How the ArcGIS Utility Network Management Extension Supports Electric Utilities

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Executive Summary

Change is sweeping the electric utility business. Battery storage, extreme weather, widespread digital transformation, new rules, and competition from solar power companies stress industry executives. Their assets are old. Their employees are retiring. Revenues are declining. Customers are demanding better service.

To meet these challenges, utilities need to maintain and deliver information to all stakeholders including customers, regulators, and employees. To achieve this, information systems require higher performance, more elaborate detail, and greater scalability. With the growth in popularity of mobile devices, modern utility workers need these information system capabilities on a wide variety of devices to do their jobs effectively.

The electric utility industry is asking for digital models that show greater detail and present it in the best way for the user's need. Esri designed the ArcGIS Utility Network Management extension to provide a new foundation for utility geographic information system (GIS) solutions. The extension provides full-featured mapping, analytics, and data management, optimized for all types of utility assets. The extension was designed for utilities, modeling entire networks at a level of detail that was never before possible. A host of derivative information solutions are possible to support nearly every aspect of the utility business. Solutions based on a utility network can support safe and effective operations, efficient asset utilization, and increased stakeholder engagement.

Utilities have used GIS to manage network asset data for decades. The ArcGIS Utility Network Management extension is part of a strategic investment in new capabilities. The extension accurately represents today's complex electric networks, helps contain future data modeling costs, and supports increased organizational efficiency. How? By distributing actionable network data to other systems, stakeholders, and today's workforce.

Modern grids and operational technology (OT) systems require far greater detail than is typical in electric utility GIS. Electric utility networks are increasingly reliant on electronics and data for even routine operations. Data about the network can be thought of as a digital twin, or digital simulation of physical assets. A utility network provides a robust digital twin of an entire electric system, suitable to support modern utility business processes.

The underlying architecture of the ArcGIS Utility Network Management extension exposes its cross-platform capabilities to other systems. Sharing data between mission-critical systems simplifies data maintenance and system integrations. This reveals hidden patterns and enables analytics that would otherwise be impractical. The resultant business intelligence supports data-driven management and performance optimization.

The US Department of Energy identified six capabilities essential for grid modernization: design and planning tools; devices and integrated systems; institutional support, security, and resilience; sensing and measurement; system operations; and power flow and control.

The ArcGIS Utility Network Management extension supports these capabilities.

For the first time, there is a true interconnection between the engineering design of assets and the ways they are operated and presented to users. This is a direct response to the needs of the electric utility sector, with a new design that is ideally suited for both operational and business intelligence.

The ArcGIS Utility Network Management extension takes advantage of the full set of capabilities of the ArcGIS Enterprise platform. These capabilities include sophisticated analytics, real-time data integration, and excellent visualization, enabling utilities to create real-world models. It gives appropriate user experiences for a wide audience, including customers. Esri's Utility Network Management extension helps utilities tackle many of the business challenges they face.

What Is the ArcGIS Utility Network Management Extension?

In an environment of limited resources and increasingly complex networks, electric utilities need a new wave of GIS-based network management with more functionality, added flexibility, and superior access to information. The ArcGIS Utility Network Management extension greatly enhances the network management capabilities within ArcGIS.

> The ArcGIS Utility Network Management extension introduces new terminology. The following terms distinguish new capabilities in ArcGIS.
>
> **Utility network** - A utility network is a new data type within the geodatabase offering many new capabilities.
>
> **ArcGIS Utility Network Management extension** – The ArcGIS Utility Network Management extension is the product required to use the capabilities of a utility network. It is an extension to ArcGIS Enterprise.
>
> **Network management in ArcGIS –** Network management in ArcGIS is the complete set of activities related to creating, editing, managing, analyzing, visualizing, and sharing network information with ArcGIS. When based on a utility network, these activities utilize the ArcGIS Utility Network Management extension itself as well as ArcGIS Pro, partner solutions, or other web service clients.

A utility network implemented with this capability creates a new data type in ArcGIS. The extension is designed to provide a robust foundation for scalable modeling of all electric utility assets. It is a direct response to the needs of the electric utility sector with a new design that is ideally suited for both operational and business intelligence. A utility network is a new, modernized framework to model electric networks in greater detail.

Esri provides a standard model to represent electric networks. This model can be extended to meet a utility's unique needs. Partner solutions or extended user-defined configurations may be necessary to fully exploit all desired capabilities of the extension. The new framework accommodates everything needed to support uses beyond simple mapping. It supports other mission-critical needs like planning, engineering, network analysis, and operations.

