SATELLITE-POWERED VEGETATION MANAGEMENT

How the world's leading utilities use satellites and AI to decrease customer interruptions, improve reliability, and reduce expenses

... and how you can, too!

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The state of vegetation management today

The good, the bad, and the promising

From dedicated professionals who've become wellsprings of historical knowledge and knowhow to infrastructure that's held its own for decades, utility vegetation management operations have a lot to be proud of.

Today, those plusses are especially valued as utilities strive for grid growth and service reliability amid the challenges brought by Mother Nature and technological change.

While practices and procedures that have held for years are keeping operations moving, the heavy hand of climate change is driving more intense storms and wildfires, which, with today's labor changes and budgetary concerns, are taxing vegetation management.

Inside the utility — *tech, costs, and retirements*

Selecting and implementing new software and procedures to track vegetation can be daunting, and some utilities have opted to leave well enough alone.

But just because "we've always done it that way," doesn't mean "that way" is the right way to handle today's increasingly intense responsibilities.

Internal challenges holding back acceptance of new technologies, like satellite and AI solutions, include:

Reliance on paper

Some continue to use paper maps to track vegetation overgrowth and hazard trees. Others have taken the step forward to scan the maps into a system like Microsoft OneDrive, to allow the reporting to be accessed electronically. But there are not many systems available to adequately gather, organize, and analyze data.

Resistance to change

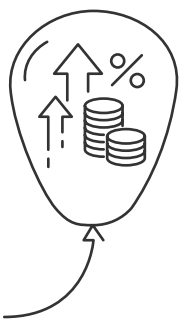
Hesitance around new technologies is not unusual as all humans can be resistant to change. While satellites and AI can bring improvements in data gathering and sharing as well as analysis, it can be hard for utilities to get employee buy-in to the change. Major pushback includes a bevy of questions, such as:

- What we have works. Why change?
- Is the technology really proven?
- Will the technology be accurate?
- Is someone going to lose their job or promotion over this?

Change can be difficult at the higher levels of the utility as well, for investors and stakeholders who want guarantees before taking the leap. They would also like an easy way to navigate those corporate structures most resistant to change.

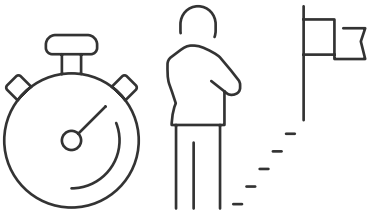
Budget constraints

Shutting the door on new technologies, such as satellite and AI solutions, can become second nature for some utilities. It is already difficult enough to stretch the budget to handle aging infrastructure replacement and repair on top of general vegetation management practices, and everything is only becoming more expensive. With stagnant or declining budgets, squeezing out funds for new tech solutions can seem like an impossibility.



Retiring workforce

Retirements across the board, from talented field staff to executive leadership, can hobble a utility's operations.



Demographics indicate that the majority of the workforce in vegetation management across utilities have more than 15 years of experience and a vast amount of institutional knowledge. But professionals reaching this level, with a decade or two of experience, are choosing to move on, some retiring and some starting their own companies.

What may be a positive move for the retiring individuals puts utilities in a tough spot.

Of course, utilities will recruit staff, but the new hires — including those who may just be moving in from another area of the company — can be problematic. They may have project management experience, but without vegetation management experience they face a huge learning curve.

So, the industry is faced with the challenge of holding on to their high-level managers longer or dealing with lack of experience until new hires can evolve beyond the knowledge gap to fill the position.

Outside utility walls — *trim cycles, visibility, climate initiatives*

Similar to resistance to internal change, the pushback on external changes can be strong.

Trim cycle status quo

The preference for fixed annual trim cycles instead of just-in-time responses dictated by new technologies is clear.

It's true that throughout the year, unless

there's rain, sleet, snow, hail, or some other type of event, evaluating and trimming vegetation will occur per annual cycle planning. Most utilities are faced with the impossibility of servicing an entire territory in one year, so there is always going to be a need for annual trim cycle planning that will rotate across segments, year after year.

The possibility is to transfer from a year-after-year approach to a data-driven risk-based analysis stance. With a satellite and AI solution, high-risk areas are easily identified, and AI can evaluate the urgency level. Work crews can be sent in September to a circuit that is typically addressed in February to cull danger trees and remove risk, while other circuits might get pushed out another year based on conditions and growth rates.

Poor visibility

Utilities have a lot of decisions to make and need visibility across their transmission and distribution lines as well as substations to plan operations and maintenance (O&M). Currently, many utilities use manual processes, including meetings and phone conferencing, to determine:

- What is the status of vegetation growth across the system?
- What resources are needed to manage vegetation to achieve reliability targets?
- What is the optimum trim schedule based on budget and vegetation growth?

They make the choices that support the most risk-free approach to vegetation management, such as putting a circuit on a 4- or 5-year trim cycle to achieve a pretty good assurance that required reliability will be maintained.

While these choices will be evaluated and made based on risk, their efficiency and effectiveness can be driven up a notch with a data-driven approach, based on the wealth of information and insight offered by a satellite and AI solution.

Climate initiatives

Obviously, storms and disasters can change the outcome of the best-laid plans. By mid-third quarter of 2022, climate-driven weather disasters had cost the world $29 billion.[1] Climate change now regularly multiplies the already harsh burdens of a particular weather event. Despite the need to address the extra burden, some utilities continue to hesitate to adopt new solutions due to doubts around perceived risk.

- How does this satellite technology work?
- Is it really accurate?
- What is it going to cost me on top of what I'm already spending?
- What are my risks in spending extra money?
- Will I get the desired outcomes?

When the scales tip toward change

While some utilities are quick to look to new approaches and solutions, most will avoid the tech adoption until they clearly:

- Reach the place where increases in costs or outages become overwhelming.
- Acknowledge that satellite and AI solutions are the way the industry is headed and recognize that they just need to get more comfortable with the technology.

Luckily, new innovations have brought satellite-powered vegetation management into the fold — arming utilities with the data they need to ensure climate resilience and grid reliability.

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– yaleclimateconnections.org

[1] https://yaleclimateconnections.org/2022/10/world-rocked-by-29-billion-dollar-weather-disasters-in-2022/

The rise of satellite-powered vegetation management

How innovation spurred a game changer for vegetation management

AiDash Intelligent Vegetation Management System inspection analysis dashboard view

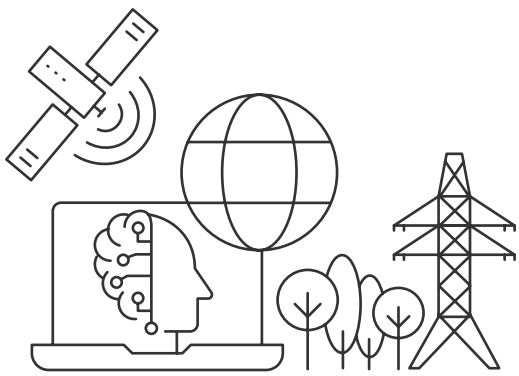
All industries have experienced the steady march of technology and its push for adoption.

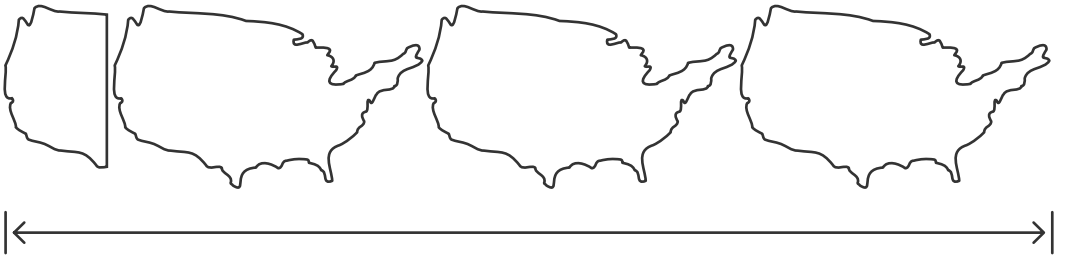
Utilities are no different.

Even those utilities that experience technology hesitancy have taken steps forward, whether it is by updating to enable smart grids, installing reclosers, flying drones or aircraft running LiDAR, or adding other automation.

But today, you can take a massive step forward in your operations by bringing satellite and AI technology to your vegetation management.

This new climate technology brings you the capability to quickly assess vegetation along your utility's rights of way. It's a first step toward the main goal of any utility: minimize outages and customer interruptions (CIs).





A field crew manually inspecting line miles can typically cover 10-20 miles per day, about the distance to the grocery store and back. A satellite can easily assess 10,000 line miles per day, which is more than 3 trips across the United States.

Satellites have come of age: What's propelling their popularity?

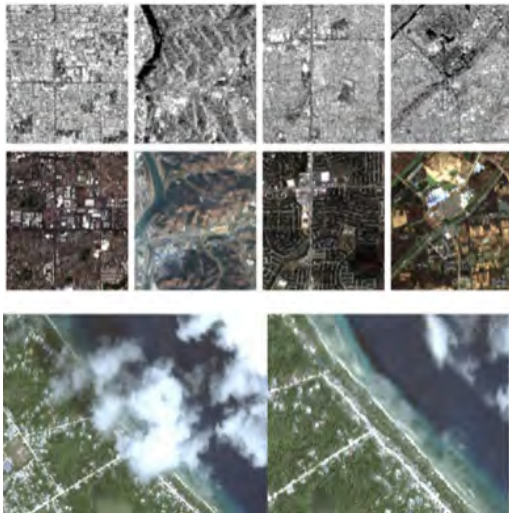
Satellites have come a long way since the launch of Sputnik in 1957, which opened the path to modern satellite navigation. Utilities are finding the new availability of satellites, their ability to scale, and their evolving imagery capabilities compelling reasons for adopting satellite and AI solutions.

With about 1,000 new satellites launched every year, the availability of satellites to monitor vegetation as needed is a nonissue — even at 24-hour intervals.

Likewise, capturing data across your entire transmission and distribution (T&D) network does not pose a scalability issue for satellites. While a field crew manually inspecting line miles can typically cover 10-20 miles per day, depending on the terrain and accessibility of lines, a satellite can easily assess 10,000 line miles per day.

And remote sensing, since Sputnik, has evolved from a single optical sensor to multispectral, and even hyperspectral imaging. Heightened resolution capabilities, once in the 80 meter (88 yard) range, have now focused down to 30 cm (12 in., or about the width of a small laptop), to provide a wealth of data points for analysis. Plus, 10 cm (4 in.) resolution is coming in 2023.

With the help of satellite imagery and AI, we can now identify, predict, and monitor vegetation threats to T&D grids. These systems can also plan disaster recovery strategies in advance of storms and wildfires, accelerate disaster responses, and provide immediate post-disaster insights to reduce outage time.



Heightened resolution capabilities now provide a wealth of data points for analysis.

By bringing data from assets into one place and adding analysis and insight, satellite and AI solutions inform effective decision-making. This means you can reduce risk, avoid penalties, and easily report to regulators, investors, and other stakeholders.

Satellite and AI solutions also bring you the power to accelerate grid hardening and reliability initiatives far more efficiently than before.

Let's take a deeper look at a few areas where satellite solutions are looking up.

Metrics that measure up

The right satellite and AI solution will support your budget optimization years in advance and, on average, can:

- Allow a 20% savings in vegetation management costs.
- Improve grid reliability by 10%.
- Reduce vegetation-caused outages by 10%-20%, reflected in improved SAIDI and SAIFI.*
- Enable ROI within 1 year.
- Lessen the need for boots-on-the-ground evaluations as well as drone- and aircraft-supported LiDAR surveying; that means reduced carbon emissions from trucks and planes for a cleaner and greener planet.
- Improve compliance with regulators to avoid penalties.

Solutions focused on augmenting and improving — not replacing

The utilities most willing to embrace new satellite and AI technologies for vegetation management recognize that satellites are just one part of the solution. Other technologies and the human factor remain constants in the equation.

A satellite and AI solution should be part of your overall system of data acquisition and risk determination. The technology is not meant to replace field inspectors or take away jobs. Trees will still need to be trimmed or removed. Trim cycles and hazard tree removal will need to be planned. Inspections will need to be conducted on the ground and/or evaluated from aerial LiDAR or satellite data.

The difference is, with satellite data and AI analysis informing your process, the individuals handling these tasks can be far more efficient in what they do.

