode and overwhelmed the drought-stricken trees' natural defenses. Hundreds of thousands of acres of forest have been destroyed, leaving swaths of fire-prone, dead wood.[17]

According to Tom Smith, a specialist for the CA Department of Forestry and Fire Protection, the bark beetles, "are only successful in attacking the trees when the trees are stressed. Right now all the

Bark beetles are native to California,[22] but growing populations have consumed thousands of trees.

trees are stressed because of drought."[18]

The U.S. Forest Service estimates that 129 million trees have died in California's national forests[19] because of these factors. What this means is that a spark that created a small fire a decade ago could now start a massive blaze in today's climate.

Most regions have vegetation management cycle from 3 - 5 years

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With this rise in fires has come sharpened preventative efforts too, in the form of stringent regulations. While other regions have vegetation management cycles that average from 3-5 years,[20] utilities in California are expected to examine all transmission and distribution lines annually. And after a series of mandatory clearance rules passed several years ago, some California utilities had to triple their annual utility vegetation management budgets in order to comply.[21]

While California is in the spotlight, wildfire and blackout prevention is a national issue. The options are to implement proactive measures now or deal with a plethora of consequences at a not-so-distant date.

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A Massive Investment

While Vital, Vegetation Management is Costly

Utility vegetation management has changed little in recent decades. Manual inspections are labor intensive and expensive. Helicopter surveys may be faster, but they are wrought with inaccuracies.

The utility industry has only recently begun integrating technology into their processes.[23] This includes vegetation management, with LiDAR and imaging technologies. These have the power to create an accurate picture of vegetation's proximity to power lines and allow utilities to prioritize which areas are in urgent need of maintenance.

LiDAR data is more accurate than helicopter surveys and faster than waiting for a manual inspection crew. It is the future of preventative vegetation management. And it's cost effective!

According to Elizaveta Malashenko, director of Safety and Enforcement Division at the California Public Utilities Commission (CPUC), vegetation management is one of the largest expense items

LiDAR and imaging data identify vegetation proximity with high precision.

a utility pays in order to maintain the grid.[24] In California, investor-owned utilities annually spend over a quarter billion dollars on vegetation management for distribution lines alone.[25]

This cost is only increasing as urban regions push farther into forested regions of the Pacific and Atlantic coasts. Larger populations in wooded areas mean more electrical infrastructure to maintain, and more conscientious wildlife conservation laws require surgical approaches to vegetation management, as opposed to clear cutting.

Where does this leave utilities? With larger populations to support, increased public scrutiny, underfunded operating budgets, aging utility infrastructures in many regions of the country, and rising fines for outages and fires.

Do not despair! These struggles are exactly why we created Grid Health 360. Want to leverage LiDAR data, identify problem vegetation before it causes a problem, and save money? Read on to learn more.

Why Vegetation Management is a Challenge

*To paint a clearer picture of why vegetation management is so difficult –
and costly! – we took a closer look at the largest utility in California.*[26]

A Constant Threat

A service area of 70,000 square miles contains over 120 million trees with the potential to either fall on or grow into power lines.

A Hefty To-Do List

Over 100,000 miles of overhead transmission and distribution lines must be maintained and protected against vegetation, poor weather, and other threats.

An Ambitious Project

3,500 employees and contractors are tasked with trimming and removing roughly 1.4 million trees every year.

A Massive Investment

This utility invested $1.6 billion in its vegetation management programs over a period of five years, with the goal of reducing outages and fires.

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Introducing
Grid Health 360

Grid Health 360

At Pacific Data Integrators (PDI), we believe quality asset data hygiene should be at the core of any program, as utilities drive most of their investment decisions from the capacity and health of capital assets (including substations, transformers, smart meters, power lines, pipes, and so on).

Limited by their regulator-sanctioned cost-plus revenue model, maintenance is a key lever to profitable and safe operations. Therefore, it is imperative for utility companies to understand the condition of their assets and where they are located.

Our partner Informatica agreed with us, and Grid Health 360 was born. This utility solution leverages Informatica Master Data Management (MDM) and Data Quality (DQ).

Grid Health 360 allows operators to reconcile transformer, meter profile, and pulse information to facilitate improved load and demand planning.

Accurate asset data can be leveraged to make vital business decisions.

It also allows customers to assess the smart meter vendor performance and the spread of behind-the-meter generation and storage capacity.

However, the core of this solution – and this eBook – is its vegetation management capabilities.