The extension lets users create, manage, analyze, and share all electric network data. It is designed for increased scalability and performance and can deliver information quickly, even with very large datasets. Moreover, utility networks are designed to ultimately be available on any device, anytime, anywhere—distributing vital information throughout organizations. Even in the field, workers can use the capabilities to support routine and emergency operational requirements. The technology can handle modern data needs and makes it easy to share information securely with everyone who needs it.

The extension was designed for utilities, modeling entire networks at a level of detail that was never before possible. A utility network is a comprehensive framework of functionality designed to model all the assets—such as switches, lines, generators, conduits, and substations—that make up an electric system, with real-world behaviors built directly into these features.

The ArcGIS Utility Network Management extension is based completely on web services and deployed differently than previous network asset management solutions from Esri and its competitors. The services style of software deployment enables the extension's functions to be accessed and acted on remotely by a wide variety of users.

Using an agile approach and the capabilities of the extension, customers can implement the technology quickly by configuring solutions and avoiding large-scale customization. At a high level, the framework for this implementation strategy is to understand and prioritize business needs, deploy a utility network, and then use an iterative approach to deploy applications to fulfill the prioritized needs. This approach reduces both the cost and the time to realize solutions, cutting the total cost of ownership and providing greater return on investment.

What Can Network Management in ArcGIS do for Electric Utilities?

Utilities have used GIS to manage network asset data for decades. Knowing asset locations, their condition, and their relationship to one another is fundamental to managing them. However, managing electric networks is becoming much more complex than traditional asset management. The ArcGIS Utility Network Management extension is specifically designed to accurately represent today's more intricate electric networks, contain future data modeling costs, and increase organizational efficiency by distributing information about the network to all stakeholders and the modern workforce.

A Strategic Investment in Capabilities
Network management in ArcGIS is part of a strategic investment in the capabilities required to model and operate the electric networks of the future. Historically, electric utility system planning and operating practices have been very conservative and based on generalized system modeling concepts. These conservative and generalized practices do not allow users to achieve current grid modernization objectives. A utility network is a framework to align a utility's digital infrastructure with emerging technologies, enabling the technical capabilities necessary for grid modernization.

Utility grid modernization objectives include the ability to incorporate advanced devices, improve resiliency, optimize power flows, and increase situational awareness with real-time sensing capabilities. As utilities embrace grid modernization and increasingly manage operations with advanced functions, having a central source of fully connected network data becomes imperative. Advanced functions all need GIS as a unified source of network data and also as an outlet to distribute operational information to the enterprise, enabling executives, engineers, and operators to work from the same intelligence.

Modeling Greater Detail
Modern grids and OT systems require far greater detail than is typical in electric utility GIS. Also, systems need to accommodate a wide range of possible operating conditions brought about by sophisticated network devices. Microgrids, distributed generators, sensors, smart inverters, automatic switches, and electronic controls all bring greater complexity to electric networks. To work safely, the data and information systems supporting modern networks must accommodate their increased complexity and detail.

Sophisticated devices have more connection points, bypass functions, and test provisions. In addition, they are configurable, integrate with communication systems, and exchange parameters with other devices and systems. These parameters help govern equipment settings, price signals, and protection from harmful conditions. Much of this complexity is linked to modern electronics that consume network data in real time.

Representing a network in greater detail enables a utility to manage it more precisely and more cost-effectively. For example, rather than tracking reliability statistics by feeder, a utility network allows tracking at the equipment level. This detailed information can be used to focus system improvement, maintenance, and vegetation management resources where they will have the greatest impact on reliability.

Complex network operations are based on conditions as they exist in real time. Self-healing capabilities, power flow reversal, and automatic switches all require networks and their supporting OT systems to respond rapidly. A utility network can model the equipment details necessary to support OT systems. Engineers, dispatchers, and line workers alike require near real-time information to operate the network safely and effectively. When planning and executing changes, utility workers need to understand how operations will affect the entire network based on the present conditions.

Given the many forces acting on electric networks, network management in ArcGIS anticipates the continuous evolution of equipment, offering the flexibility to

model it at the finest level. Modeling the networks to support near real-time analysis, distributed energy resources (DER)—such as solar, wind, and energy storage devices—and advanced distribution management systems (ADMS) must be able to address far greater equipment detail, intricate connectivity, and multiple energy sources. Without new viewing functionality, this additional detail would result in map clutter, making it impossible to visualize data clearly or act on it safely.