Reliability, reliability, and reliability

As discussed in Chapter 1, the pain points utilities struggle with — especially outages that affect customers — propel them to look for better, cost-effective, and just plain reliable work plans and solutions.

- What are the reliability performances on our circuit?
- How many outages are we experiencing and how long do they last?
- What is the outage trend telling us?
- Where do our indices stand for SAIDI and SAIFI?
- Have customers reported issues? What are our regulators expecting as far as our CI response and other improvements?

It's never a good story to say to a customer who has experienced an outage:

"We do a really good job, except for the circuit you're on."

Answers to these questions drive the utilities to investigate new technologies.

It's never a good story to say to a customer who has experienced an outage: "We do a really good job, except for the circuit you're on." With the capability of satellites to provide and constantly update the complete picture of your utility's rights of way — your customers need never hear that comment.

* SAIDI = System Average Interruption Duration Index, SAIFI = System Average Interruption Frequency Index

Satellite imagery is bursting with data

As is experienced across many industries, the more data the better — as long as you put it to good use. Utilities can now work with the vast data gathered by satellites and the AI-honed insights, both of which are continually improving. Combining satellite solution information with ground truths adds up to a data-driven, risk-based approach that is highly effective.

More data can populate more data models and inform decisions around funding various projects:

- Where to allocate funds for specific LiDAR reviews to support system hardening.
- Where to update poles and reclosers for grid reliability.
- Where to rearrange trim cycles to focus on hazard tree removal.

For example, LiDAR is useful and effective, but expensive. Yet there are cases in which LiDAR is a good choice, so it is still going to be used.

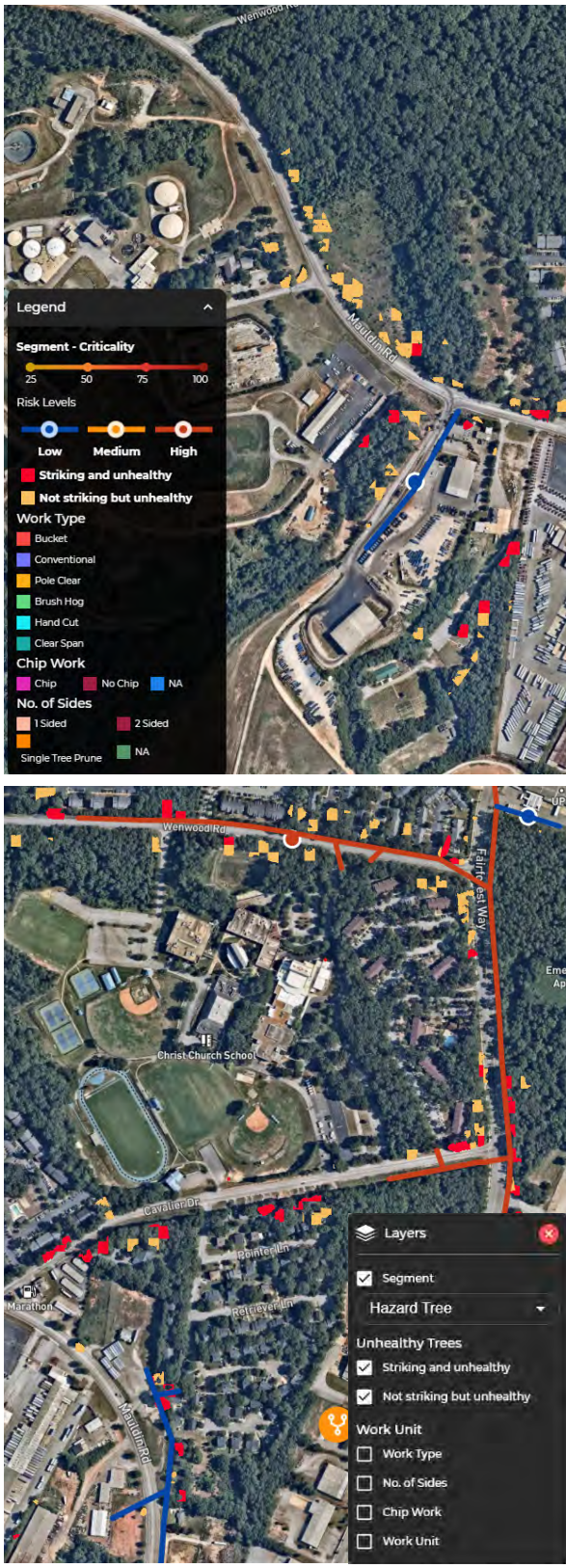
If the satellite scan shows vegetation that is not in compliance, and you combine that data with information regarding poles that are past their manufacturer's recommended date, spending the money on a deeper look at those poles with LiDAR or a staff field evaluation may give you a sense of where to start to address the issue.

Regulations are coming on strong

Whether it's climate-resilience-related regulations dictated by the U.S.'s Build Back Better Act or the UK's Environment Act 2021, or other CI-related updates issued by more regionally or locally based regulators, mandates demand response.

Consider the California Public Utility Commission's (CPUC) proposed updates to General Order 95, section 35, which would require utilities to visually inspect 100% of their above-ground lines and facilities every 12 months.

That type of mandate can be overwhelming because of the sheer volume of the task. Vegetation management is already a hefty operating expense for utilities. In the U.S. alone, clearing vegetation from high-voltage overhead power lines involves a $7 billion annual spend.



AiDash Intelligent Vegetation Management System dashboard views

Realize ROI in the year of deployment

With satellite data, ground truth and historical data, and pre-trained AI models, AiDash Intelligent Vegetation Managment System helps you plan, optimize, and execute your vegetation management. You'll be more efficient than ever.

Find vegetation risks in real time — before they damage your grid.

Optimize your vegetation management program years in advance.

Increase accountability with pre- and post-inspection streaming.

With climate change happening at a pace that even climate experts had not considered 10 or 15 years ago, and troublesome trends expected over the next 20 to 50 years, annual inspections of all vegetation may very well be a ubiquitous requirement because trees are dying faster.

But if such inspection regulations became a national standard or if something similar was enacted in Europe or other regions — how could that work be completed and paid for?

Satellite and AI solutions are gaining traction as they can enable the scale and speed of inspection and evaluation that regulatory bodies are increasingly requiring.

The opportunity in satellite-powered vegetation management

At this point satellite and AI technology solutions are becoming not just popular but almost inevitable. They are the only player in the game that can quickly and affordably scale to cover miles upon miles of T&D lines. In fact, as this technology constantly improves to bring greater resiliency and reliability, it has gained a standing as one of the most futureproof solutions on the market.

If your utility is concerned with the dollar risk of moving into this type of climate tech to meet regulations or for general expediency, opt for a solution that provides fast ROI — within a year — similar to what AiDash offers with Intelligent Vegetation Management System. This type of solution lessens the risk of sinking budget dollars into a program without a reasonable ROI to show for it. You can approach your rate board to request rate adjustments, but the ROI makes the solution almost budget neutral.

With the capabilities of satellites and the regulation and general pain points that demonstrate the need for climate tech, utilities that invest in satellites and AI on the front end will see benefits. In fact, adjusted work plans will generate savings on trim cycles that will likely far outweigh spending on the solution.

How satellite-powered vegetation management works in the real world

Real utilities. Real stories. Real results.

Vegetation management along utilities' rights of way is the first step toward minimizing outages and customer interruptions. Indeed, fully 1/3 of system outages are caused by vegetation.

But today, satellite imagery and AI helps to identify, predict, and monitor vegetation threats to the world's electricity transmission and distribution grids.

Leading utilities are already putting these innovations to work today to become more resilient, efficient, and sustainable. And they are realizing important outcomes.

Let's look at some of the ways that the industry is using AiDash's satellite-powered vegetation management solution: AiDash Intelligent Vegetation Management System (IVMS).

Top U.S. Electric IOU

Looking for a more efficient method to manage vegetation over thousands of miles of distribution lines, this large IOU found AiDash Intelligent Vegetation Management System.

They partnered with AiDash to deploy an end-to-end, satellite-powered platform to help protect customers from outages. The goal was to know as much as possible about what's growing along electric lines before service is disrupted by storms, falling trees, or overgrowth.

The collaboration helps make vegetation management more efficient. In a trial deployment, AiDash was able to optimize their prune cycle from 5 years to nearly 6 years.

That means less time and money wasted working on trees that don't yet need to be trimmed.

Another analysis helped pinpoint the locations of danger and hazard trees, which can cause up to 70% of power outages. AiDash assessed which areas were most likely and developed a prioritized list of hotspots for hazard tree removal.

Their outcomes were gratifying:

- **Unlocked** efficiencies, saving over ***$5 million per year***.
- **Improved** SAIFI (System Average Interruption Frequency Index) by about ***5%***.
- **Optimized** routine maintenance line miles by ***16%***.

United Power

As a rural electric cooperative in Colorado's **mountainous northern front range**, United Power has to be smart with its budgets and resources.

They saw that a relatively small investment in technology would yield large returns in conserving budget, staff, and other resources.

And boost system resilience and reliability.

United Power implemented AiDash IVMS to replace inefficient, manual systems that relied on office software and depended on driving the 400 miles of overhead line.

Holly Woodings, Mountain Area Manager, was able to move to a cycle trim by using satellite power to:

- **Identify** vegetation encroachments.
- **Estimate** the hotspots.
- **Create** accurate work orders for her contractors to trim the trees efficiently.
- **Conduct** satellite imaging audits to verify that the work is completed.

She was also able to accurately manage her budget with projections of the cost per line mile to trim the encroaching vegetation.

“AiDash gave me the complete results that I wanted,” said Woodings.

Watch this video for more information about United Power and IVMS.

Top 20 U.S. utility

With a flat budget for utility vegetation management and dramatic rises in vegetation-related costs and customer interruptions (CI), this utility was caught between Nature and Finance.

A new perspective restored their grid reliability. And more.

They worked with AiDash satellite-powered Intelligent Vegetation Management System for better information about their large and complicated environment:

- **100,000 miles** of overhead distribution.
- **1,000 contractors**.
- **$100 million budget** for vegetation management.

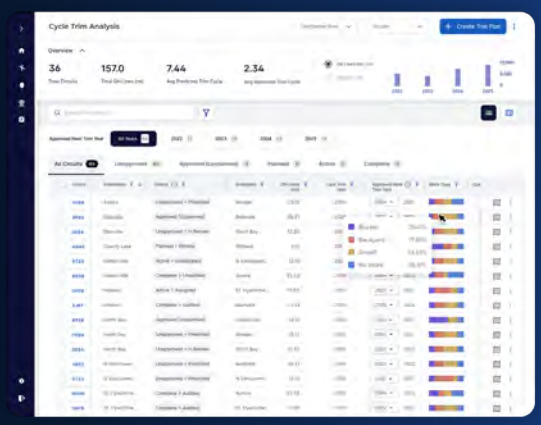
They found enormous value in the product’s cycle optimization capability. With information about every feeder in the electric utility’s system, it looked at criticality, customers, vegetation load, effort, and outage histories.

Then it ranked the feeders based on necessary trimming according to natural trim cycles, and what trimming they could afford within existing budgets.

This new data-driven approach let the company prioritize work on the feeders that rank highest for reducing CI.

“A time-based cycle approach prune plan is best practice today, but a data-driven optimized approach will soon be the industry’s best management practice.”

— Vegetation Strategy Manager at a top 20 electric IOU



Overview of AiDash IVMS cycle trim optimization and work type identification dashboard

The data also helped vegetation managers identify the natural trim cycle for each feeder: Not one is the same as another.

With the Hazard Tree Spotter, the company logged more than 25,000 trees through an app that let contractors with a smartphone report overhangs, leaners, and other hazards.

Their experts found that the AiDash system supported major improvements in grow-in related outages.

For 2 consecutive years, the company beat their vegetation SAIFI goals every month and lowered their vegetation CI rate by 1/3. **In fact, they reached their best overall CI levels. Ever.**

Fortune 500 utility

The biggest challenge for this Fortune 500 utility company was not their size. Though 60,000 miles of transmission and distribution (T&D) lines and a vegetation management budget over $200 million was not exactly easy to manage.

Visibility with their contractors was the problem, which resulted in reaching less than 50% of their annual trimming goal. Other concerns:

- Costs were rising and network reliability was dropping.
- Contractors didn't have good information to support accurate bids, so their estimates were unnecessarily high.
- Without knowledge of site details, trimming crews often brought the wrong tools or equipment, causing delay and expense.
- Critical areas could be missed entirely, while noncritical areas received too much attention.

