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ArcGIS® Anchors Grid Modernization

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ArcGIS Anchors Grid Modernization

Executive Summary

How are utilities dealing with shrinking revenues, rising costs, and skyrocketing customer demands while strengthening resiliency? The answer: create a tougher, smarter, more secure, and healthier grid. ArcGIS® software can help. It provides understanding, engagement, and insight into nearly all dimensions of grid operations.

So, what is the problem?

Why are utilities embarking on grid modernization? What's wrong with the grid?

- Outages are not uncommon. According to the US Energy Information Administration (EIA), the duration and frequency of outages are increasing. Weather is more extreme. These changes create more hazards to the power system.
- The grid is old. The American Society of Civil Engineers' [score](#) for American energy infrastructure is D+.
- Renewable energy is growing fast. EIA projects that renewable energy will grow to 31 percent of the total US power generation mix by 2050.
- Governments deregulated markets. This has created utility business uncertainty.
- Utilities are technology dependent. Sensors abound. The grid is vulnerable to cyber-attacks.
- Customers demand better service and value.

These challenges are tough. But they are not insurmountable. They call for changes in the way utilities operate.

Grid modernization is a call to do things differently.

What's the solution?

There is an adage: *If you continue to do what you have always done, you will get what you have always gotten.* If utilities continue to operate as they have done in the past, they will continue to experience the same problems that have always plagued them.

Change must happen.

Change involves policy reform and infrastructure investments. It demands a shift in customer engagement. It will mean hardening the grid. Utilities will change how they operate a grid where energy supply is at the whim of Mother Nature.

They will transform their use of technology.

Utilities have made substantial investments in technology. Yet the solutions have largely automated manual processes, creating silos. Siloed systems mask cross-organizational patterns and decisions. They create suboptimal solutions. They are costly.

Improvement demands better understanding of grid behavior and customer expectations. Barriers and silos must be torn down.

Problems and solutions are linked to location.

Where are outages occurring? Where are obsolete assets? Where are the distributed energy resources (DERs)? Where are customers using retailers? Where is the grid subject to cyber-attack? Where is the grid vulnerable? Where are customers behaving differently?

Geographic information system (GIS) technology has been used in utilities for decades. However, it has largely been relegated to back-office mapping groups. That is changing.

ArcGIS is a location intelligence platform. It needs to be a critical element of grid modernization. Why? Location plays such a dominant role in both the problems and the solutions facing utilities today.

One strategy to help utilities meet these challenges is to fully leverage ArcGIS in three ways:

- Migrate to a real-world model of the assets in the GIS. Include all parts of the grid as completely as possible.
- Implement a full system of engagement in which the GIS is exposed to all stakeholders, inside and outside the company. Likewise, use the GIS to consume data from a variety of internal and external sources.
- Fully leverage ArcGIS software's analytical capabilities. Employ a system of insight.



ArcGIS is a complete GIS. It is a system of record, engagement, and insight. It models the grid to improve risk assessment. It consumes real-time data from sensors and social media. That heightens awareness of threats. It uncovers patterns. This makes for better investment, security, and operational decisions. It provides immediate situational awareness. It helps utilities understand customers.

Grid Modernization

Short-term power failures inconvenience people. Longer-term failures shut down businesses, causing revenue loss. Extended outages create havoc and chaos. This chaos often results in loss of life—sometimes in substantial numbers.

Jobs are lost. People are permanently displaced.

EIA says power failures increased 54 percent between 2013 and 2016. The grid was based on the weather patterns that existed decades ago. During Superstorm Sandy, storm water inundated electrical equipment. No one had anticipated this.

For most of its history, power flowed from large, central generating plants. The balance of supply and consumption was well understood. Not so with solar and wind power sources. They vary with the weather. As renewable energy produces a substantial and growing part of the power supply mix, the control of the grid becomes far more complex.

In many states, utilities no longer own their power plants, nor do they have a direct relationship to end-use customers. This puts additional pressure on earnings.

Distributed energy resources siphon revenues.

Utilities are under constant threat of cyber and physical attacks, sometimes in combination.

Because of these issues, the US Department of Energy (DOE) created the Grid Modernization Initiative (GMI) just a few years ago.

What Is Grid Modernization?

DOE recognized that

- There are too many outages.
- The grid is old.
- Renewable energy is projected to grow 31 percent from its current level by 2050.
- Deregulated markets will increase.
- Cyber and physical attacks will continue to be a threat.
- Customers expect electricity pricing to be competitive and affordable.

In its GMI 2018 report, DOE stated the following:

"Our extensive, reliable power grid has fueled the nation's growth since the early 1900s. However, the grid we have today does not have the attributes necessary to meet the demands of the 21st century and beyond."