The software solves these problems and others, handling structural relationships, generating schematics, performing complex tracing, and storing 3D information—all with built-in rules that enforce high data quality standards.

Creating a Digital Twin
Electric networks are becoming increasingly reliant on electronics and data for even routine operation. Data about the network can be thought of as a digital twin, or digital simulation of physical assets. A utility network provides a robust digital twin of an entire electric system. The model, or digital twin of the system, is now central to a network's very operation. A fully functional digital twin, adequate to support disparate utility roles, is a big step from the straightforward facility mapping models of the past. Because a device's connections and location guide its every operation, a digital twin must be sophisticated enough to represent each device, accurately and completely, at its precise location.

Therefore, the digital model of the system is central to many utility business functions. Increasing electric system complexity ushers in new challenges in record keeping, workforce development, maintenance, operations, electric system optimization, and troubleshooting. The ArcGIS Utility Network Management extension is designed to meet the complex and variable data, modeling, and analysis needs of all users. These users include employees, stakeholders, and other automation systems, both today and into the future.

Cost Containment
Running seamlessly on most modern database management systems, the extension's features minimize total cost of ownership by reducing nonproductive activities like data repair and the chores associated with system integrations. Incorrect or incomplete network data delays the outputs needed to drive informed decision-making. This obstruction requires repeated work by skilled practitioners, which wastes valuable labor hours. To avoid this, built-in rules and productivity and quality assurance tools speed data input while enforcing data integrity within a utility network.

Previously, file exports/imports and point-to-point system integrations were costly, time-consuming, and difficult to maintain, and they severely limited the addition of new data or functions. Extensive customization was often necessary to move data between GIS and other mission-critical systems such as OMS, SCADA, or ADMS. The web services architecture and overarching ArcGIS network management model reduce the delay and expense of system integrations while providing room to grow over time. The sophisticated ArcGIS network management model can represent all elements necessary to support Common Information Model (CIM) interoperability. While some preparation work is still required to achieve interoperability, these enhancements act to contain the costs of data maintenance and system integrations for years to come.

Increased Organizational Effectiveness through Distribution of Network Data

Network management in ArcGIS is designed to expose network information and intelligence to everyone in the enterprise, delivering the right data and capabilities to the right person or system at the right time. As a result, the entire organization can contribute to the completeness and accuracy of the data.

The new network capabilities are provided cross-platform, reducing the dependency on powerful desktop computers. Users can even edit the data by using connected mobile devices. Those capabilities will be provided to any client including laptops, tablets, mobile phones, and potentially other devices.

The underlying architecture of the ArcGIS Utility Network Management extension also exposes all its capabilities to any application that can access its web-based services. A shared view between systems reveals commonality and overlapping impacts and enables analytics that would otherwise be impractical. The resultant near real-time system and business intelligence supports strategic data-driven management and performance optimization.

By combining and understanding the outcomes from disparate systems, utilities can enhance network performance and add customer value. With the proper tools in place, information silos may give way to superior organization-wide situational awareness, driving efficient operations.

Network management in ArcGIS provides improved capabilities that position utilities to enhance efficiency, increase actionable information intelligence, and enrich electric system operations. It supports better decision-making and safety through improved accuracy, timeliness, and availability of information. When all business functions have unified, near real-time access to the information they require, each worker is empowered to operate with peak effectiveness.

How Network Management in ArcGIS Supports Grid Modernization

Historically, the grid was based on large, dispersed generation facilities, hierarchical control systems, and a one-way power flow to passive loads. To improve reliability and resilience while accommodating the changing mix of distributed generation and to utilize information and control systems for grid optimization, the US Department of Energy (DOE) defined six technical needs in its Grid Modernization Initiative. The DOE's objective is to provide a common basis for grid modernization road maps and guide technical development activities. Network management in ArcGIS aligns very well with the capabilities necessary for grid modernization.

Design and Planning Tools

The design and planning tools that are common today use very simplified models of the power system. The 2017 Grid Modernization Peer Review Report from the US Department of Energy states, "While more capabilities are added to these tools, they do not take advantage of modern computing techniques, and they will ultimately be unable to keep pace with the increasing complexity of the grid."