The utility turned to AiDash Intelligent Vegetation Management System to gain the visibility they need. From satellites and AI.

They found that sophisticated AI and work management software gave them the accurate information they needed to better control budgets, manage contractors, and do it all transparently. IVMS offered many capabilities:

- Build accurate work estimates, including crew hours and cost.
- Identify various work types and floor work.
- Analyze vegetation density.
- Develop detailed 5-year circuit-level trim planning based on criticality and trim cycles.
- Produce detailed bid packets and job packets for contractors.

It was a wise investment that brought almost immediate returns.

IVMS helped them plan what to trim, where to trim, and how to trim it. Contractors could handle the most critical segments sooner. Oversight of their vegetation management budget improved.

Most importantly, vegetation-caused outages dropped. And system reliability rose for their 3 million end-clients.

How did they get those results?

- Identified over 30,000 line miles that didn't require immediate trimming.
- Spread trimming costs over 5.6 years instead of 4.6 years.
- Trimmed the most critical areas more frequently.
- Made contractor bids more accurate by understanding site restrictions early.

Read the full case study for more information about this Fortune 500 utility and IVMS.

Major electric utility co-op

Over 80 years, across 16 electricity distribution co-ops, and for 1,000,000 customers, this power cooperative has supplied power reliably.

But their collection of survey technology had grown in complexity just as its effectiveness dropped: They still had poor visibility of their whole network and primary risk areas.

Their vegetation management systems were mostly manual and paper-based. And unable to help the co-op reduce their operations and maintenance budget.

They needed a fresh perspective — from space.

They chose AiDash Intelligent Vegetation Management System for satellite-powered vegetation management.

They got satellite imagery and AI, which gave them a single view of their entire network and classified their risk areas.

IVMS gave them quick, accurate details they never had before.

- Captured and grouped vegetation into different height classifications.
- Prioritized trimming schedules, saving costs.
- Predicted tree growth to show future hazard trees.

Their operations and maintenance (O&M) processes became far more effective.

They budgeted with accurate data. They called for bids with detailed plans. And they had a mobile app for their field workers that helped them efficiently complete their work.

What's more, ***AiDash IVMS discovered that 100% of earlier hazard tree interruptions had occurred in just 25% of the line miles*** — a startling finding that helped project managers focus their efforts and resources like never before.

Were they happy with the results? Delighted.

- Improved the utility co-op's multiyear trimming cycle plan.
- Shrank work-planning costs by 5%-10%.
- Dropped inspection expenses by 80%.

Read the full case study for more information about this major electric co-op and IVMS.

Globally, over 75 utilities of every size use AiDash. And our solutions are deployed on more than 500,000 transmission and distribution line miles.

Core industries rely on AiDash satellite-powered vegetation management systems to become more resilient, efficient, and sustainable through the power of satellites and AI.

Executive use cases for satellite-powered vegetation management

Why utility executives rely on satellite-based solutions

Costs are up, budgets are fixed, and expectations from both regulators and customers for safe, reliable, clean power are only increasing. Today, utility executives are under increasing pressure to raise reliability and keep costs flat even as climate change increases the risk of vegetation-caused customer interruptions (CIs) and wildfires.

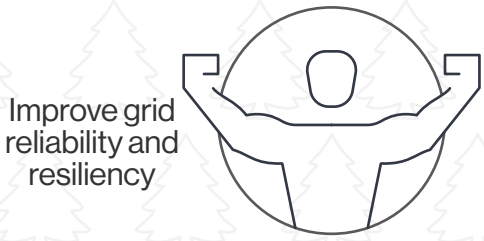
In fact, vegetation is the cause of 80% of customer interruptions.

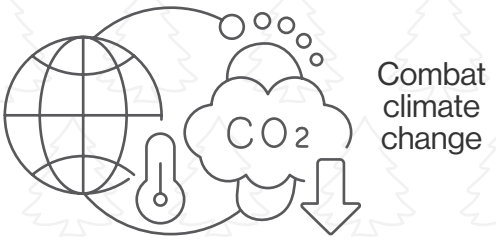
It's clear that you can't effectively manage what you can't see. The opportunity to successfully manage these conflicting demands is to optimize vegetation management with better, data-driven insights and planning.

With satellites and AI, electric utilities optimize vegetation budgets and work plans to save costs, improve grid reliability and resiliency, and enhance safety. And they are realizing ROI from Year 1 of deployment.

Gain fresh perspectives from space

Managing vegetation inside and outside utilities' rights of way (ROWs) is the first step toward minimizing outages and CIs. With the help of satellite imagery and AI, you can now identify, predict, and monitor vegetation threats to electricity transmission and distribution grids. These systems can also develop disaster recovery strategies in advance of storms and wildfires, accelerate disaster responses, and safely provide immediate post-disaster insights to reduce outage time.





Advancements in satellite technology and AI allow efficient capture and analysis of vegetation management data. Far beyond what popular mapping apps display, today's advanced technologies offer satellite images with sharp resolutions of 30 cm (12 in.), and 10 cm (4 in.) is coming soon. With the ability to detect light well beyond what human eyes see, today's satellite AI can evaluate tree species, vegetation health, moisture content, ground movement, and more — even at night and through clouds.

In light of these innovative and proven systems, traditional vegetation management is no longer sufficient. By comparison it is costly, time-consuming, and highly subjective. Sending personnel into the field and deploying aircraft with remote sensors takes more time to collect and process data about ROW vegetation. And they can't scale to a satellite's ability to report on 10,000 miles of vegetation in a single day.

With fast, comprehensive, and accurate data, today's satellite and AI systems also incorporate existing data from field teams, remote sensing tools, and enterprise applications. The resulting reports and predictions guide vegetation managers with useful cost-benefit analyses and prioritized workplans.

Build reliable and resilient rights of way

Satellite and AI solutions help you make better, data-driven decisions to reduce power outages and customer interruptions. You can improve SAIDI and SAIFI* indices for your customers while you conserve your vegetation management budgets. AiDash customers have reduced vegetation-caused outages by 10%-20% and improved grid reliability by 10%.

To help improve system resiliency, satellite technology allows utilities to safely monitor disaster and weather events by capturing images before and after them. It helps utility managers locate and assess damages and determine what kinds of equipment and tools are needed for repairs. It also helps in subsequent events to assess risk, predict damage, and strategically stage crews and equipment beforehand.

Do more with your O&M budget

With a satellite-enabled surgical approach to vegetation management, you can reduce wasted operations and maintenance (O&M) effort as well as prevent many emergencies. Map your network with satellites to prioritize risk, allocate budget in the right places, and accurately predict where and when your vegetation risks exist. Satellite AI enhances your agility by collecting vegetation data, processing it, and providing going-to-work plans in a fraction of the time required by manual methods.

Many utilities find enormous efficiencies from replacing traditional cycle-trimming plans with efficient, data-driven plans, which don't ask them to pay for unneeded work. Better ROW data also allows contractors to make more accurate bids because they know the actual site and tree conditions. And those bids are often lower because travel time is more efficient and equipment needs are more precise. Validation of the work is faster, more accurate, and safer than before, with cost-effective before-and-after analysis of vegetation changes in automated reports.

These efficiencies are especially important for today's utilities, which now confront the pressures of inflation and other drivers of cost increases for contractors and materials. AiDash customers reduce their vegetation expenses by 15%-20%, giving vegetation managers the flexibility to move budget from cycle trim to other pressing issues along the ROWs.

Get your crews home safe each night

Tree work is inherently dangerous, with 15 times the fatality rate of all other industries, according to the U.S. Bureau of Labor Statistics. This regrettable statistic highlights an important advantage of satellite AI in

* SAIDI = System Average Interruption Duration Index, SAIFI = System Average Interruption Frequency Index

inspecting and monitoring work sites from a very safe distance to prepare work crews for their day's work. Remote inspections by satellites are equally fast, economical and safe for sites that range from open meadows to swamps, mountains, and areas of disruption.

Field technicians and supervisors don't need to enter hazardous work areas as frequently, avoiding exposure to the dangers of high-risk environments. With terrain characteristics and other site-specific information gathered beforehand, crews have AI-sourced recommendations for the right equipment and tools for the necessary work.

Rise to climate change

Climate change has real impact on vegetation in electric utilities' rights of way, with increasing tree disease, severe storms, droughts, and wildfires. There are also rising expectations among utility customers and regulators for safe, reliable, clean power. Utilities cannot fight or stop the occurrence of natural disasters, but they can and must be prepared to predict, plan, and mitigate climate change's effects.

Satellites offer a far lower carbon footprint than field teams driving equipment to sites for initial inspections, for the work itself, and for confirmation of the work. Today's satellite AI systems also prevent unnecessary work by supporting data-driven vegetation management that replaces inefficient cycle trimming with specific trim plans for trees that actually need it.

Inform your communities

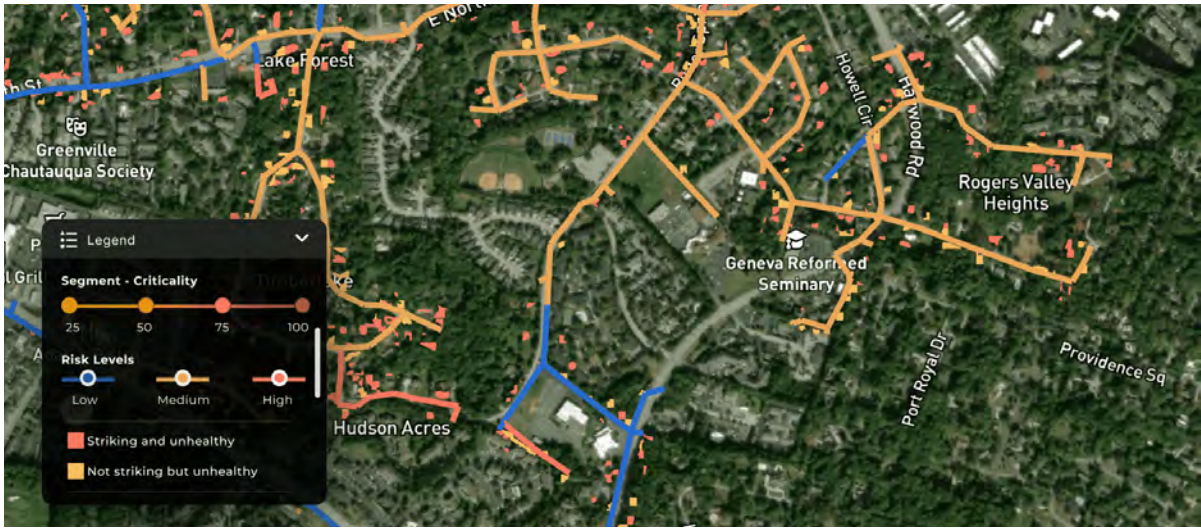
Because the world is becoming more dependent on electric power to reduce greenhouse gas emissions, electric utilities must redouble efforts to ensure safe, reliable delivery. Here, too, is where utilities can apply the value of clear satellite data and detailed AI insights in day-to-day vegetation management. Power grid reliability and resiliency are now more important than ever.

Just as essential as dependable electricity is a dependable electric utility. To set and fulfill expectations among customers, clear and useful communication is key. Satellite AI develops faster, more accurate information about ongoing disaster response in a region than any other remote sensing system. Ensure community safety just as you ensure workforce safety with clear, precise information about road closures, restoration work, downed lines, and more.

Wherever you're sending repair crews, you'll want to keep customers away for the safety of both groups.

Vegetation manager's use cases for satellite-powered vegetation management

Better data drives better insights and reduces customer interruptions



Vegetation is among the leading causes of utility power outages. That means vegetation managers have the single biggest role in preventing customer interruptions (CIs). But it's not easy, is it?

Climate change has altered the stakes with increased extreme weather: high temperatures, violent storms, searing droughts, devastating floods, and more. Storm season preparation, response, and clean up now last all year. Fire season is more destructive and longer, too.

At the same time, vegetation management costs are up, budgets are flat or worse, and expectations are increasing among management and customers for safer, cleaner, and more reliable power.

Have vegetation management practices kept up? Yes and no. Innovation has blossomed across the spectrum of tools and techniques for the electricity industry, but many utilities continue to rely on legacy practices that don't meet today's needs.

One of the more prominent innovations is using satellites and AI for vegetation management. Satellites can detect vegetation clearances and health in and around utilities' rights of way (ROWs). With a view from space, they can monitor ROWs at a scale that's never been possible. As a result, they are transforming operations, maintenance, and sustainability.

