RIGHT-OF-WAY SAFETY TAKEN TO NEW HEIGHTS WITH GEOSPATIAL ANALYTICS

Identification and removal of vegetation in a timely manner are vexing problems for electric power utilities, gas utilities, and their contractors.

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A DAUNTING CHALLENGE

A Northern California power utility operates 28,000 miles of electric power lines in high fire-threat districts (HFTDs). Similarly, a Southern California utility operates a comparable number of lines in HFTDs. East coast power utilities operate mileage, in areas not as prone to wildfires but more prone to asset damages whenever a hurricane strikes. Power utilities across the nation spend enormous amounts of financial and staffing resources to ensure that vegetation near power lines does not create problems for the company, its customers, or the environment. Gas utility providers are concerned with gas leaks that can lead to loss of product, infrastructure failure, and—in the worst cases—explosions.

Standard practice for these utilities and their contractors is to use every available means of gathering information to direct vegetation management (VM) and leak mitigation efforts. This often means sending scouting and forestry personnel into rugged areas far from civilization to gather information, prioritize their next steps, execute all VM plans, and provide documentation of the completed actions. Utilities are using all technology available to them to help identify issues and collect actionable intelligence, including:

- Boots on the ground, used by most utilities
- LiDAR (Light Detection and Ranging) technology, used by many utilities
- Drone technology, some utilities are beginning to trial

But these merely address the data-collection piece of the puzzle. The real power lies in the timely and accurate analysis of that data, yielding actionable alerts to off-nominal issues.

Still, in these vast areas of high fire threat and high vulnerability to weather events, individual encroachments can be present or missed during routine maintenance. That can lead—and has led—to wildfires and infrastructure destruction that threaten not only the invaluable forestland around these lines, but also lives, personal property, and the very financial viability of the utility.

A NEW APPROACH

A new approach to surveillance of a utility's entire asset infrastructure and the directing of risk mitigation efforts has started making its way into the utilities' collective tool belt. Utilities can now partner with companies that leverage satellite imagery and geospatial analytics. These companies can then use the results of this combination to get actionable alerts that can be used to mitigate safety hazards, reduce risk, and help restore service faster after the event has happened. This article focuses on a pair of companies that have come together to develop a suite of algorithms designed to help utilities deliver safe, reliable service at the lowest possible cost.

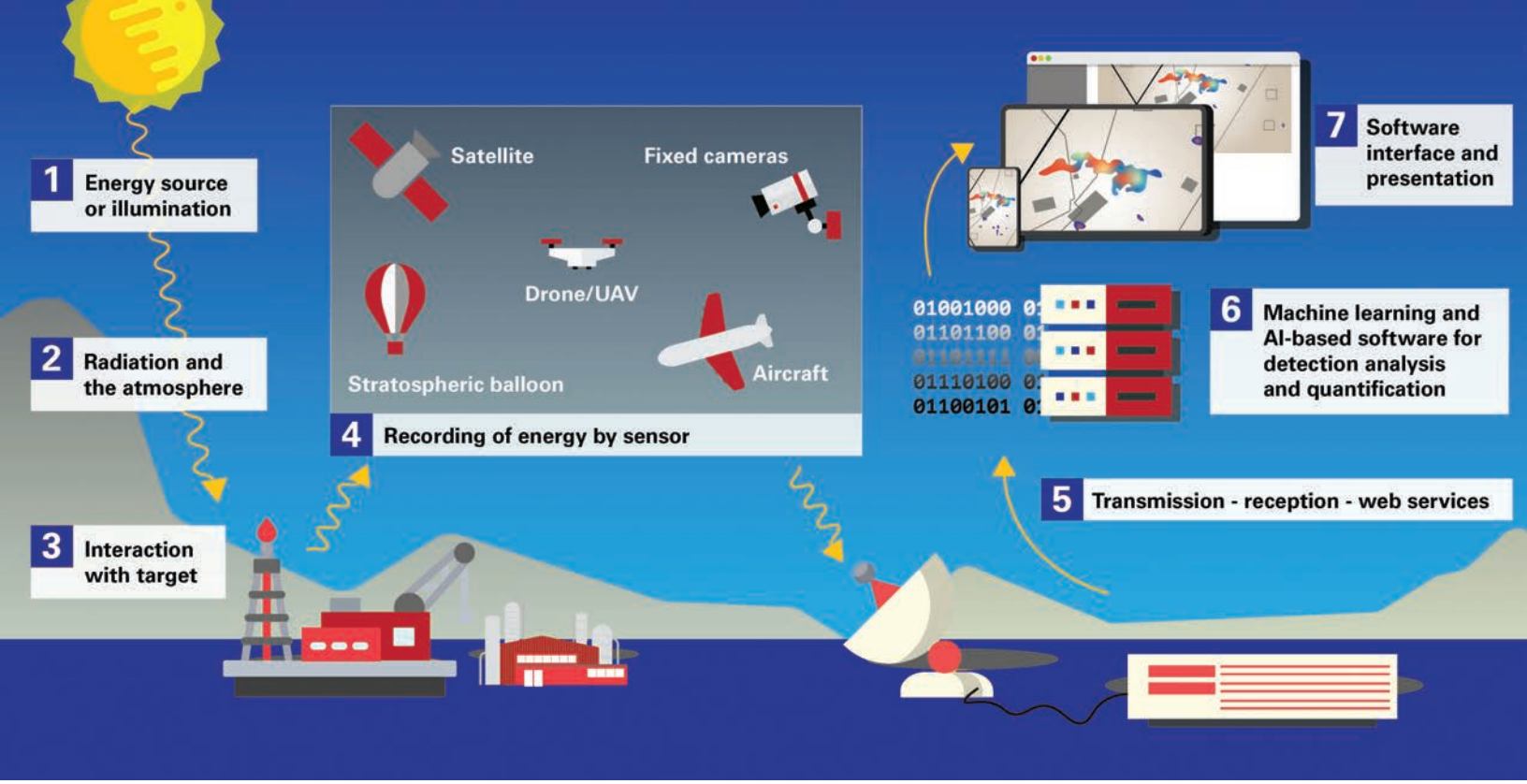
ACRT Services and Satelytics have recently teamed to harness the power of geospatial analytics to target specific and timely mitigation efforts that will help prevent forest fires caused by vegetation encroachment on power lines, determine likely failure points across a system, and pinpoint gas leaks.