The DOE identified the need to develop superior design and planning tools. Furthermore, the department determined that the current modeling frameworks fail to account for the interdependencies of the transmission, distribution, and communications systems. In the future, more detailed grid models must be scalable and capable of combining these subsystems into a single framework for fully integrated large-scale analysis. Network management in ArcGIS does this

seamlessly, with multiple domain networks within a single model. These techniques efficiently model the specific behaviors of each network type as well as its equipment detail in a single network. This complete model can support the more precise design and planning techniques that are considered essential for grid modernization.

Devices and Integrated Systems
The DOE's research determined that many new devices are necessary to achieve high efficiency in a reliable, sustainable, resilient electric grid. In addition to unconventional devices for DER, demand-side management, and transportation electrification, the DOE also identified the need for advanced types of infrastructure such as improved distribution switches and system configurations like fault location, isolation, and service restoration (FLISR). According to the DOE report, "To achieve widespread deployment of these technologies on the electric grid without compromising grid reliability, safety, or security, the devices must be able to connect and exchange data on the grid." (2017 Grid Modernization Peer Review Report—US Department of Energy) Network management in ArcGIS includes advanced terminals, connectivity associations, and behavior rules to represent the detailed data points required by these advanced devices.

Institutional Support
On top of the highly technical requirements of grid modernization, there are straightforward needs to effectively communicate maps and information about the system and modernization efforts to all stakeholders. These stakeholders need clear, concise information to make the best investment decisions. "State policy makers, regulatory agencies, and regional planning organizations play a critical role in shaping both the direction and pace of grid modernization, but many state regulatory agencies are hard-pressed to address the complex issues related to grid modernization and the deployment of distributed energy and renewable resources," according to the DOE report. "Thus, the demand for objective technical assistance and information on grid modernization is high and likely to increase."

To monitor the progress of modernization efforts, stakeholders must consider past, present, and future states of the grid in their areas of interest. Network management in ArcGIS uses new methods to store and retrieve the system's states over time. Utilities must provide maps and information—along with supporting analysis—to regulatory bodies and nontechnical audiences. The extension's advanced network modeling capability is built on the out-of-the-box analytics, machine learning predictions, visualization, and collaboration capabilities of the core ArcGIS platform. This means even the most sophisticated grid model can be analyzed and presented anywhere in beautiful, color-coded maps that immediately communicate the important ideas.

Security and Resilience
To ensure the security and resilience of a modern grid, the DOE further identified needs to reduce vulnerability and improved impact assessments of potential threat scenarios. These scenarios range from extreme weather to physical and even cyber attacks. The goal is to more effectively anticipate, prepare for, and rapidly respond to events. Analysis of this kind requires overlaying detailed grid information with other data such as threat locations, asset condition ratings, and weather forecasts.

Network management in ArcGIS supports very detailed grid asset information from the core ArcGIS platform and its rich collaboration functions. The structural associations and containment functions permit the rapid correlation of facilities and threats. Using core functions, the grid can be conveniently layered with other location and business intelligence, demographics, weather forecasts, and real-time operational data for powerful analysis and visualization. The results of this analysis can be quickly shared with a wide variety of devices and on the web, using standard ArcGIS tools.

Sensing and Measurement
One of the key grid modernization drivers for the improved sensing and measurement capability is increased situational awareness, providing timely decision support. Knowledge of the current grid state, and conditions such as ambient and equipment temperatures are vital to managing a more modern and dynamic system with superior infrastructure utilization. These systems have the potential to lower operating margins and ultimately minimize energy costs for consumers. Monitoring system health indicators and predicting outcomes also enable rapid and effective responses to abnormal conditions.

The ability to correlate disparate data sources, including real-time sensors, and apply predictive machine learning techniques is foundational to applications like predictive failure analysis and transactional energy markets at the distribution level.

The results of sophisticated analysis are only as good as the underlying information they rely on. To maintain a high-quality information model of the system, the extension's validation framework employs built-in rules and feature behaviors. These functions are always running in the background to ensure data consistency and network data integrity. The extension and the ArcGIS platform excel at bringing together data from different sources, including sensors, in near real time. With the data organized in one place, ArcGIS can be used to apply advanced analysis and visualize and distribute collaborative results across an organization.

System Operations, Power Flow, and Control
"The current approach to electric power system operations and controls was developed during the last three to four decades using a piecemeal approach, within narrow functional silos, and well before the development of modern computational capabilities," according to the DOE report. "The rapid growth of renewable power generation, the increased use of electric vehicles, and the growing need to integrate customers with the power system are rendering the current generation of grid operating systems obsolete." The DOE's target in this regard is to "develop an architectural model that encompasses all major elements of the grid and allows people from various industry segments and geographic regions to view the grid in the most appropriate way for them."