The DOE further stated what a modern grid must have:

- Greater **resilience** to hazards of all types
- Improved **reliability** for everyday operations
- Enhanced **security** from an increasing and evolving number of threats
- Additional **affordability** to maintain our economic prosperity
- Superior **flexibility** to respond to the variability and uncertainty of conditions at one or more time scales, including a range of energy futures
- Increased **sustainability** through energy-efficient and renewable resources

Location Is a Common Theme

The traits of a modern grid, as noted above, all have one attribute in common—location. That suggests that GIS and specifically ArcGIS underpin nearly every grid modernization measure.

ArcGIS models the grid to improve risk assessment. It reveals where it is best to invest in resiliency. It consumes real-time data from sensors and social media to heighten awareness of threats. It uncovers patterns for better investment, security, and operational decisions. It provides immediate situational awareness. It helps utilities understand customer behavior. It delivers productivity tools to keep costs down.

Grid modernization relies heavily on a thorough understanding of the physical aspects of the grid. Utilities need to understand the behavior and the vulnerabilities of the grid. ArcGIS provides the means to model the grid in detail. The DOE stated that the grid must be made resilient, reliable, secure, affordable, flexible, and sustainable. ArcGIS is the technology to help utilities do that. ArcGIS does this in three unique ways:

- Unifies IT and OT into a single coherent framework
- Leverages spatial analysis
- Delivers operational awareness

**Grid
Modernization
Anchored by
ArcGIS**

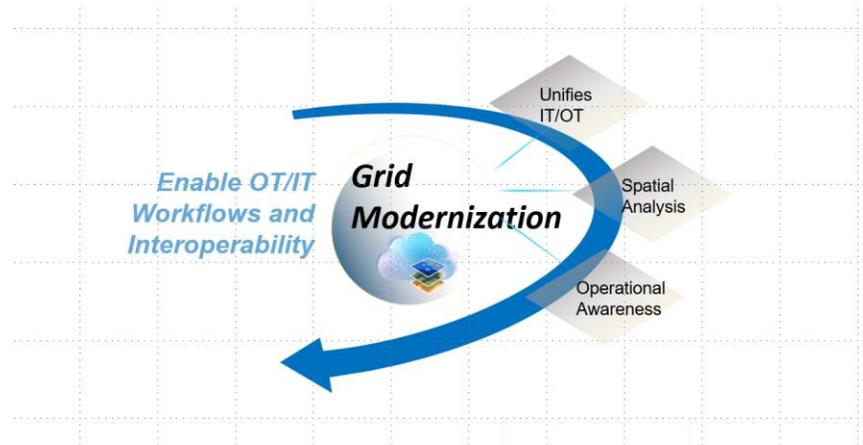


Figure 1—ArcGIS Enables Grid Modernization

**IT and OT
Unified into a
Single, Coherent
Framework**

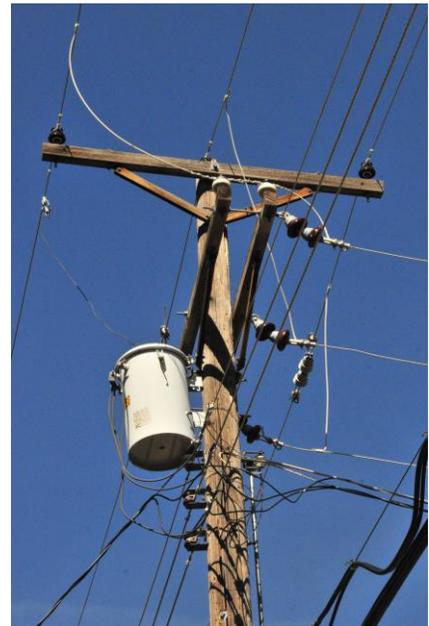
Utilities struggle with siloed systems. For example, supervisory control and data acquisition (SCADA) systems only manage real-time information from utility monitoring devices and control devices. Those devices include substation breakers, relays, instruments, and meters.

They do not measure other devices, such as sound, temperature, or wind sensors. SCADA systems do not consume social media services. Also, SCADA is only marginally geography based. SCADA abstracts the transmission network to a schematic representation. It has no knowledge of terrain, earthquake zones, or flood zones.

Enterprise asset management (EAM) systems handle the asset life cycle. They cannot manage assets' spatial relationship to each other or to other, nonutility assets.

Advanced metering infrastructure (AMI) processes customer consumption. It only understands customer addresses. It has no knowledge of the relationship of meters to the grid. Nor does it know the location of the communication infrastructure that underpins the system.

An Advanced Distribution Management System (ADMS) is geography based. It only manages the operational model of the distribution system. It does not have direct data about the transmission system. Nor does it manage the structural elements of the distribution network. It cannot do spatial analysis.



Utilities perform simulation studies of the electric network. These include load flow, short-circuit analysis, state estimation, insulation coordination, and stability analysis. Like SCADA, these systems are schematic based. In most cases, the modeled devices do not have location information. ArcGIS can consume the results of the system analysis and combine that data with other system data and services. ArcGIS brings system analysis to life.