Now vegetation inspections and mitigation measures can shift from a legacy, calendar-based approach to a data-informed, risk-based approach. Utilities now optimize their vegetation management with better,

data-driven insights and planning for lower costs, improved reliability, and enhanced safety.

Vegetation managers who prune trees, cut costs, and improve grid reliability and resiliency with the power of satellites and AI are already realizing return on investment from Year 1 of deployment.

Traditional methods of vegetation management don't cut it anymore

Legacy methods worked well with the tools and conditions they were built for. But are they right for vegetation in today's environment?

Yesterday's approaches offered limited data that was siloed and had to be managed manually, limiting the opportunities for effective, comprehensive planning. Compared to new technology, operations and maintenance became inherently slower and increasingly less effective. Decision-making was restricted, with little visibility of urgent situations and hazards. Managers didn't have the information they needed to prioritize tasks optimally.

As a result, the best available method was less efficient, scheduled maintenance cycles, and costly reactive maintenance.

That's not enough for today's electric utilities. Innovation is needed now.

A new perspective from space with satellites and AI

Satellite technologies have advanced rapidly to now offer a highly data-driven approach to vegetation management. With selection among multispectral, thermal, and synthetic aperture (SAR) imaging, satellites take the range and frequency of vegetation monitoring to a new level.

More than just offering unique views of vegetation, satellite systems have the biggest advantage in putting historical information to work. Analyzing combinations of different scans over time yields fresh perspectives that field crews need but can't gather for themselves.

But experts in the field remain a crucial part of the entire system. Equipped with a mobile app that is connected to the desktop application in the head office, field crews can capture information from the field and validate satellite findings. Perhaps more importantly, with satellites scanning vast areas, the field crews can spend their valuable time in high-priority or high-risk zones where human expertise is needed.

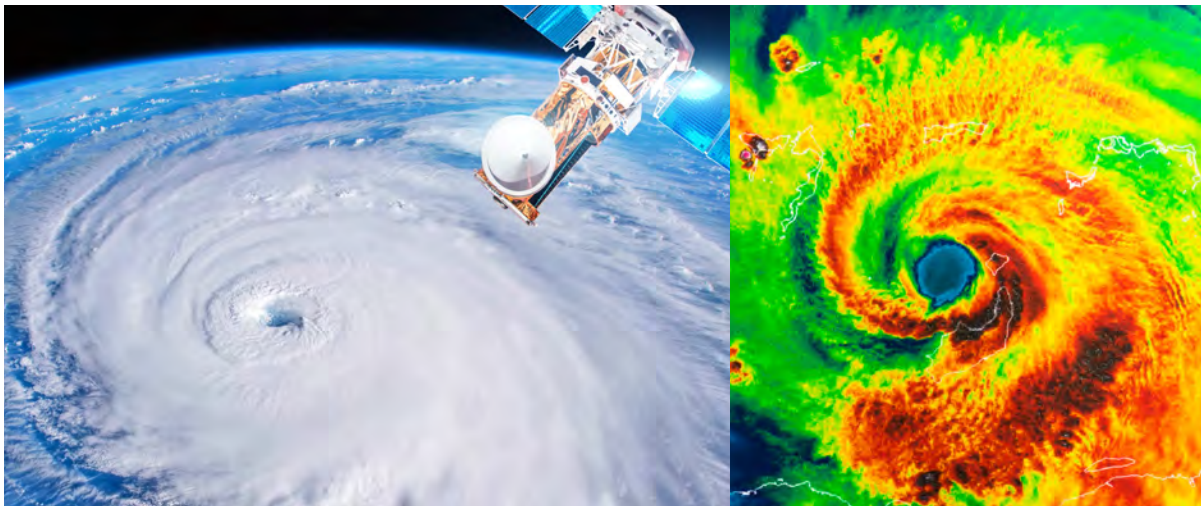
With state-of-the-art AI and machine-learning models using an expanding variety of geospatial images, these systems are trained and calibrated continuously with millions of data points across different vegetation, terrains, and regions. The models are also reviewed extensively against ground truth by ISA Certified Arborists and industry experts to validate support of clear, optimal vegetation management plans.

How to manage vegetation routinely and in disasters

The power of satellites and AI helps you prune trees, cut costs, and improve grid reliability and resiliency. Use satellite technology to gain a 360-degree view of transmission and distribution ROWs, and to detect and forecast sideline and floor growth, providing a full picture with pinpoint accuracy.

You can also seamlessly connect the satellite data with most of the industry-leading third-party applications to increase productivity and streamline workflows. This synchronizes data across systems and supports a unified view that turns critical data into actionable insights.

Using satellite data, ground truth, historical data, and pre-trained AI models, electric utilities plan, optimize, and execute their vegetation management for efficiency, reliability, and resilience. Build data-driven processes to reduce CIs, improve SAIDI and



SAIFI*, improve grid reliability by up to 10%, and reduce vegetation-caused outages by 10%-20%.

A satellite and AI solution is a force multiplier for your teams, efficiently scanning miles of ROWs to identify the areas where your vegetation experts can apply their skills more effectively. These are the areas that show the greatest risk of vegetation encroachment or the areas that are most important for surrounding communities.

You can also improve the safety of your teams by sending fewer people to the field, using advanced knowledge of terrain and other conditions to be sure the correct equipment and tools are sent.

Optimize cycle trimming

Manage your cycle trimming more accurately by using satellites to identify, predict, and monitor your ROWs for a wide variety of benefits.

- Automatically develop more accurate bid packets.
- Calculate natural prune cycles at circuit and subcircuit levels.
- Plan with all your utility constraints, such as budget and effort.
- Reset your risk evaluations more often with cost-effective satellite scans.
- Reduce overall risk by trimming your highest risk areas each year.
- Automatically create work plans that your field teams receive via a mobile app with no delays for printouts and other administrative delays.

Weather any storm

Satellites and AI are also effective in forecasting storm and wildfire outages and damages to help you plan quickly, restore safely, communicate accurately, and build climate resilience. With a view from above and data from your history, they let you predict outages with reliable information as early as 72 hours before landfall.

In one system, you can track weather parameters hourly and spot damage-prone areas, predict outages, and prioritize resources and logistics. Plus, you can estimate resources to prepare your field, engineering, and operations. Record field assessments and observations with a mobile application for notes, photos, and comments.

With near-real-time, clear information, you can transform your customer communication and satisfaction with accurate restoration time estimates.

But before you can realize the benefits of satellite-powered vegetation management, you have to get buy-in at your utility.

* SAIDI = System Average Interruption Duration Index, SAIFI = System Average Interruption Frequency Index

Change management: How to secure buy-in

Gain support for satellites and AI at your utility

Your decision to bring satellite-powered vegetation management into your utility is a move toward ***resiliency***, ***efficiency***, and ***sustainability***.

But the move beyond that first step to results requires support from the people who work with the technology. The new solution will be disrupting work processes that have been in place, possibly for decades, and those shepherding the change will need answers to the whys and what-fors that may arise.

The No. 1 and 2 ways a satellite- and AI-driven vegetation management solution can ensure company buy-in are a single, constantly available, and reliable point of contact and a decided focus on staff engagement within the implementation process.

The customer success manager — an imperative change partner

When deciding on a satellite and AI solution you need to know what support will be provided. While the promise of a general customer service team may be somewhat reassuring, pressing for a single point of contact can prove invaluable.

A dedicated customer success manager (CSM) will save the steps of tracking down exactly who can make a change in your solution's analysis process or who can explain a dashboard feature.

Plus, the familiarity of a dedicated CSM adds ease and a comfort level in the transition from a pilot to a software-as-a-service (SaaS) implementation.

Pilot process buy-in

Top management who have greenlighted the pilot will, of course, be initially committed to a satellite and AI solution. The pilot process should serve to strengthen that buy-in.

Goodwill toward the pilot can be dampened if too much engagement is expected from your managers. Look for a solution provider that can create the pilot without a major disruption of operations. For example, can your provider move forward with just these basics from your utility?

- GIS (geographic information system) shape files to identify where your lines, poles, protective devices, and meters are located.
- Outage history.
- Vegetation management cost information.

Throughout the timeframe for a pilot to go live [approximately 6 months for the AiDash Intelligent Vegetation Management System (IVMS), depending on the number of line-miles included], you'll want to ensure that your CSM is available to guide you through the process of basic pilot activities of your satellite and AI provider:

- Acquiring imagery.
- Reviewing analyses.
- Conducting field validation.
- Developing internal processes.

You'll also want to make sure your selected provider engages a certified arborist to walk through findings with you. You'll need an understanding of these results to compare with current ground truth regarding your vegetation management approach.

In addition to confirming the value of the solution and affirming the move to a subscription contract, specific findings of efficiencies and improvements will be the extra boost management needs to engage staff in the new solution.

SaaS implementation buy-in

There are skeptics at every organization. They may point out technology concerns or budget issues as you move from the pilot to a SaaS program.

The participation of a CSM is essential to help you manage this transition. In addition, you'll want to assign "change agents" within your utility to assist with onboarding, including:

- Training on features and functions.
- Education in best practices.

Also, look to your CSM to connect you and your staff to subject matter experts, as needed.

But there is much more your top management and CSM can do to ensure the transition goes smoothly. Confirm that your CSM will be helping with these areas of your SaaS implementation process:

- Optimizing system operations.
- Tailoring analytics.
- Building use cases.
- Validating field results.

Caveat: Don't overlook company culture

There is a reason "If it ain't broke, don't fix it" has become a modern-day proverb. This sentiment often lies behind a general employee mindset to challenge major workplace changes.

Now is the time to make sure those whys and what-fors are answered.

And not just by memo.

Your change agents — individuals who not only understand the new technology, its features, and its benefits, but also can explain them with the staff's point of view in mind — have a vital role to play now.

Here are some approaches they can take for moving past reluctance and getting that essential employee buy-in.

Help current staff work smarter

Assure those pushing back — "I don't want to take work away from my guys" — that new satellite and AI information is here to inform, not replace staff. The work isn't going anywhere. The new data will direct staff to the most urgent work first and map out the most effective trim cycles.

Keep your workflow apps

If you choose this approach with your provider, you'll be pushing the satellite and AI data into your current workflow program(s). This keeps any learning curve minimal and reduces staff anxiety over the change.

Get information. Here. Now.

Information availability at the click of a button empowers all levels of the utility, from executives to the field team. If a hazard tree is in danger of causing an outage, both management and workers can easily spot the issue and take action. That means field staff addressing a nearby trim cycle won't have to wait for management to plan their day. They can move directly to the danger tree situation and communicate with management with details from the scene.

Talk SAIDI and SAIFI*

Everyone understands an outage. No one wants to experience one at home or at work. And your staff does not want to see one on their watch. Boost confidence in the satellite and AI approach by discussing where the pilot has shown a reduction in outages and better reliability numbers reflected by SAIDI and SAIFI.

Change management, not punishment

In your timetable for employee onboarding and initial system use, build in room for learning flexibility. When employees know that they have time to learn and that they aren't going to be penalized if they don't get it all right in the first 30 days, an easier, less frustrating transition is in store.

With a CSM providing the constant steering of your project that keeps top management engaged and your own change agents working to educate and allay employee fears and suspicions, you'll clear the way to a smooth transition to your full satellite and AI SaaS solution.

* SAIDI = System Average Interruption Duration Index, SAIFI = System Average Interruption Frequency Index

Lessons learned: Solid info beats assumptions and pitfalls

A road map for a successful transition to satellite powered vegetation management

The information that satellites can bring to utilities might seem too good to be true. Doubts caused by this notion, lack of information, or misunderstanding of capabilities can hobble implementation of a new satellite and AI solution.

Here are four ways to overcome assumptions and pitfalls with solid info.

Get questions answered upfront — so you know

How, exactly, are details about vegetation inside and outside of your rights of way going to be measured? How much can a satellite see?

These are areas you'll want to have a firm understanding of before embarking on a new satellite and AI solution.

You are implementing a new technology, so brace yourself and embrace the new technical capabilities. If you don't have an understanding of features and benefits, or just how everything works, ask your vendor to explain.

For example, with a competent satellite-and-AI solution, these areas of concern should be easy to address — and confirm that yes, you can:

- Determine vegetation height while the satellite is moving: ***It triangulates to provide that information.***
- Get satellite readings through the clouds: Synthetic aperture radar (SAR), unlike optical technology, ***can "see" through the darkness, clouds, and rain***, detecting changes in habitat, levels of water and moisture, and effects of natural or human disturbance.
- Leapfrog beyond general insights with machine learning (ML): ***A subset of AI, ML enables your solution to "teach itself."*** ML algorithms build a model based on sample data, to make predictions or decisions to benefit your utility.