The network management model in ArcGIS provides very detailed system characteristics in a framework that is compatible with operational systems, enriching them with geography-based information connected to customers and the real world.

Specific Benefits of the ArcGIS Utility Network Management Extension

Esri built the ArcGIS Utility Network Management extension to give electric utilities what they have been asking for, which includes the following:

Representation of Every Type of Equipment and Its Connections
One of the key advantages of network management in ArcGIS is a more detailed and accurate representation of the entire electric system—a complete digital twin. All significant parts of a system can be modeled. Features are placed and displayed in a natural way for visual clarity. The real-world representation of devices makes it easier to use network data in other mission-critical systems. Esri partners or users can configure additional domain-specific modeling capabilities directly within the GIS.

Connectivity—Connectivity is the key to modeling advanced networks. Network management in ArcGIS represents all aspects of the modern grid and captures how everything in a network is interconnected. For example, the extension represents the actual conductor connections to an automated recloser including bypass switches and lightning arresters. It also represents the physical location of the recloser and explicitly tracks its relationship to the pole on which it resides.

Improved User Experience—A cabinet or substation may be relatively compact in size but contain dozens or hundreds of utility features. Representing these dense areas on a map can create clutter and result in poor legibility. A utility network represents dense areas—or assemblies of multiple features—in simplified ways, dramatically improving the user experience.

Structural Attachment—Utilities often carry more than one type of resource on a common set of structures. For example, a pole or conduit bank may support both electric and communication lines. The extension's treatment of structures can relate them to multiple networks like electric and communications. This eliminates structure data redundancy and allows explicit tracking of these close relationships, enabling accurate cost recovery of joint-use fees.

Diagrams and Schematics—The complex and dynamic nature of electric systems demands improved visualization techniques. Network management in ArcGIS delivers several ways to explore the assets and connectivity of the entire system. The map view shows the overall picture, and the layer visibility functions control when additional detail is displayed. The diagram view automatically shows features in a schematic representation or one-line diagram. Network subsets like circuits, feeders, and transmission lines are managed inherently as part of the network. Network management in ArcGIS includes preconfigured diagramming capabilities that allow the generation of these advanced diagrams without any additional setup.

Three Dimensions—3D data is built into every network element. All features inherently include x,y and z location information, providing the data to support new ways to use modeling and augmented reality for safety training, design, and job planning.

Access to the Capabilities for All Users and Mission-Critical Systems
Historically, GIS data was used by a relatively small set of power users and was not accessible to others who also needed it, such as fieldworkers, executives, managers, and accountants. Network management in ArcGIS includes new functionality to streamline the distribution and use of network data by all users,

including other mission-critical and OT systems. It is designed to unfold all its capabilities to any user device or application that can access its web services.

For example, field crews can use focused apps on their device of choice. Engineers and modelers can transform raw data into actionable information, unlocking data from their desktops and easily sharing their results across departments. When electric system issues do arise, customer service representatives can be notified before customers call. And most importantly, network management in ArcGIS can provide near real-time situational awareness to managers and supervisors as events occur, facilitating timely and accurate data-driven decisions. Core functions of ArcGIS enable different users to share data across multiple platforms. For the first time, network management in ArcGIS is designed to also deliver full network functionality to all users.

A utility network facilitates the straightforward exchange of network information with other mission-critical systems. Technologies like an outage management system (OMS), voltage and reactive power (VAR) optimization, or FLISR each operate on a data representation of the network unique to that technology's purposes. Exchanging data with an ArcGIS utility network can reduce data maintenance tasks within these systems. Data exchange offers improved consistency across business lines while potentially reducing the cost of data maintenance activities, the time to carry them out, and the potential for errors.

This commonality among models further facilitates analyzing, visualizing, and distributing the results from these systems with core ArcGIS capabilities. Network management in ArcGIS provides a framework to potentially aggregate and visualize the behaviors from numerous other systems such as ADMS, SCADA, and AMI/MDM.

Secure operational systems are not intended to distribute information widely but are intentionally architected to guard it closely. A utility network does not displace operational systems as the systems of record for operational data. Rather, it magnifies the value of these systems' data across the enterprise.