Customer information system (CIS) or customer relationship management (CRM) technologies have a plethora of information about the customers. This includes their

addresses and consumption patterns. These technologies lack the connection of the customers to the electrical network. Also lacking is the ability to look at aggregate customer behavior.

A simple example illustrates how ArcGIS can bring together data from completely different IT and operational technology (OT) systems.

This example shows how ArcGIS accesses real-time voltage data from a cable company, then displays that data with electric distribution data from a power company. ArcGIS could even access voltage complaint data from the company's CRM. The external sensors are fiber-to-coax nodes. The dashboard of figure 2 shows the real-time voltage measurements of an electric distribution network. The electric network data is managed by ArcGIS.

This illustrates how ArcGIS can consume real-time Internet of Things (IoT) data in an app. It also illustrates the ability to provide spatial analysis and coordination of the sensors to the electric distribution network. It shows these attributes:

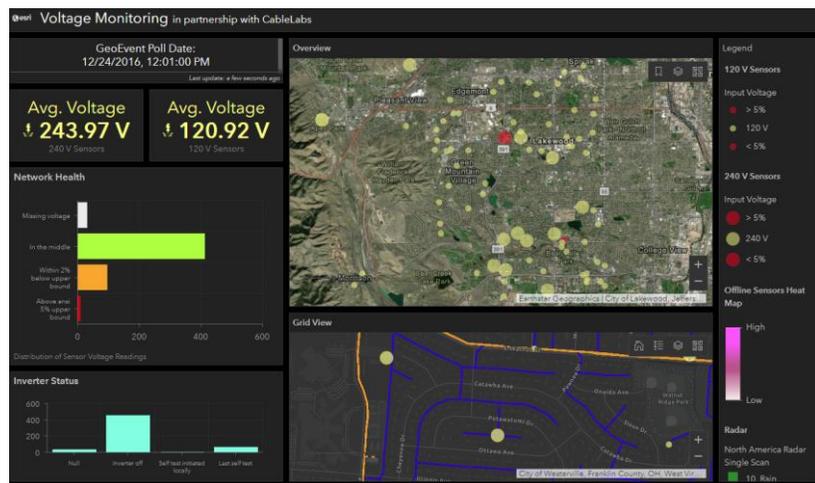


Figure 2—Real-Time Voltage Monitoring Using External Sensors

- IoT integration—Two distinct sets of data: one being real-time information (from the sensor network) and one being a system of record from ArcGIS. As noted, other datasets can be added from other IT systems such as a CRM, AMI or other services (weather, traffic), or internal OT systems such as an outage management system.
- Analysis—ArcGIS can perform spatial analysis not just on data from the GIS but from all data it consumes, regardless of the source. This is critical. Once a service is consumed by the ArcGIS platform, that data appears as if it was maintained and managed by ArcGIS.
- Awareness—This dashboard can be delivered to anyone in the organization. Decision-makers in different locations can see what's going on, all at the same time.

ArcGIS will not replace any IT or OT system. What it will do is bring together OT and IT systems. It reveals the relationship of one data source to another. ArcGIS can consume services from outside the utility, such as imagery; weather, lightning, demographic, crime, and fire reports; and other IoT services into a single environment.

ArcGIS can bring together data from SCADA (for transmission), ADMS (for distribution), and customer information (from CRM and AMI). It can add data from EAM for work locations. It can take all this data and help users visualize and analyze it—all by location. It truly unifies IT and OT.

ArcGIS Unifies IT and OT

IT and OT are unified by ArcGIS with the following IoT capabilities:

- Connects disparate data—ArcGIS consumes data from all kinds of sensors, not just those of the utility systems. This could include sound, video, temperature, movement, or wind. The key is that ArcGIS captures the location of the sensor data, which then can be used in conjunction with other pieces of information.
- Captures IoT/real time data- ArcGIS represents network devices, including those from the utility as well as other IoT devices.
- Exports seamlessly to network analysis- ArcGIS can deliver real-world models to system analysis tools via web services. It can consume the results. This data can be combined with information from other OT and IT systems.

Spatial Analysis

Once data is collected from a variety of sources, ArcGIS adds significant value using spatial analytics. Those sources come from real-time sensors and control systems such as SCADA and ADMS.

Other sources include spatial information from the web through services. This information also comes from IT systems as noted above. GIS visualizes that data. However, it does even more. It uncovers patterns and trends that simple visualization cannot.