Satelytics is a software company that offers cloud-based geospatial analytics for the energy sector. Multispectral and hyperspectral imagery is gathered from satellites, unmanned aerial vehicles (UAV), planes, stratospheric balloons, and fixed cameras, then is analyzed to provide both alerts and qualitative results for customers. The analysis interprets spectral signatures in sunlight reflected off objects, features, and gas emissions on or near the Earth's surface. These spectral signatures are like human DNA in that they provide specific information about features of interest (e.g., vegetation health, vegetation speciation, chemical constituents present in soil and water, land movements, gas emissions, encroachments on transmission corridors, etc.). Where other remote-sensing approaches essentially deliver photography and shape identification, the geospatial analytics approach allows companies to wring much more information from the imagery.

Today, more than 90% of the data is obtained from satellites because they provide the broadest areal coverage for the least cost, and at the greatest frequency. With satellites, data can be gathered daily and results can be sent to customers within hours. This timely analysis of petabytes of data is made possible by artificial intelligence (AI) algorithms and cloud computing, which afford infinite data storage and computing power.

Included in these automated results are the specific problem, location, magnitude, and detailed qualitative information.

The oil, gas, and water/wastewater markets have already employed this geospatial analytics approach. They have recently incorporated the technology as a staple of their safety and environmental programs. Oil, gas, and water/wastewater companies have been using the technology for monitoring revegetation programs after buried pipeline installation, monitoring for pipeline leaks, spotting wastewater effluent impacts to surrounding bodies of water, and identifying algal blooms that threaten freshwater intakes. Satelytics is currently focusing tremendous attention on the electric power utility industry because many of these same algorithms can be adapted for use in the electric utility, forestry, rail, mining, and specialty chemical markets.



EARLY ADOPTERS CAPITALIZING ON NEW OPPORTUNITY

ACRT saw an opportunity to employ this technology to help the company provide extremely timely and efficient VM services to its electric utility customers. This timely information would help the utilities mitigate risk and create value for their customers. Utilities budget hundreds of millions of dollars annually for VM. Geospatial analytics wielded as a tool can effectively direct the efforts of field workers, making workers more efficient. Instead of sending crews out to look for problems, the software automatically identifies VM problems and directs field crews to specific locations, prioritizing those that need immediate attention—preventing potential disasters—keeping crews safer in the process. The software then provides automated documentation of actions taken by field crews, thus increasing the safety of utility operations, demonstrating regulatory compliance by the utilities, and reducing overall costs for the utilities.

Some of the most compelling features of the new technology are algorithms that determine tree height, measure tree health, determine the encroachment of trees and other vegetation on rights-of-way (ROW)/corridors, and even determine specific tree speciation. The latter allows utilities and their contractors to put special focus on notoriously problematic species that result in additional risk. This information provides a powerful toolbox that increases the safety of operations for their utility customers.