AI/ML evaluates and identifies unhealthy trees that may fall within right of way through woodland property.

Do these capabilities add up to a solution that will benefit your utility? Ask your provider for use cases and case studies. Ask what

other customers have achieved through your vendor's approach.

Exploit the agility of satellites and AI — from within your chosen workflow tools

While you can expect your new satellite and AI technology to provide workflow management, you do not need to put your current systems out to pasture.

An agile satellite and AI solution should offer the flexibility to populate your current workflow applications — SAP projects, for example — with solution-gathered and generated data. Self-built workflow systems should not be an exception to this rule.

Ensure your provider can work with the systems your utility is using or provide a workflow component if you need one.

In addition, a satellite and AI solution should extend its agility to incorporate all ground truth data to ensure you have the full picture.

In essence, the solution should capture satellite imagery and ground data, employ an AI platform that can assess, interpret, and provide insight from that data, and transfer that information to current workflow and management systems.

By specifying these data agility and compatibility requirements upfront with your provider, you'll save yourself and your staff the headache of learning a new workflow app. This eliminates the need for a redo of what is already working, and spares employees the task of learning yet another new system.

It's the power of new data in your familiar app.

Flip the script — move into proactive response

At its best, vegetation management involves insightful planning and agile execution.

But with the challenges of aging infrastructure, storms, wildfires, and other disasters, not to mention budget limitations, careful planning takes a back seat to reactive vegetation management.

How do you preplan for events that are not fully predictable and incorporate effective new steps that also consider climate change and regulatory activity?

Here is where the capabilities of your satellite and AI solution can help you avoid the pitfalls of constant reactive action and take your vegetation management processes to a proactive new level.

There is a place for reactive steps: Wildfires demand reactive response to battle flames and prevent further spread. Massive storms need reactive preparations when their paths have been identified and reactive response for grid restoration.

But you can move into a proactive approach by combining your new sky-level views with historical data of high-risk areas, where you have already identified dangerous vegetation, such as hazard trees. AI analysis and insights will help you not just to prescribe trims to prevent outage events in rights of way, but also to identify areas for system hardening and grid monetization.

Use your solution's capabilities to flip the script. Aim to look forward and plan for future risk. Maximize use of your solution's capabilities to prescribe future vegetation work rather than just keeping pace with what is happening today.

Prioritize change management — go fishing

Your pilot is a success, and you are ready to roll into a full software-as-a-service program.

Now is the time to make change management a priority.

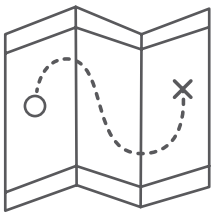
Your program is not a success without staff buy-in. And implementations are notoriously difficult.

Your provider should have staff available to help guide the transition to climate tech. But you'll need to add to that support within your utility with invested "change agents," who understand and can evangelize the technology and the benefits. These individuals must be able to talk with those who dispute the solution's value, don't believe in it, or don't get it.

The "elephant in the room" for some staff will be the assumption that the new solution will take jobs away. Let field arborists, field inspectors, tree crews, program managers, and supervisors know that they will still be needed. The intent of the solution is to optimize processes and boost efficiency. It is not an approach to cleaning house.

Rather than staff working manually or with technology like drone or plane-based LiDAR to try to determine where greater vegetation clearances are needed or where tree health is poor, satellite and AI intel will point them directly to problem areas where their skills and experience are most needed.

Compare this to going fishing with a guide: Instead of manually moving from location to location to find a good spot, the guide points out where the fruitful spots are. Let field staff know that your satellite and AI solution will direct them directly to hotspots — bypassing a tree in the bottom 20th percentile of risk and identifying danger trees in the 90th percentile of risk, for example.



Ultimately, facilitating an understanding of what the satellite and AI solution will and will not do is what ensures buy-in and implementation success.

A modern tool in the vegetation management toolbelt

How satellites stack up against LiDAR and how they can work together

Remote sensing is a powerful tool to have in your belt for vegetation management and disaster management.

And with the technology rapidly advancing, it's becoming an essential piece of the puzzle for data-driven operations and maintenance.

You have plenty of options when it comes to remote sensing, but satellites and LiDAR draw the most comparisons.

Both are going to give you a lot of data, which is key to an optimized vegetation management program. However, how they do it, the format of that data, and what decisions you can make with them, are very different. Let's compare how a satellite solution, in particular, AiDash Intelligent Vegetation Management System (IVMS), stacks up against LiDAR.

AiDash vs. LiDAR: Pricing comparison

LiDAR costs can vary with the method used, but generally, even the least expensive form of LiDAR is 5x what AiDash costs.

One AiDash customer said:

> *"It'll amaze you how cost-effective the contract with AiDash is compared to what we paid for LiDAR. LiDAR could be* ***$100 to $120 a mile****. For us to scan our system could be $15-$20 million annually. That's just not set up in the O&M budgets.*
>
> *But our contract with AiDash has been one of those expenses that's been able to be gobbled up without a lot of pushback, just because we felt like we're getting the benefit.* ***It's more than paying for itself.****"*

LiDAR requires someone in the field to complete the scans, whether that's driving a truck or flying. There are unmanned aerial vehicles (UAV), but sending those up is also costly. This is before any data analysis, which has to be done after each scan, or factoring in the carbon emissions, regulatory permissions, and safety concerns.

Satellite-powered vegetation management, on the other hand, doesn't require a person to scan or regulatory approval to fly, and it doesn't release carbon emissions. Plus, AiDash takes care of all data analysis.

AiDash vs. LiDAR: Head-to-head capabilities

Speed of data acquisition – With AiDash and satellites you can get a scan of your entire system with one click, and your information is constantly updated with new risk and reliability analysis. This speed and ease finds many utilities opting for continuous monitoring with satellites and sending LiDAR on certain sections based on those findings.

Resolution – LiDAR is 10 cm (4 in.) resolution and satellites are at 30 cm (12 in.), which is the same accuracy as an on-the-ground inspection. LiDAR is great when you need to do a small section and get things down to the inch, like with asset inspection, but it may not be in your budget for vegetation management. Satellites are a cost-effective way to monitor your entire network for clearances, mitigate potential disasters, and optimize your cycle plans based on risk and reliability. Plus, satellites are expected to be at 10 cm (4 in.) resolution by the end of 2023, making for a futureproof technology.

Weather conditions – LiDAR can be used for scanning a section on a clear day, but it can't see at night, through clouds, or during storms. Satellites use synthetic aperture radar (SAR) to pierce through cloud cover and see at night, which makes them particularly useful during disaster management and restoration.

Historical data and change detection – One vegetation manager put it like this, "LiDAR is great information, but it's stagnant. It's just a scan in time and it doesn't change. Day 1, after you scan, everything becomes assumptions, and to rescan often enough to make real business decisions just isn't in the budget." Satellites have been in orbit for over 50 years, giving access to years of historical data, and it's cost effective to scan multiple times a year for change detection.

Regulatory compliance – Regulatory approval is a factor to consider with aerial LiDAR, as many local governments have ordinances and regulations that can prevent or slow scans. Satellites are readily available without requiring any regulatory approval to capture imagery.

Features	AiDash (Satellite)	Ground-based LiDAR	Aerial LiDAR
Cost per mile	$	$$$$	$$$$
Resolution	12-inch high resolution	4-inch high resolution	4-inch high resolution
Speed	Instant	Very slow	Moderate
Change detection	Yes	No	No
Clearance detection	Yes	Yes	Yes
Tree health monitoring	Yes	No	No
Risk and criticality analysis	Yes	No	No
Regulatory approval needed	None	None	Required

The AiDash process

DISCOVER

Uncover pain points, set goals, figure out what success looks like, and start on our proprietary GIS shapefile correction.

DESIGN

Tailor the system to fit your needs. Set up custom reports, dashboards, and workflow integrations.

ANALYZE

Run analysis on historical imagery to create growth models and risk assessments on your entire system.

VALIDATE

Set up training workshops and send our certified arborists and utility experts to help build and validate plans in the field.

SUCCESS

Report on ROI, discuss additional use cases to optimize your budget and increase reliability.

Hazard detection and tree health – Satellites can monitor factors like tree health, chlorophyl content, moisture, and soil conditions to identify hazard trees and wildfire risk, as they start to decline, not after they're dead. This type of proactive monitoring can't be done with any other technology.

Operational efficiency – Remote sensing isn't just about acquisition costs. Following LiDAR scans, the data must be processed by analysts to get meaningful insights. AiDash uses AI to run powerful analysis, create workflows, and provide insights to make meaningful business decisions quickly.

How LiDAR and satellites can work together

Regardless of what some vendors may want you to believe, satellites and LiDAR complement each other.

Satellite data can be your continuous, all-encompassing view, which then gives you the confidence to send crews out to a specific area or fly LiDAR on a targeted section, saving time and money.

And if you have LiDAR data already, we can input this into our AI model, combining it with our satellite data to come up with even more accurate predictions and growth rate models.

At the end of the day, it's about finding the right balance of each for your specific needs. We encourage every utility to investigate all options before deciding, and if you're on the fence, ***you can always start off with a proof of concept***.

Or if you want to move ahead with a full system implementation, with a team dedicated to your success, you can move confidently to data-driven, satellite-powered vegetation management.

At AiDash, we aren't just setting you up and leaving you to figure things out, either. We work with you to configure the system to your needs, tailor analytics, build use cases, validate in the field, and set up a process that everyone, from executives to field supervisors, can buy into.

How to work proactively with your regulators

Bring a data-driven plan to ensure compliance and minimize liability

With regulations coming from utilities at both the federal and state levels, steps to keep relationships with regulatory agencies moving smoothly are vital.

Consider FAC-003-04 standards for transmission vegetation management, which require minimization of encroachments from vegetation located adjacent to the utility rights of way (ROWs). Enforced by the U.S. Federal Energy Regulatory Commission, or FERC, it is just one of many federal-level regulations enacted by countries around the globe.

Add to that burden regulations from state and often local agencies. Most support similar missions — to ensure that efficient and reliable energy is delivered to consumers safely, securely, and cost effectively — but specifics will differ from state to state, agency to agency.

In general, regulators try not to pierce the veil of managing the day-to-day business, but they do require compliance with guidelines and protocols.

Compliance is necessary to stay in good standing with regulators and avoid hefty fines for violation. Being on good terms also makes it easier to bring new issues and approaches like satellite-based vegetation management to regulators for positive resolution.

Let's look at 5 ways to work proactively with your regulators.

Ask for what you need within annual reporting

Do you have work you want to move forward with and need to ask regulators for funding — approval on new rates? Are you looking to implement a satellite and AI solution? A best practice is to work that proposal and request for funding into your annual reporting.

Yearly reporting and processes to review work and budget requests within such reviews are typically already established. So, getting your new plans and requests in front of regulators with your yearly report saves the struggle and protracted processes of special hearings, which can take months or even years to complete.

Review the FAC-003-04 standards for transmission vegetation management.

Review

https://www.nerc.com/pa/Stand/Project%20200707%20Transmission%20Vegetation%20Management/FAC-003-2_White_Paper_2009Sept9.pdf

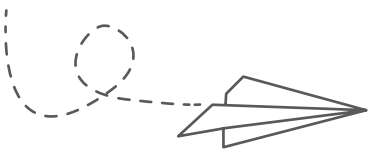
And, while you may need to go out and do the time-sensitive work you are proposing before the regulatory approval is in place, getting your ask before the regulators within the annual reporting means you'll have your answer sooner rather than later.

Create a risk profile

If you've already put a satellite and AI solution in play, you are reaping a vast amount of valuable data that can inform operations and maintenance. This is also information that can convince regulators to approve current and future funding for different programs.

Remote sensing provides real data, essentially your proof of concept, to bring to regulators to show that you're actively working on a plan: This is what we've been using, this is how it works, and these are our results. It can even help to decrease your liability should a disaster occur.

Think of remote sensing results almost like a paper trail.



Run AI analysis to spot areas of concern or high risk. The system flags these, and it recommends ways to provide the best results in your budget. Then you can do a post-work audit after the fact using satellite imagery to ensure the right work was done in the right area.