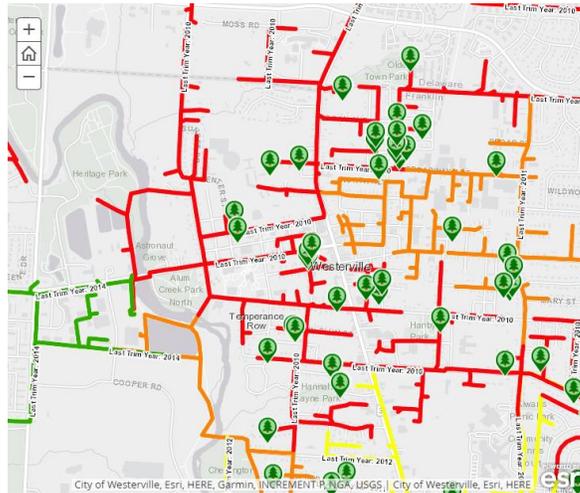


Figure 3—Factors Influencing Distribution Vulnerability

Bringing disparate types of data together and showing that data on a map has substantial value. Figure 3 shows an example of a simplified vulnerability study. The lines are electrical circuits. They are color coded based on the length of time since the utility had trimmed the trees around the lines. A red line represents a circuit segment where the trees had not recently been trimmed around the lines. Green represents circuits where trees were trimmed recently.

The tree symbols represent tree-related outages. Not shown are areas where maintenance on the lines is needed.

This map visualizes the data. It is helpful up to a point. The map doesn't fully represent problem areas so that it's easy to understand.

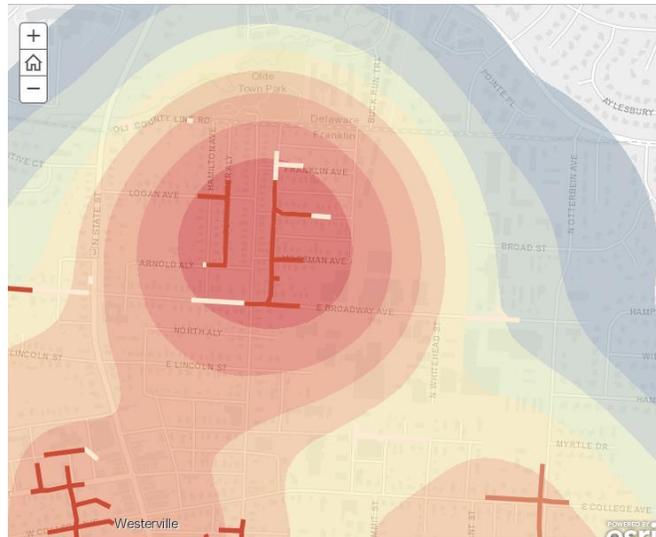


Figure 4—Results of the Spatial Analysis

Figure 4 shows the same study results as in figure 3 but after performing a spatial analysis. The dark red shows the areas of the electric distribution network in which the trees have not been trimmed for some time, there have been a high number of tree-related outages, and there are open repair work orders. This clearly illustrates what areas of the network need attention.

Spatial Analysis Creates Better Insight

That is the value of spatial analysis. It takes as many variables as available, organizes that data by location, and pinpoints areas of highest vulnerability.

ArcGIS is an information system that enables discovery through spatial representations and analyses. Its true purpose is to help users gain insights from raw data. Limiting GIS use to a digital replacement of paper maps constitutes underutilization—a lost advantage.

Using ArcGIS to find answers to business problems strengthens decision-making and focuses actions.

An example of spatial analysis in action is how utilities can use spatial analysis to better understand their underground system. Certainly, a utility can use ArcGIS to document its underground cables. It can gain more value by using ArcGIS to discover which cables are most likely to fail. Spatial analysis can help a utility answer the question, where could a single event have the most devastating impact on the network?

ArcGIS can answer this query with a simple map output, showing a large red polygon around the most vulnerable network section. The utility can then mitigate risk there—saving money and better serving customers. ArcGIS improves safety by highlighting danger zones. It ensures that the utility stays out of the news (when cables fail or catch on fire or propel manhole covers into the air.)

Imagery Enhances Decision-Making

Utilities underutilize imagery. Imagery in the form of lidar, orthophotos, and phodar provide additional insight into the impacts on the network. Image processing strengthens the already powerful insight of spatial analysis.

ArcGIS has the most advanced image processing capability anywhere. By analyzing the spectrum of leaves, utilities can determine the health and the species of trees. Seeing clusters of unhealthy trees can raise concerns because dying trees signal a

potential fire hazard. ArcGIS can then determine how close critical electric facilities are to the hazardous trees.

ArcGIS Utilizes Spatial Analysis

Spatial analysis is used by ArcGIS with the following capabilities:

- Assesses risk—Network risk that is risk of a network failure equals vulnerability plus consequences. Spatial analysis considers both. ArcGIS consumes data from many sources. This includes load flow, short-circuit, and stability studies. It uses statistics, science, and big data analytics to focus where vulnerability exists. ArcGIS then examines where that vulnerability will have the greatest negative impact on the network and the community it serves.
- Processes imagery—ArcGIS processes images to provide insight into the surrounding environment. Using spectral analysis, it can uncover issues hidden from the naked eye.
- Provides machine learning and big data analytics—In combination with imagery and video, ArcGIS can uncover imminent failures. Using machine learning, utilities can scan millions of devices in seconds to locate dangers lurking in their network.

