Ulteig

We listen. We solve.™

MODERNIZING THE ELECTRIC GRID

Prepare for the future and address the increasing reliability, resiliency and efficiency concerns on an aging distribution system.

Grid modernization is a broad term that generally refers to the process of making electric systems more resilient, efficient, reliable and optimized for Distributed Energy Resources (DER) and load side technologies. Efforts can range from distribution system hardening of traditional poles and wire systems, through asset replacements, to updating obsolete protection systems with the newest technology, (i.e. FLISR automatically locating a fault, isolating it, and restoring service to the unaffected parts of the system).

Grid modernization efforts typically include one or more of the following goals:

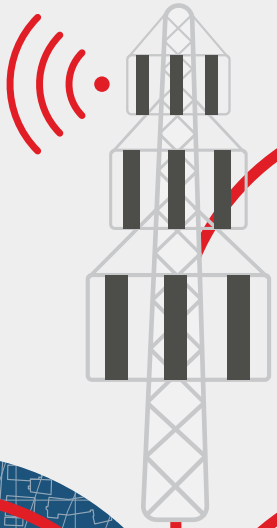
- **Increasing Resiliency**
- **Reducing Losses**
- **Improving Reliability**
- **Managing Peak Demand**
- **Accommodating New Dynamic Loads (i.e. Electric Vehicle (EV) infrastructure)**
- **Optimizing Grid Operation for DER (Solar, Wind, Block Chain and Energy Storage)**

GRID MODERNIZATION CYCLE

Utilities require solutions that are specific to their needs. Ulteig works directly with electric utilities on creating well-designed plans for implementing grid modernization objectives to ensure long-lasting benefits. Not sure where to start? Generally, we recommend the following four stages for implementing a long-term grid modernization strategy. Enter the process at whatever step makes the most sense for your utility:

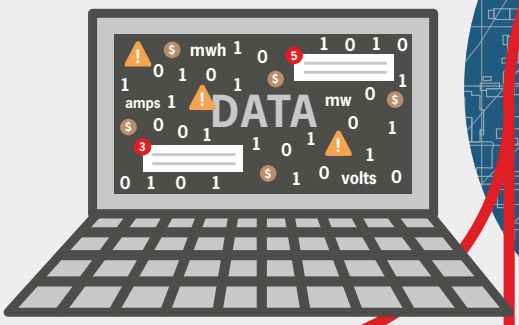
1 SYSTEM EVALUATION & FRAMEWORK DESIGN

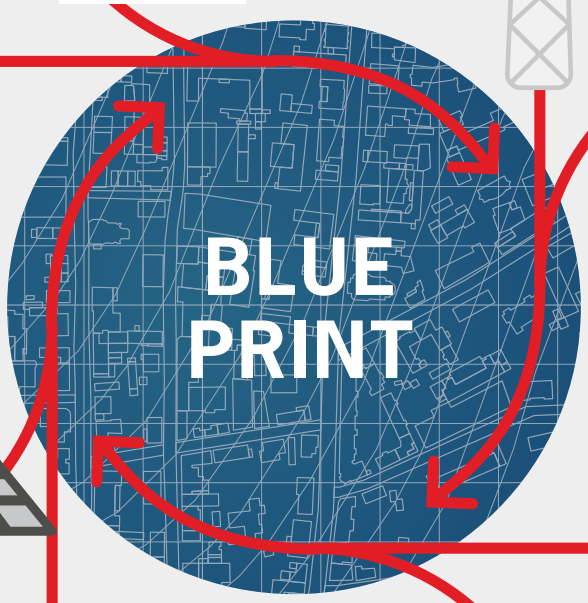
Since every utility is different, the first step is to evaluate your utility's individual systems to determine its unique needs, identify current issues and discover high-risk areas. From there, we can develop a solution to address your specific goals.

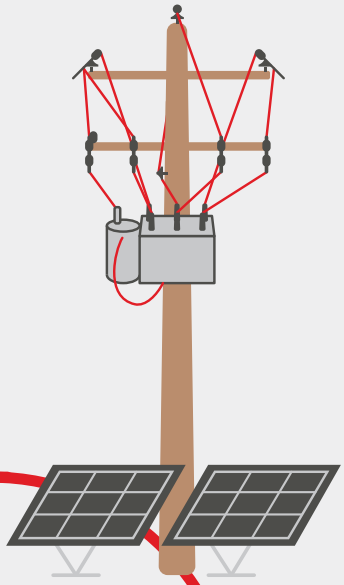


2 COMMUNICATION, NETWORK & DATA MANAGEMENT

The overall effectiveness of Grid Modernization implementation is enhanced by include a secure communication network and a method for managing incoming data. This isn't a one-size-fits-all solution, so we can help find one to suit your needs.