With controlled and convenient information distribution, ArcGIS can publish appropriate operational information to stakeholders, acting as a data marshal of grid activity. In this way, operational data is enabled to add value to other utility processes like engineering, system planning, scenario development, and regulatory compliance. Using complete utility network data as a foundation, ArcGIS can correlate operational data—analyzing and visualizing it with asset data—and push live feeds from network management systems into maps and dashboards. The resultant near real-time system and business intelligence supports strategic, well-informed management and performance optimization.

Built-In Productivity Tools
Built-in productivity tools minimize the overall cost of ownership of a utility network model. Users have access to shortcuts, templates, and streamlined workflows within the software. Templates conveniently group even the most complex feature representations for ease of use. These preset collections of related assets can be edited with a single action and organized into groups for more interactive editing. Preset templates create automatic relationships during feature generation. For example, with a single click, a preset template can create a pad-mounted, single-phase transformer with two elbows and two line ends.

To support a modern grid, network representations need to be as accurate as possible. To reduce mistakes and prevent errors, QA/QC is built in. Data rules ensure that different types of features are connected to each other correctly. The technology leverages industry-standard rules that guard against costly data entry mistakes. The underlying architecture can potentially meet the data needs of other systems without costly and time-consuming data import/export processes.

Network Analysis for Real-World Events
Network management in ArcGIS supports analysis of the entire electric system to better manage routine operations, contend with real-world events, or model potential scenarios. Out-of-the-box tools perform rapid and intelligent tracing of electricity flows through everything in the grid. This capability supports potential advanced partner solutions for improved system analysis, outage restoration, and emergency response. For example, tracing beyond a protective device that has operated can return a dynamic view of the network for analyzing the customers affected by the outage. System planning processes can be enriched with near real-time operational data to analyze loading and voltage constraints along with the impacts of DER.

Accurate Time-Based Representations of the Network Configuration
For the first time, new methods to represent the state of the network through time are built directly into the software. The state in time is managed inherently, making it straightforward to view or analyze the system configuration at points in history; at the present; and potentially for planned, future scenarios. By modeling time this way, network management in ArcGIS also supports better asset and project management. Working with EAM, assets can be tracked through their life cycle as a feature of the software. Likewise, projects are modeled as they move through planning, design, and construction.

Conclusion

Esri is the global market leader in GIS. Since 1969, Esri has helped customers unlock the full potential of data to improve operational and business results. Esri engineers the most advanced solutions for digital transformation, the Internet of Things (IoT), and location analytics to create the data and maps that run the world.

Esri continues to improve its technology and develop solutions that are specifically designed for electric utilities. ArcGIS offers the most powerful mapping and spatial analytics technology available. Today, network management in ArcGIS continues those efforts by offering strategic capabilities to facilitate grid modernization. It does this while helping to contain data-related costs and add customer value. Esri provides a standard electric utility model that can be extended to meet a utility's unique needs.

The ArcGIS Utility Network Management extension is part of the ArcGIS platform and leverages its fundamental capabilities to assemble and store data with location intelligence, allowing users to analyze and share information conveniently with all stakeholders. Esri offers many training and professional development opportunities to help users learn how to apply this technology.

Esri gives customers several options to receive assistance in implementing utility networks. Esri's Jump Start packages assist with data preparation, software installation, and configuration to launch utility networks in support of daily tasks and workflows. For a more comprehensive approach, the Esri Enterprise

Advantage Program provides a flexible framework of services, training, and premium support to help any organization reach its full GIS vision. Finally, the Esri Partner Network is a rich ecosystem of organizations that work together to build on, extend, and help implement the ArcGIS platform including the ArcGIS Utility Network Management extension.

The ArcGIS Utility Network Management extension models the electric grid in greater detail with higher performance and improved scalability and underpins grid modernization activities. Esri's network management in ArcGIS helps utilities tackle many of the business challenges they face.

This document is an overview of the ArcGIS® Utility Network Management extension's capabilities, its impact to network management within ArcGIS, and its value for electric utilities. It is not intended to be a complete or technical description of the extension's functionality.

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Esri, the global market leader in geographic information system (GIS) software, offers the most powerful mapping and spatial analytics technology available.

Since 1969, Esri has helped customers unlock the full potential of data to improve operational and business results. Today, Esri software is deployed in more than 350,000 organizations including the world's largest cities, most national governments, 75 percent of Fortune 500 companies, and more than 7,000 colleges and universities. Esri engineers the most advanced solutions for digital transformation, the Internet of Things (IoT), and location analytics to inform the most authoritative maps in the world.

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