Operational Awareness

Solid decision-making is difficult without thorough operational awareness. Awareness happens in three ways.

First, awareness requires immediate information—what data is available right now. Second, it comes from analysis—what the data means. The third is from data access and dissemination—gaining that intelligence and getting it to everyone at the same time.

A utility is a complex operation. There are a variety of assets, customers, and workers distributed over vast areas. The assets are connected and related. ArcGIS can add layers of information. Examples include external factors such as weather, terrorism, crime, traffic, fires, and earthquakes. ArcGIS puts all these elements together to give utilities outstanding operational awareness.

Operational awareness comes about by

- Bridging the gap between OT and IT.
- Consuming unlimited spatial information.
- Providing spatial analysis.
- Visualizing the results.
- Delivering those results to all stakeholders.

ArcGIS Delivers operational awareness with these capabilities:

- Visualizes the real time network—An electrical network is a complex system. It has millions of elements. ArcGIS assembles information from virtually any source.
- Delivers deep information insight—ArcGIS consumes information from literally any source, including data from smart cities, from other utilities, and from imagery and traffic services. This provides the context to answer the question about what is going on right now in the network.
- Presents to any device—ArcGIS delivers operational awareness regardless of the device or situation.

Key Attributes of a Modern Grid

Resiliency and reliability require a thorough knowledge of the behavior of the grid. A secure grid requires a deep understanding of the threats, both physical and cyber. Utilities will adopt technology for improved productivity. Customers demand affordability and flexibility. Society has embraced sustainability.

Location information is critical to [understanding grid behavior. Thus, the implementation of ArcGIS is key to successfully moving utilities to modernization. ArcGIS provides heightened grid understanding by unifying IT and OT. It uncovers threats, vulnerabilities, and lapses in productivity, with spatial analysis. Finally, it liberates utilities from having to assimilate information from many disparate sources, giving utilities keen operational awareness.

Resiliency and Reliability

ArcGIS provides answers to the basic question of where the network is at risk. It shows the relationship of assets to each other. It understands the relationship of networks to their surroundings.

Consequently, it is essential for restoring power, storm tracking, and security monitoring. Leveraging real-time information, machine learning, big data, and analytics, GIS gives utilities the answers they need to harden the grid in the most vulnerable areas.

A recent paper, *A Customer-Focused Framework for Electric System Resilience* by Alison Silverstein, Rob Gramlich, and Michael Goggin of Grid Strategies, examines both resiliency and reliability.

In the paper, the authors state, "Power system reliability and resilience are deeply intertwined—reliability covers those long-term and operational steps that reduce the probability of power interruptions and prevent loss of customer load, while resilience measures reduce damage from outages and hasten restoration and recovery to shorten outage durations."

Reliability is deeply involved in analysis. Reliability engineers assess where damage or failure is most likely to occur. Failure is often a combination of several factors, most involving location. That might include the location and age of assets and their maintenance and failure history. Natural causes include storms, lightning, fires, wind, fallen trees, soil conditions, vegetation, and animal damage.

Resiliency measures result from reliability analysis. These measures include mitigation of those factors utilities can control. They also include measures that protect their assets from events they can't control.

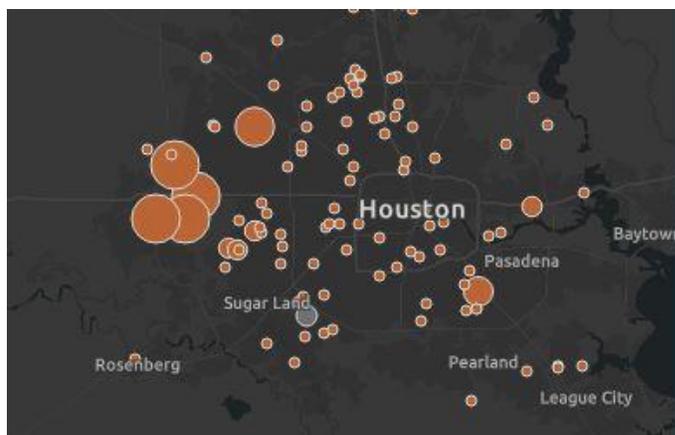


Figure 5—Reliability Analyses Using Insights for ArcGIS

This example uses Insights for ArcGIS in ArcGIS a user-friendly framework for quick spatial analysis. It leverages big data analytics to allow large volumes of data to be analyzed and visualized quickly. The data for figure 5 was based on 18 months of outage data with 55 million event data points. The bubbles indicate clusters of failures.