Vegetation Health Analysis

Overgrowth can cause "tree arcing," which is the leading cause of outages for utilities. In four years, tree arcing sparked 4,000+ wildfires in Texas alone.[27] This is why a core piece of our Grid Health 360 Solution, the Vegetation Health Analysis tool, leverages LiDAR data to create a 3D map of vegetation.

With Vegetation Health Analysis, customers can view the vegetation levels in an area of interest.

Not only does Vegetation Health Analysis show customers where trees are located in proximity to power lines, it also maps out how healthy trees are relative to the surrounding vegetation.

The tool works by pairing LiDAR data with LasTools software and infrared imagery (RGBI or 4-band), creating a "vegetation index." Within this index, our algorithms rank the amount of photosynthetic production, which allows us to identify where vegetation is located as well as how healthy trees are.

IDENTIFY
PROBLEM VEGETATION

PDI estimates customers will be able to save $700 per brushmile with Grid Health 360.

Our Vegetation Health Analysis tool produces a map that clearly displays canopy density and health and flags high-risk areas such as potential fire hazards. For instance, a dead tree can be at greater risk of falling on a power line or sparking a fire and may require immediate removal.

In addition to populating on a virtual map, the Vegetation Health Analysis tool can integrate with third-party reporting dashboards via SOAP or Rest APIs. This integration means Vegetation Health Analysis can be displayed as alerts within third-party tools such as Tableau, keeping utilities aware of high-risk vegetation areas.

In summary, rather than sending crews out on predetermined cycles of vegetation management, utilities can now use Vegetation Health Analysis to prioritize high-risk areas. By utilizing our solution's risk-based deployment of vegetation management rather than the traditional, interval-based strategy, we estimate our customers will be able to save $700 per brushmile!

LiDAR Data Acquisition

Light Detection and Ranging (LiDAR) data is created by aerial sweeps. An airplane or helicopter will survey the area of interest with a pulsed laser, collecting data on the variable distances of different objects. Combined with other data, this information creates a 3D picture of the area of interest.[28]

If a customer wants to bring their own LiDAR data to the project, we can leverage that data to produce a virtual map output that analyzes our customer's specific area of interest.

If a customer does not have their own LiDAR data, or their LiDAR data is out-of-date, we will work with them to gather the necessary information. We have a variety of partners that excel in LiDAR data acquisition. In these circumstances, our LiDAR data acquisition partners can work with our customers to gather up-to-date LiDAR data that will be leveraged by our tool.

Combined with other data, LiDAR data creates a 3D picture of the area of interest.

Value Analysis

Grid Health 360 Value-Add
- More accurate view of assets
- Increase ability to make accurate business decisions
- Missing pulse resolution
- Improved load planning and fraud mitigation
- Ability to identify unregistered solar panels or batteries

Vegetation Health Analysis Value-Add
- Estimated savings of up to $700 per brushmile
- Ability to implement proactive vegetation management
- Power outage and wildfire prevention, in turn protecting homes, infrastructure, and lives
- Risk mitigation plus protection of customer satisfaction and company reputation

Market Analysis

Target Market
Utilities in North America

Market Size & Growth
The electric power industry in the U.S. has a revenue of nearly $400 billion.[29] Annual growth is sluggish to non-existent.[30] However, our solution can cut costs, increase efficiency, mitigate risk, and provide savings—all of which are ideal for companies faced with slow growth.

Market Trends
A slew of wildfires has placed vegetation management under a spot light. Utilities are exploring how technology can be leveraged in this area and in other utility processes, to boost efficiency and customer service while increasing safety and stability. At the same time, utilities across the continent are having to replace aging infrastructure and are using this as an opportunity to phase in newer, smart technologies.

Competitive Landscape
While the collection of LiDAR and utility data is beginning to spread, most companies have trouble leveraging this data. Grid Health 360 is a cutting-edge solution that transforms LiDAR and utility data into an unparalleled view of utility assets and vegetation. This is truly a unique solution.

Key Success Factors
The key success factor will be spreading awareness, as this is a cutting-edge solution. We started the process of gaining awareness by partnering with Informatica to host a series of webinars, and attending DistribuTECH 2018.

Request a Custom Demo

We'd love to show you what Grid Health 360 is all about! Click below to sign up, and one of our utility experts will be in touch shortly to schedule a personal demo.

Schedule a Demo

Grid Health 360

An Unparalleled View into Utility Assets.

Endnotes

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