Taking that data-driven report to your regulator is a massive asset in your corner and may even help you make the case for more funding. For example, show regulators: This is what we've been able to do, but with more money to address trees outside ROWs, we would be better able to sustain and improve our reliability.

Stack your deck with concerns most regulators relate to — and that means customers

Satellite-powered vegetation management is an approach with myriad benefits for utilities. But what's in it for the customers? That's what the regulators will want to know.

It's understandable, since the customer typically assumes the cost for large projects on both the transmission and distribution sides in the rates they pay for service. There must be a very strong customer connection. Every investment must be for the benefit of customers either by improving service reliability or accessibility.

Beyond the new projects, keep in mind that regulators are also very sensitive to customer issues and complaints. If you've had challenges such as outages or other service issues, be sure to not only identify them but also show what you have done to fix the problems.

As you advocate for your plans, bring SAIDI and SAIFI into the mix. If your numbers are great, you are reinforcing your positive image with your regulator. If they are lackluster, use them to your advantage. Explain: Here's where we see issues, and here are the adjustments and technology changes we believe can address these challenges.

Bring contractors and providers into the conversation

Contractors and technology providers can be assets or allies to a utility as it presents plans to a regulatory board.

Contractors have their own pain points in trying to deliver what the utility needs as far as cycle trimming, pole replacement, or hazard tree identification, for example. Include this contractor story in communications with regulators. What does the contractor need to improve their work? In the case of satellite-based vegetation management, how will contractor staff work with this technology? What will they be doing to support it?

Technology providers, too, can reinforce the need for your proposed plan, but take care to avoid marketing spiel. Focus instead on how the solution, such as satellites and AI, works. Describe how it has worked in the past with use cases and success stories from other customers.

Where appropriate, offer to bring contractors or providers before regulators at their request. Just be sure to preapprove their presentations. Then, let them tell the story for you.

Keep turnover in mind

Annual reporting is your opportunity to educate regulators about your utility, its reach, history, current performance, and plans.

And this complete description of who you are and what you are doing bears repeating. Every year.

With responsibilities that often have them working on overload, individual members of the regulatory body may not recall a utility's specifics year over year.

Plus, turnover is a constant.

Some regulators are directly elected and may be out at the next election. Others are appointed, but, again, if there is a party or political change, new regulators may be joining the agency. A change in governor, for example, may very well clean house for the related public service commission.

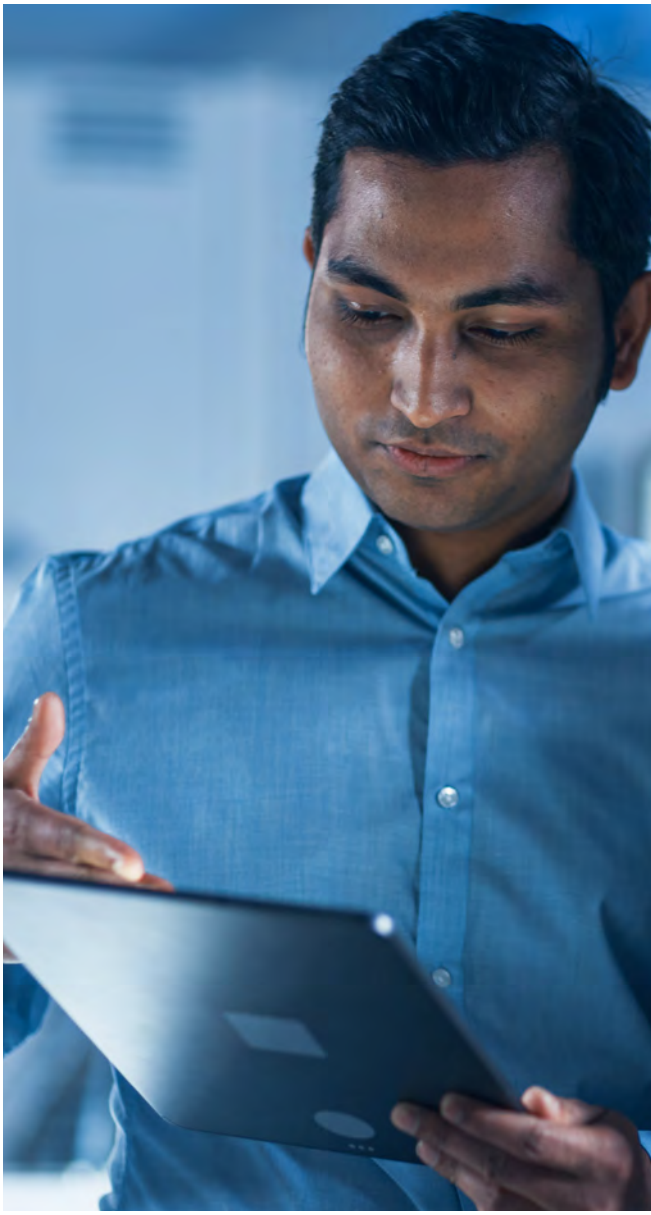
In addition, serious events may prompt resignations: For example, five members of the Electric Reliability Council of Texas (ERCOT) board, which oversees the Texas electric grid, resigned after a 2021 winter storm left more than 4.5 million customers without power.[2]

As new members onboard at regulatory agencies some may not have deep background in utility operations, and certainly will not be up to speed on your utility.

A patient, educational mindset is a must for building and keeping a positive relationship with your regulators.

In addition to the above proactive approaches to regulators, consider presenting a solution like AiDash Intelligent Vegetation Management System, which delivers ROI in the first year. Relying on current, accurate data from this satellite and AI solution, utilities quickly realize that they don't need to trim and pay for everything that they previously planned for.

Present these savings to regulators, so you'll need to request additional monies only if necessary in other areas.



[2] https://yaleclimateconnections.org/2022/10/world-rocked-by-29-billion-dollar-weather-disasters-in-2022/

The unseen advantages of satellite technology

Unexpected benefits of satellite-powered vegetation management

Beyond the expected advantages of employing satellites and AI in utilities' vegetation management are many real but perhaps hidden benefits.

At its heart, satellite-based vegetation management helps with lessening customer interruptions (CI), reducing costs, increasing grid reliability and resiliency, and establishing data-driven prune plans to improve SAIDI and SAIFI*, while ensuring crews are focusing on the right work.

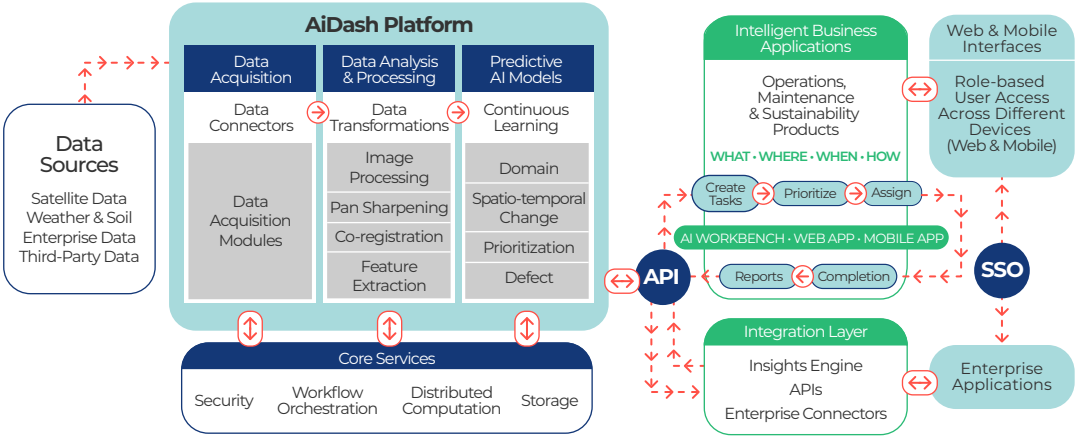
But along with those obvious advantages come many "hidden" benefits in the head office, in the field, in served communities, and with regulators. Let's take a look.

Comprehensive data at the desk

These days, data drives high-performing operations in any business. Most utility vegetation managers have a wealth of right-of-way (ROW) data that flows in from field teams, drones, aircraft, and more recently from satellites. All this data comes in as photographs, data streams, LiDAR files, GIS location information, written reports, and spreadsheets. And that data is often siloed in separate systems that don't talk to each other, leaving vegetation managers to piece it all together.

How can anyone make sense of all that data? With great difficulty and a wide margin of error.

* SAIDI = System Average Interruption Duration Index, SAIFI = System Average Interruption Frequency Index



How the AiDash AI platform works

Satellite analytics changes everything. Vegetation managers now realize far better agility by using all the information the utility already has, including remote sensing data and even enterprise data.

An AI platform automates the data collection process and includes easy connectors from external data sources, integrating the data into comprehensive analysis that yields reliable, accurate conclusions, reports, and recommendations — including historical views and trends.

A view with all the data even helps make budget management more effective. With the right data, vegetation managers can pay for some vegetation work out of the capital budget.

For example, if a utility has thousands of traditional fuses getting replaced by reclosers, the satellite and AI system shows all of them at once. The manager then has the ability to see that a fuse in the middle of a group of trees could be moved upline 3 spans, still protecting customers but saving potential outages because of the tree density.

In addition, the manager may be able to move some of the related tree trimming costs from operations and maintenance (O&M) to the capital budget during the process, even if it's only a few hundred spans.

More efficiency in the field

By combining satellites and AI, vegetation management gains a new layer of intelligent automation. The system automatically creates work plans within your budget and risk-based recommendations, sending them to managers for approval. This takes countless hours out of assessing, planning, creating work plans, and coordinating with contractors.

Informative dashboards and reports enhance operational efficiency by offering useful insights at all levels — from executives to field crews. For example, a mobile app is incredibly useful for people in the field, and a performance dashboard has insights an executive or program manager wants to see.

The ability to open a computer and know everything all at once is a game changer. Managers have a bird's-eye view of their entire network to see exactly what needs to be done to achieve their objectives. It's a powerful advantage. Better data yields better bids from contractors, more cost-effective work, and efficient, accurate validation of the work.

But safety is perhaps the most important field advantage of satellite technology. The Bureau of Labor Statistics found that tree workers have at least 15 times the fatality rate and 3 times the nonfatal rate of all industries.[3] Satellite systems enhance field safety by identifying difficult terrain, such as swamps, unpaved roads, or steep topographies, and recommending appropriate equipment for the area and the work assignments.

Not to mention that letting satellite systems handle most of the pre-inspection process significantly reduces the number of miles driven. This approach cuts down on wasted time by focusing on highest-risk areas, but

[3] https://tcimag.tcia.org/tree-care/tree-worker-safety-update-by-the-numbers-another-us-vs-them/

If utilities dedicate 10% of owned land
to carbon capture, they could save almost

£300 / US$364 million by 2035

more importantly, it far reduces the chance of a vehicle accident.

Better communication with communities

Satellites and AI help utilities get ahead of community expectations for reliability and environmental sensitivity.

In disaster response, speed is everything. Every hour cut from storm restoration is an hour your community has power. Modern satellite-powered vegetation management helps with this remarkably well.

Just as important is communicating accurate information to the affected communities. With families in the dark and small businesses unable to serve their customers, time slows, and frustrations rise. Alert communities to road closures and downed lines so they aren't delayed in frustrating traffic and your field teams can work quickly, without unnecessary interference. Give them clear estimates of repair times so they can plan with appropriate expectations. Satellite technology helps all of this.

New abilities in sustainability

Like most businesses, utilities are much more focused on sustainability and environmental responsibility than before. This comes from changing expectations among internal staff, customers, and investors. The efficiency and broad perspectives of satellite-powered vegetation management systems helps with these responsibilities in many ways.

The view from space offers a smaller carbon footprint from operations by reducing the necessity of burning fossil fuels to send teams out for pre- and post-inspections. And fewer miles on the equipment mean that vegetation managers can spread repairs and replacements over longer periods of time.

Satellite tech helps utilities respond to increasing interest of investors in environmental, social, and governance (ESG) results. It's about the data again. Satellite and AI systems help to establish, track, and report on ESG metrics to help utilities track and meet their sustainability goals, to show results to management, regulators, and local communities.

In addition, utilities may be able to use their own land for carbon offsets as they pursue their sustainability commitments. With the cost of carbon credits projected to rise by up to 3,000% by 2029, organizations can now save up to 90% on carbon offset programs

by unlocking their own land assets.[4] Large landowning businesses such as utilities have an important opportunity here. If utilities dedicate 10% of owned land to carbon capture, they could save almost £300 million (US$364 million) by 2035.