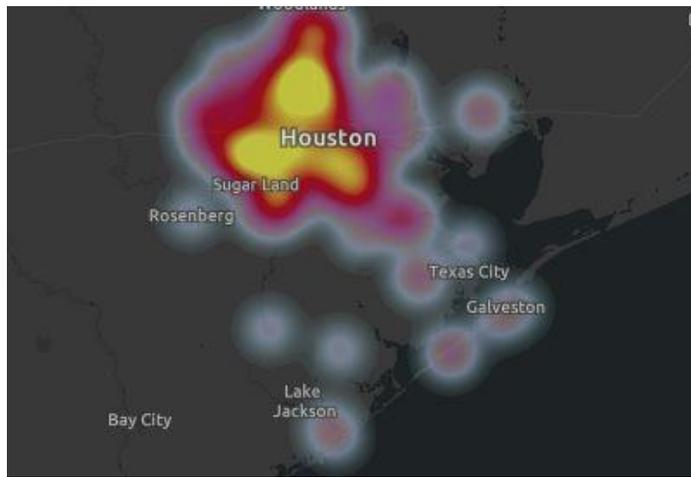


Figure 6—Heat Map Showing Density of Failures

Figure 6 shows the data in figure 5, represented as a heat map. This map shows that the pattern of failures is heavily focused in one area. This type of analysis gives utilities added insight into why failures occur in certain areas and not in others. Utilities then can add more data. This data includes proximity of environmental factors, such as moisture and smokestack emissions, to help uncover reasons for the cluster of equipment failures.

The analysis using Insights for ArcGIS uncovered patterns that could not be determined by simple tabular analysis. This helps utilities develop the probability of failure. A risk analysis follows. It identifies areas of high vulnerability, which would be most likely to have the greatest impact.

Making the Right Resilience Decision

Once staff have information from the reliability analysis, they begin resilience measures. Figure 7 illustrates an interesting analysis of an area that has recently experienced a fire and is fire prone.



Figure 7—An Illustration of a Fire Zone Overlay in a Utility Network

The utility must develop resilience measures to help lessen the fire damage. Measures include insulating conductors or hardening the network with higher and stronger poles. The utility can proactively trim trees and treat brush to stifle growth.

Figure 8 gives a somewhat different example. In this case, fallen trees were causing most of the outages for this utility. This figure shows the reliability analysis. The resilience measure was dead tree removal. The results were a dramatic improvement

in tree-related outages and a substantial improvement in overall reliability. In this case, the utility accessed available web services as input analysis.

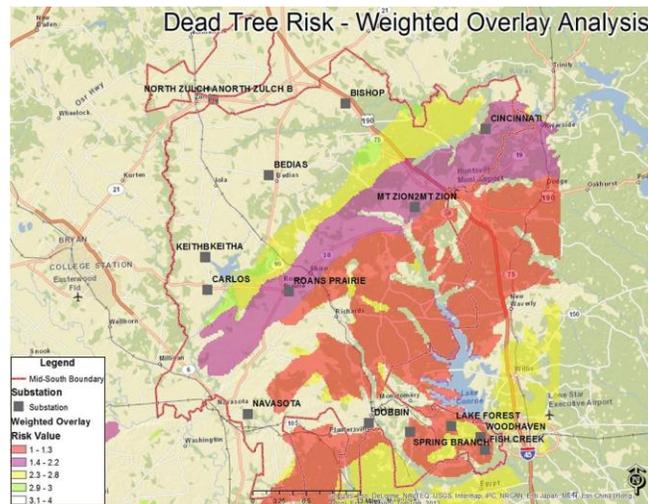


Figure 8—Spatial Analysis for Dead/Fallen Tree Risk

In this example, ArcGIS accessed millions of maps from the web and incorporated them directly into the utility's GIS.

Consider another example. A utility suspects that a piece of equipment might have sustained flood damage. Staff takes flood information from one of the many published web services. They overlay web service maps onto the utility's facilities data in ArcGIS. This visualizes where equipment is at risk of inundation during a flood. Spatial analysis highlights the risk. The utility publishes this risk map as its own web service. It then can be consumed by anyone with a web browser. This is a vast improvement over the old way of trying to overlay potentially outdated floodplain printouts onto facility data.

This reliability analysis indicates the probability of failure or damage due to flooding. The resilience measure would be to relocate equipment, raise the equipment on platforms, build flood control structures or simply install sandbags.

Resiliency also involves measures to shorten outages during events. Here situational awareness is critical.

Spatial Analysis Reveals Greater Insight into Reliability

ArcGIS visualizes the grid in relation to its surroundings. ArcGIS monitors the health of the grid. It shows where there are sensors that have failed to report results in the last hour. It creates physical and network relationships. It establishes a real-time view of the grid. It can note where things are changing.

It shows the complete state of the grid, represented by a realistic model in a way that people understand.