These new geospatial analytics tools will help deliver value and certainty to the industry.

GEOSPATIAL ANALYTICS ROLLOUT PLAN

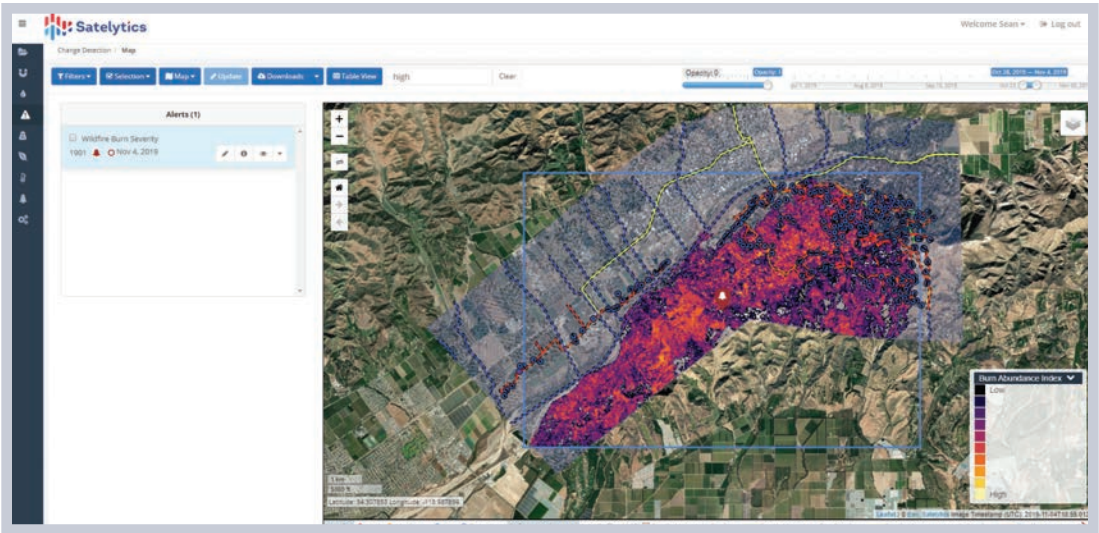
ACRT is now employing the Satelytics software to provide solutions to specific pain points expressed by utilities. Some of the current uses are listed below:

- Identifying trees to be worked (trimmed or removed to prevent encroachment on utility corridors)
- Documenting trees that have been worked
- Helping utilities to narrow their work zones
- Counting and tracking dead and dying trees
- Improving the efficacy of VM programs
- Improving the financial efficiency of VM programs

Vegetation survey tasks that would normally take weeks, months, or quarters to complete with field crews can now be accomplished in hours and days with the assistance of algorithms. The application of this technology frees field crews to travel directly to the problem location, address the problem, and get back safely with less time spent in-field or even in harm's way. The data analysis portion is accomplished in literally just a few hours—not months of post-processing or integration. The results are delivered into the hands of the users quickly to facilitate intervention before the situation changes or disaster strikes.

SECONDARY IMPACT AND FUTURE EXPANSION OF THE TECHNOLOGY

The consequences of wildfires (whether caused by VM or not) continue long after the fires are extinguished. A lesser-known effect of wildfires is the permanent impact that can change watershed areas. These impacts can include land movements, loss of sediment-filtering vegetation, and unwanted ash production. Ash swept into tributaries and reservoirs can feed algae responsible for the production of cyanobacteria. Officials in Oregon expect last year's unprecedented wildfires to cause turbidity problems for local utilities, as well as increased source water temperature, both of which are known causes for harmful algal blooms.



Wildfire-impacted areas identified by Satelytics.

After a wildfire has moved through a watershed, spring rains or snowmelt can carry uncovered soils, ash, and associated nutrients into tributaries and reservoirs, sometimes months after the disaster. Larger objects and debris are also loosened by fires and can damage reservoir infrastructure. These actions will likely drive numerous remediation projects for water managers who maintain reservoirs for recreational users and the populations reliant upon them for drinking water. Algorithms can identify point sources of sedimentation, nutrient load, and even metals, allowing for focused remediation at the earliest possible moment to combat long-term consequences. Land measurements can focus on revegetation programs and identify subsidence around a waterbody.

CONCLUSION

Safety, reliability, and value are the primary drivers of the utility vegetation management (UVM) industry. Geospatial analytics are not going to solve all the industry's problems, but they can be a powerful tool that can direct rapid decisions and subsequent field efforts. With each day that goes by, more tools are being added to VM managers' tool belts. Some of these tools are even coming from space. That is out of this world—literally. ■