[4] https://www.bloomberg.com/professional/blog/carbon-offsets-price-may-rise-3000-by-2029-under-tighter-rules/

Find the right the right satellite-powered vegetation management vendor for you

How to evaluate vendors, ask the right questions, and create a must-have list

Investing in new technology is never an easy decision, and 70% of the time those digital projects fail. Chalk it up to a lack of buy-in, poor integrations, and a lot of overpromising and underdelivering on the sales side.[5]

But with climate change, rising costs, and more scrutiny on providing reliable power now than ever before, you must invest in technology.

And, like anything else, not all satellite-powered vegetation management vendors are created equal.[6]

We've heard the horror stories of pilots going poorly, deadlines being missed, capabilities being oversold, and underdelivering on expectations.

To help make sure that never happens to you again, here's a list to give you the right questions to ask to cut through the fluff and make sure you end up with the right fit.

How quick it is from signing a contract to getting actionable data?

This is a decision that you'll have to make. It can take months to just implement certain tools and onboard. Others are much faster: For example, at AiDash we can often get you up and running quickly so that you see a full return on investment in less than a year.

What's an example of actionable insights I'll get?

Any good satellite-powered vegetation management tool must be actionable. Just getting a scan and being told "you should send a crew to check out this problem area" isn't actionable.

You likely know a lot of your problem areas. You need to uncover insights and truly be able to perfect your program.

For instance, you should be able to plug in your budget and get a list of priorities based on reliability and risk impact. Or get a list of your top 100 high risk trees in a given area so you can point crews exactly where to inspect, not just the first 100 trees they see in that area.

[5] https://www.mckinsey.com/capabilities/transformation/our-insights/perspectives-on-transformation
[6] https://www.aidash.com/vegetation-management-system/

What's your revisit rate? How often can I scan my system?

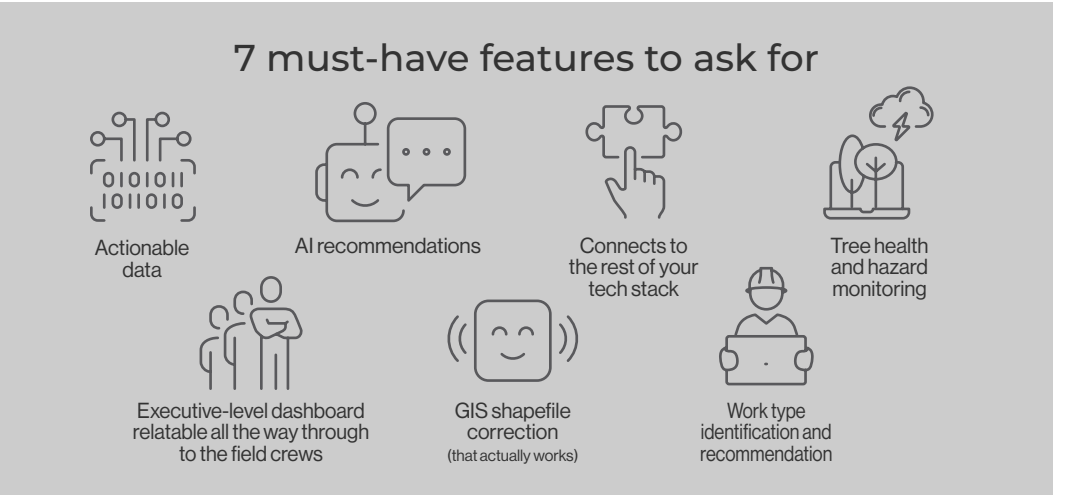
The revisit rate of satellites today is extremely fast, but that doesn't mean that's how often you can actually scan your system. Be careful here. You need to dig into how often you can scan your system, and what the vendor recommends.

At AiDash we recommend starting with twice a year, once right after leaf out, and once right before the end of growing season. We can then add on scans for disaster response or other special programs as needed, but starting with twice a year is the best cost-to-value ratio at the start.

How accurate are the models?

A vendor is only as good as their AI models. It takes a lot of data to train a model, so naturally the prediction rates will improve over time. Ideally, you want to get at least 80% alignment between satellites and the field, but if you can get closer to 90%, you'll gain even more value.

AiDash has over 75 current customers, with our models deployed on 500K+ T&D miles, which makes our models extremely accurate, oftentimes higher than 90% alignment.



Can you currently support asset inspection?

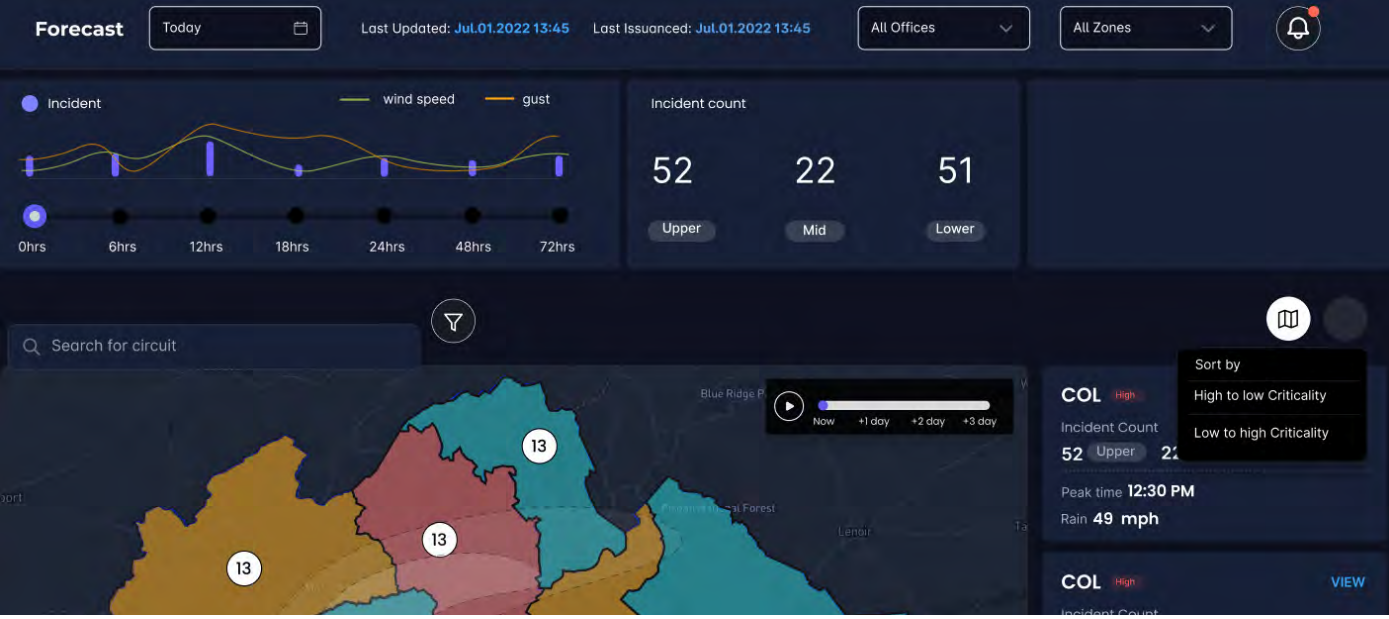
Some vendors claim this is possible today. It isn't — at least not without extremely high cost. Only a handful of commercial satellites with the resolution to perform asset inspection are available, so it is a costly and time-consuming process to get that imagery. The good news is that by the end of 2023, a brand-new constellation of hyperspectral satellites is being launched, which unlocks a ton of new use cases, including asset inspection.

Do you offer GIS shapefile correction? How?

The quickest way to experience an unsuccessful satellite project is to work with an inaccurate GIS shapefile. Without accurate GIS information, you'll never have a correct read on vegetation distance from the conductor.

A lot of vendors claim they have a solution for this, but few actually do. Try and get specifics on this if you can. If you can't (some processes are proprietary, like ours), ask to speak to a customer to get a reference on accuracy.[7]

[7] https://www.aidash.com/customers/



Incident reporting on AiDash Intelligent Vegetation Management System dashboard

How will this fit into my daily workflow?

Every utility's day-to-day looks a little bit different. You have different processes, you use different tools, you need to report a little bit differently. Really try and dig in to see how a new satellite solution fits into this. Will there be capabilities that overlap with other tools that you could get rid of, or maybe there's another tool you need to be able to integrate with.

At AiDash we often do "day in the life" walkthroughs with former vegetation program managers on our staff to help you understand if it is a good fit for your utility.

Will I be able to incorporate LiDAR data or other on-the-ground sensors?

Many utilities get data from multiple places, whether it's LiDAR, sensors, or just manual inspection recordings. A good satellite solution will help to automate the data collection process, but it should also have a way to easily plug these external data sources into the model to make even more accurate predictions.

What types of reports and dashboards are available out of the box?

There should be dashboards, reports, and insights that are useful at all levels, from executives down to the field crews. For example, a mobile app is incredibly useful for people in the field, and a performance dashboard will have insights an executive or program manager wants to see.

Make sure to think through every possible use case to see if the tool can offer the type of reports you'll need.

Do you have a way to monitor tree health or support disaster management capabilities?

Recent advancements have unlocked tree health monitoring to proactively identify, categorize, and mitigate hazard trees before they cause outages.[8] This feature should be at the top of any must-have list.

To go along with that, capabilities that support disaster management — pre-storm grid hardening, during the storm resource staging, and post-storm restoration — are incredibly important, especially if you operate in an area of wildfire risk, coastal storms, or severe winters.

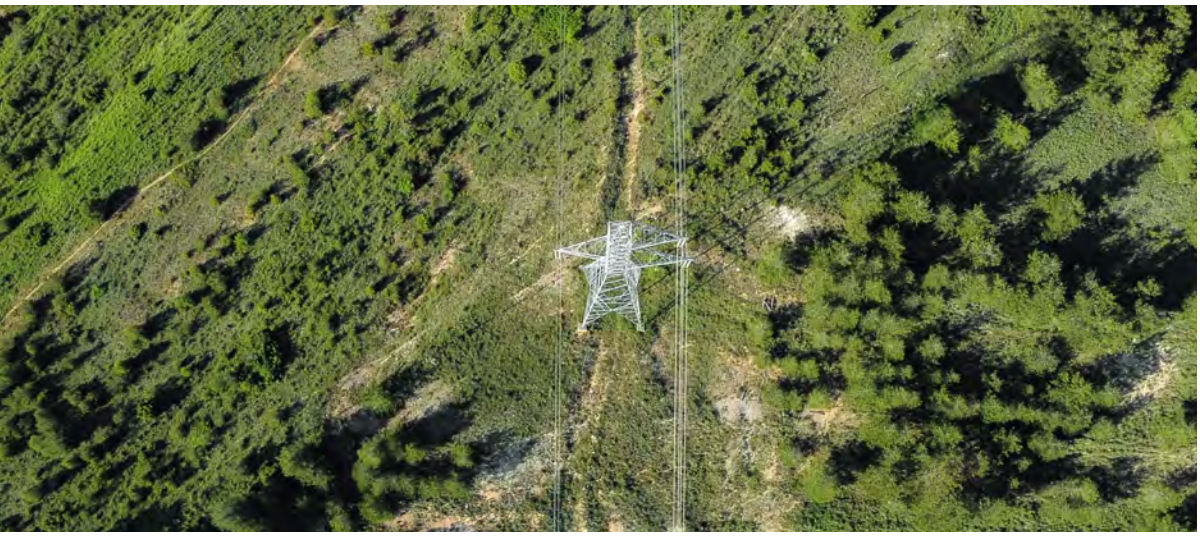
Can I talk to a current customer?

If you can't speak to a customer for a reference, it means the vendor either doesn't have happy customers, or is exaggerating capabilities when talking to you. Either way it's a problem. Whenever you're in doubt, ask for a reference. A good vendor will be happy to provide one.

[8] https://www.aidash.com/news/aidash-overhauls-utility-industrys-hazard-tree-identification-with-satellite-technology-and-ai/

What's next for vegetation management?

A look ahead for satellites and vegetation management



There's no doubt that vegetation-management-related technologies are evolving.

Yet it's not the technologies, but rather the insight from the data they gather that is game changing.

The future of vegetation management lies squarely in what utilities will be able to do with the massive quantities of data that advancing technologies provide: How can utilities turn data and insights into meaningful management capabilities?