While standard reliability metrics such as SAIDI, SAIFI, and MAIFI are helpful, ArcGIS reveals the customers' view of their utility's reliability. A good US SAIDI (less than 2 hours) could apply to a utility that has pockets of territory with poor service reliability.

Better modeling of assets delivers greater accuracy in reliability analysis. It increases the utility's confidence in resilience measures.

Security

Among the greatest threats today to the grid are cyber and physical attacks. The good news is that devices—from large transformers to the tiniest of sensors—are all

becoming smarter. They can communicate the grid's health. The bad news is that these very same devices become targets for cyber-attack. No single system is as effective as ArcGIS to assess the relationship of these devices to other aspects of the grid. ArcGIS knows where every sensor is located and what it should be seeing.

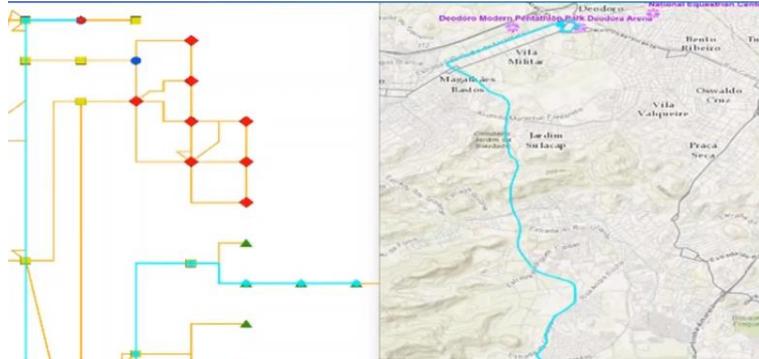


Figure 9—Linking the Physical and Logical Networks

Utilities may not be able to prevent a cyber-attack from occurring. But they can establish a plan for identifying the impact of the attack. Then they can plan for minimizing the damage.

The Physical and Logical Asset Relationships

The key to an effective cyber-attack plan is to link the physical network (and assets) to the logical assets, as shown in figure 9.

At the heart of any cybersecurity program is the recognition of the relationship between the physical cyber devices and their logical connection to operations. ArcGIS creates schematics on the fly, directly from the data in the geodatabase.

As utilities add sensors, control devices, and communication devices, they can create a geographic link to each of them. Then they align these to the utility devices that they monitor and control. The first task is to create an inventory of each cyber device (sensor, fault indicator, relay) and its relationship to the others. This can be done easily with the new [ArcGIS Utility Network Management](#) extension.

This technology gives utilities the ability to create separate cyber network geodatabases with geographic and logical representations. It has the capability to link this network to the electrical networks as well. These networks can share a structural network. For example, a sensor and a switch exist on the same pole. The sensor network and the electric network can be linked logically.

ArcGIS provides the tools to effectively capture the location of cyber assets, using a variety of field apps.

Affordability and Flexibility

ArcGIS determines the best locations for components. It uses spatial analysis. Utilities need spatial analysis to figure out the right locations for their devices. ArcGIS provides a spatial context to the analytics and metrics of grid modernization. It saves time and money.

Socializing GIS

One of the simplest ways for utilities to decrease costs is in the use of mobility for fieldworkers. Many utilities continue to print the maps from their GIS for use by fieldworkers. Other utilities have attempted to replicate their desktop GIS functionality in one-size-fits-all applications. ArcGIS provides simple tools and templates that tailor field applications to the task at hand.

Figure 10 illustrates a simple task-based app. After a storm, utilities must perform a comprehensive damage assessment. The assessors might be office workers dispatched for that task only. They can be equipped with tablets with simple forms to complete that would illustrate the location and extent of the damage. Figure 10 is a simple configuration of Esri's Operations Dashboard for ArcGIS, which collects the data from damage assessors in real time. It's simple, affordable, and flexible.



Figure 10—Operations Dashboard Used in Damage Assessment

Another example of affordability is the application illustrated in figure 11. This app is another configuration of Operations Dashboard. The app shows streetlights reported as being out or damaged. In this case, the streetlights have been reported by customers using a self-service app. This app increases the speed of streetlight outage reporting and repair. These apps also can access popular social media feeds—Twitter, Facebook, and others. So, reporting streetlight outages can be done via social media as well, increasing flexibility and affordability. It also enhances customer satisfaction.

Sharing Data

The information can be shared with other utility IT and OT platforms.