In terms of operations and maintenance (O&M) equipment at the utilities, new options for measuring transmission and distribution (T&D) systems are coming into play. These technologies measure events and the status of equipment in the field and then communicate that information back to a centralized location.

In terms of satellites and AI solutions, heightened capabilities to collect imagery and develop insights are continually being realized. We're seeing:

- Faster, smarter, smoother, more detailed information gathering.
- Improved intelligence that keeps learning to fit specific vegetation management scenarios.
- Incorporation of ground truth data from new T&D technologies.

The advancements are great, but what will they do for utilities in the future?

Satellites: Quick and nimble and at your service

Improvements in batteries and materials have enabled space companies to create smaller satellites. Size and the ability to launch several satellites with one rocket have made satellite operations much more affordable than in the early years of their use.

In fact, we're seeing about 1,000 new satellites heading up and out to work every

year. Most can collect massive amounts of imagery from a full orbit of the Earth every 24 hours, but orbits can be completed in less than 2 hours, as well.

It is that imagery, gathered via remote sensing, that satellites can deliver to utilities to boost their knowledge about their vegetation and inform their management decisions.

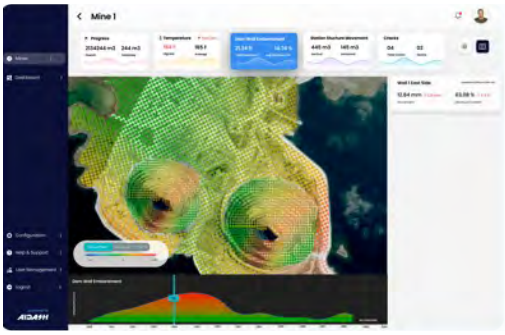
Remote sensing: See what's happening, in detail

From the earliest satellites, remote sensing has allowed observation and data gathering regarding an object or area without actually coming into contact with it, permitting speed of data acquisition and safety for field workers who don't need to visit risk-prone areas.

As remote sensing evolves, utilities benefit from more precise data about the status of infrastructure and vegetation.

Starting with optical capabilities, which take a picture much like what can be seen with the human eye, satellites have now incorporated new sensors that expand the picture with multiple bands of light. Multispectral imagery allowed 10 bands of light for analysis and hyperspectral now allows hundreds of bands.

These bands, including the newly available red edge band, provide utilities with details about soil nutrients and the amount of chlorophyll in trees, which can help determine tree health and danger tree situations.



AiDash's remote sensing can identify thermal hotspots.

Remote sensing via thermal bands is also presenting valuable capabilities. For example, identifying a thermal hotspot may be the difference in fixing a dangerous hazard around a recloser or substation before it creates a dangerous outcome.

And synthetic aperture radar (SAR) technology allows us to observe areas at night and even through clouds and smoke.

Resolution of imagery, itself, has improved tremendously since the original satellites of the Sputnik era. From imagery that could only narrow down to tens of meters that required some "guesstimating" to glean the meaning of the data, we have seen improvements that have focused imagery down to about 30 cm (12 in.). And future enhancements are expected to reach about 10 cm (4 in.) by the end of 2023.

Remote sensing has advanced to the point that we can detect floods, ground movement, soil erosion, and more. Look for these capabilities to help utilities with not just storm recovery efforts but also preventive maintenance planning, in areas where soil erosion might weaken or topple poles, for example.

But what frames the data supplied by satellites and remote sensing and makes it valuable is the analysis, via AI and machine learning (ML), which is continually improving.

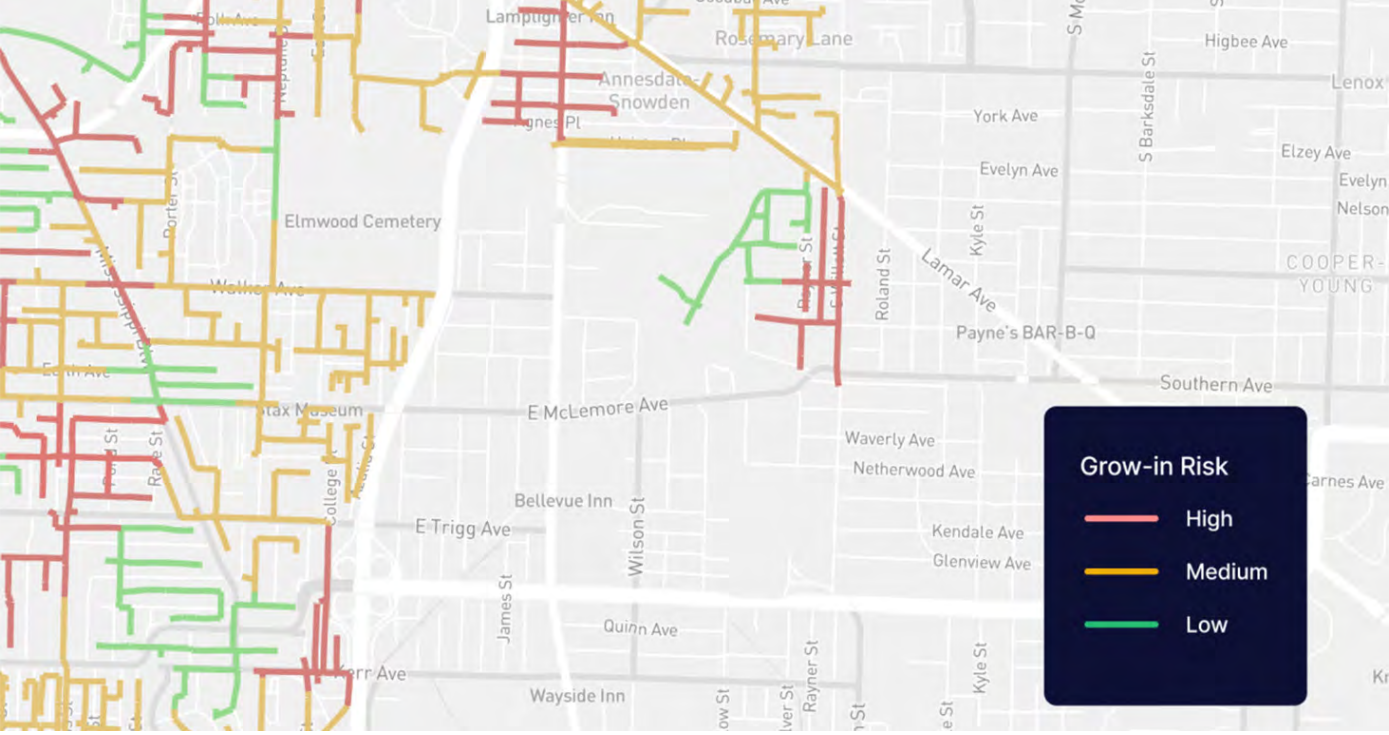
AI and ML: Ever-evolving insights

As you can imagine, adding AI and ML to the mix to process the constantly increasing amounts of remote sensing data means you need a lot of data storage and processing power. Thankfully, innovations in those spaces are ongoing, which can enable this ecosystem to thrive.

Operating with bigger, better datasets, including newer satellite data and sources of data that that are coming in from other places, AI analyzes and reasons the data to improve decision-making. ML keeps the process going, continuing to learn and improve decision-making on its own.

With AI and ML the solution keeps growing and learning from what it sees and evaluates.

Deep analysis and learning mean the future will continue to see more precise and intelligent insights.



Risk profile view on AiDash Intelligent Vegetation Management System dashboard

Satellites and AI: Ready for the today and futureproof for tomorrow

If you haven't already opted to bring in a satellite and AI solution, you are missing out on efficiencies — but only because the more time the solution has been active the better the results. The more time AI and ML have to analyze and interpret, the more recommendations you get for O&M optimization.

That is not to say you cannot jump in and ramp up efficiencies today.

If you are working with AiDash, expect a sustainable solution that delivers ROI in your first year and allows you to build on further efficiencies and savings moving forward from that point.

When you make the initial jump to a satellite and AI solution, you improve workflow. That improves efficiency. And that improves reliability.

That's because the solution allows better management of the vegetation budget. For example, instead of asking for a rate increase to pay rising labor costs in the field, deploy a satellite and AI solution. The solution can inform a more precise trim schedule that moves resources from less essential trimming zones to cover danger areas. More effective trimming means less reactive work clearing felled trees and repairing line damage.

Savings can free up funds for nonreactive work. If you are spending less on repairs, you can direct more money toward the capital projects, updating arresters, switches, polls and reclosers. These are the activities that speak to your chief mission: supplying safe and reliable service to customers.

The future also holds opportunities for satellite and AI solutions to provide improved assistance in disasters, such as preparation ahead of storms and wildfire seasons, or disaster management — getting the right resources to the right place as soon as possible.

As climate concerns grow and sustainability takes center stage, again, satellites and AI solutions can scale to measure, record, and benchmark. They can assist utilities in meeting sustainability goals and mandates.

The future of satellite and AI solutions for satellite-powered vegetation management is improvement across the board: collecting, processing, analyzing, and sharing data in a meaningful form that enhances all levels of vegetation management.

Keep current on the state of satellites and AI by visiting aidash.com.

Visit

https://www.aidash.com/

The story of satellite-powered vegetation management

How innovation and entrepreneurship created an industry that helps to keep the world's lights on

Like many Silicon Valley successes, AiDash's story includes a pivotal meeting. It was in Mountain View, California, across the street from Pioneer Park, at a workshop on vegetation management that Boston Consulting Group (BCG) hosted at their plush offices in 2018.

Gary Huntley, a long-time executive of the utility industry was working with BCG to find fresh ideas to make Entergy's electrical grid more reliable. With vegetation the top cause of outages, better tools for vegetation management were his top priority, but none had been developed. Yet.

Abhishek Singh, a successful, serial entrepreneur, had been moved by the recent destruction in California's Camp Fire wildfire, that year's most expensive natural disaster in the world. He and his partners saw need and opportunity in the satellite maps that filled the news reports. Could BCG's workshop help him understand how satellites and artificial intelligence (AI) could prevent such catastrophes?

Both men arrived in Mountain View looking for a collaborator with fresh thinking and a willingness to give and take. That moment over coffee and whiteboards would change their professional lives and foster a new industry.

What followed were many meetings in New Orleans, Louisiana, Gary's hometown. Rahul Saxena and Nitin Das, co-founders with Abhishek of AiDash, explored vegetation management with Gary over many lunches at Dooky Chase's, a historic restaurant that has for years served titans of politics and the arts.

Together, they mapped out the utility industry's existing resources and unfulfilled needs, comparing them to technology's existing functions and future road map.

Partnership was the key ingredient to this amalgamation of industry experience and technological knowhow. Phrases like "we can't do that" were never uttered. Instead, the common refrain was "we'll find out."

The result of this unique collaboration? By the end of 2022, AiDash was working with over 75 companies of every size on 5 continents. AiDash solutions have improved utilities' reliability by 10% and reduced vegetation management expenses by 20%. An expanded product line even reduces land and air sustainability costs by up to 90%.

And it all started with two inquisitive, experienced leaders who wanted to change an industry.

Meet the authors

Abhishek Vinod Singh

Chief Executive Officer, Co-Founder

A serial entrepreneur with almost two decades of experience in building innovation-led products, Abhishek is the CEO and co-founder of AiDash. An IIT Kanpur alumnus, he was formerly the COO, USA, and Head of Digital Transformation at Kellton Tech. Abhishek brings with him robust industry experience, astute domain knowledge, and innovative business and marketing strategies.

Gary Huntley

Vice President, Distribution Services at Entergy (retired) — AiDash Advisory Board Member

Gary Huntley is a retired executive with over 32 years in the energy sector, mostly in electric and gas utility operations. He retired as Vice President of Distribution Services for Entergy Services, Inc., in October 2021. During his time at Entergy, he led an organization of approximately 400 employees across Louisiana, Mississippi, Arkansas, and Texas. Gary holds a BS in electrical engineering from Louisiana State University and an MBA from Tulane University.

Edited by: Rebecca Bernstein, Douglas Howatt, and Evan Stinson

About AiDash

AiDash is an AI-first vertical SaaS company on a mission to transform operations, maintenance, and sustainability in industries with geographically distributed assets by using satellites and AI at scale. With access to a continual, near-real-time stream of critical data, utilities, energy, mining, and other core industries can make more informed decisions and build optimized long-term plans, all while reducing costs, improving reliability, and achieving sustainability goals. To learn more about how AiDash is helping core industries become more resilient, efficient, and sustainable, visit www.aidash.com.

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