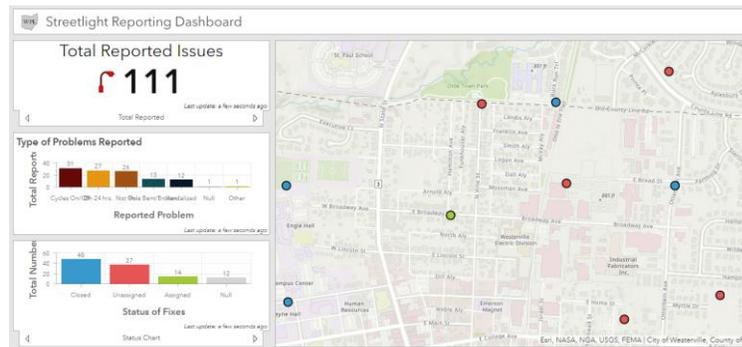


Figure 11—Streetlight Reporting Dashboard

Sustainability

ArcGIS supports renewable resources. It is used for land management, solar radiation density, wind density, and geothermal analysis. It is critical that utilities carefully model the location and attribution of all distributed energy resources. In the very near future, utilities and other entities will model DER financial transactions using technologies such as blockchain. ArcGIS is the software to help in the records management, visualization and analysis of this new utility business model.

ArcGIS has served as the foundation for planning, building, and operating renewable resources. Figure 12 shows the solar radiation densities in a proposed development.

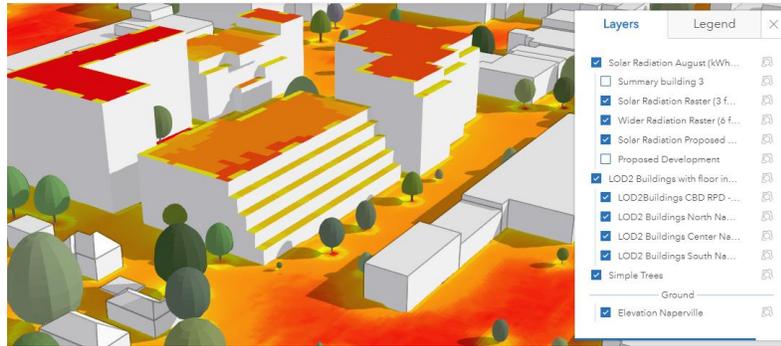


Figure 12—Solar Development Analysis Using ArcGIS Pro

The Third Dimension

Figure 13 illustrates the 3D modeling capability in ArcGIS. In this example, developers can propose a new wind farm project, using models of the wind turbines. They can place the wind turbines and evaluate their effectiveness. They can further model their operations by simulating wind resources from historic wind patterns consumed by web services. Once the wind farm is built, ArcGIS is used to combine real-time wind and production data to model the wind farm's operational effectiveness. Finally, using Operations Dashboard, utilities can create full operational awareness of the wind farms' behavior.

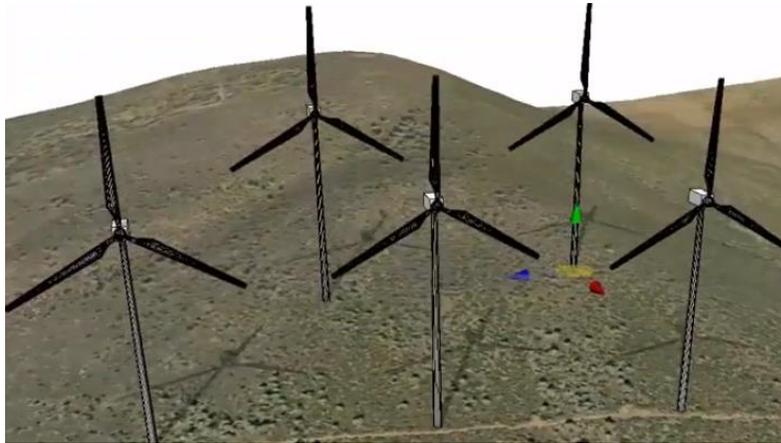


Figure 13—3D Representation of Wind Turbines, Using ArcGIS Pro

Summary

The key attributes of the modern grid include location. Where are resiliency and reliability issues? Where are vulnerabilities and threats? Where are areas of losses or productivity improvements? Where should conservation and renewable resources be applied?

Now is the time to take advantage of the advanced capabilities of ArcGIS. It's time to bring disparate data from IT and OT systems together. Time to see patterns using spatial analysis. Time to see what is happening on the grid right now and create true operational awareness. Utilities need a detailed model of the network assets—a fully accurate and complete model of their assets as they appear on the ground. They need to break down silos of technology and processes. Finally, utilities need to fully understand grid risk.

To fully anchor grid modernization, utilities need ArcGIS. It partners with utilities to build a resilient, reliable, affordable, secure, flexible, and sustainable grid.



Esri inspires and enables people to positively impact their future through a deeper, geographic understanding of the changing world around them.

Governments, industry leaders, academics, and nongovernmental organizations trust us to connect them with the analytic knowledge they need to make the critical decisions that shape the planet. For more than 40 years, Esri has cultivated collaborative relationships with partners who share our commitment to solving earth's most pressing challenges with geographic expertise and rational resolve. Today, we believe that geography is at the heart of a more resilient and sustainable future. Creating responsible products and solutions drives our passion for improving quality of life everywhere.



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