4 DATA ANALYTICS PROCESSING

Once a design is implemented, the final step is to think about how data is not only captured, but also processed, stored and interpreted. Our experts can help you lay out and enable a process that uses this information to your utility's maximum benefit.

3 TECH SOLUTIONS & FIELD IMPLEMENTATION

The next step is to complete the grid modernization project and implement it into your system. Critical decisions need to be made regarding overall design, implementation and vendor selection. Ulteig can help you navigate through these difficult hurdles.

STAGE 1

System Evaluation & Framework Design

Every utility is in a different position within its Grid Modernization efforts. Therefore, it's imperative that each system be uniquely evaluated to pinpoint high-risk areas and develop a hierarchical solution based on the specific goals of the individual utility.

The initial stage in executing a system evaluation is to perform a distribution level study. A Geographic Information System (GIS) and power system analysis tool can be utilized to supplement these studies and the planning required at this stage to help prioritize the needs and components of the utility's grid modernization initiatives.

During the distribution level study, a thorough review of the system's reliability metrics (System Average Interruption Duration Index (SAIDI), System Average Interruption Frequency Index (SAIFI), and Momentary Average Interruption Frequency Index (MAIFI) is recommended to help identify problem areas along with outage cause-based solutions.

Once the system evaluation is complete, a risk assessment and project identification phase can begin. To accomplish this, system study results are merged with the reliability evaluation to identify key risk areas that should be addressed immediately to improve the utility's reliability metrics.

At this level, Ulteig experts can help to identify a framework of specific projects, including new equipment implementation, and assign an estimated cost along with a projected system improvement value. This stage is vital in putting together a hierarchal list that will allow the utility to budget for the recommended projects

Along with identifying and rectifying current issues on the utility's system, the system evaluation and framework design stage can set up the utility for success when preparing for the addition of DERs and new dynamic loads, such as EV charging stations, within the distribution system.

View a complete list of Ulteig's electrical studies capabilities here.

STAGE 2

Communication, Network & Data Management

ARCHITECTURE & DESIGN

Two systems are recommended to ensure the overall effectiveness of the Grid Modernization design implementation: a secure communication network and a method for managing incoming data.

Determining the proper communication network is not a "one-size fits all" system. Network availability will vary based on project locations. In many cases, a single utility will need to utilize multiple communication networks to ensure overall system effectiveness. Communications options that need evaluation at this stage include fiber optics (rented or owned), licensed and unlicensed radio, satellite and cellular. Having the right networks in place allows the new technology to communicate effectively wihin its designed environment and provides visibility of the distribution system for the utility.

Increased system visibility includes managing an enormous amount of data points. It's imperative the architecture and processes are in place to receive, store and interpret this data. Many utilities today are implementing an Advanced Distribution Management Systems (ADMS), a software platform that integrates numerous utility systems to provide automated outage restoration and optimization of distribution grid performance. For this to be feasible, a well-planned network needs to be in place to communicate these data points properly to the ADMS.

In addition to automation, communications systems can be used to increase visibility at the distribution level. Key components using these systems include:

- Increased Data Points
  - Power Flow
  - Device Status
  - Fault Information and Location
- Phasor Measurement Units (PMUs)
- Advanced Metering Infrastructure (AMI)
- Improved State Estimation

Designing systems that respond automatically and immediately relay information, such as power flow and line efficiencies, can greatly improve system reliability, reduce grid costs and maximize effective use of energy.

STAGE 3

Technological Solutions & Field Implementation

Once the project roadmap is laid out and infrastructure and system requirements are selected, utilities must complete and implement the project design. Significant hurdles on this portion are navigating through the ever-changing technology available and determining the correct vendor to provide it.

Critical decisions must be made when completing the overall design and implementation. Some of these specific decisions include:

- Substation & distribution protection & control design
- Substation & distribution equipment
- Distribution line compensation
- Substation & distribution communication & network engineering
- Energy management system (EMS) & advanced distribution management systems (ADMS) support
- Project management

With the technological advancements today, many of these key applications will have solutions that rely on a convergence of both the Operational Technology (OT) and Informational Technology (IT) aspects. One key example where such a convergence is required is in an ADMS deployment. ADMS functions include automated Fault Location, Isolation, and Service Restoration (FLISR); conservation voltage reduction; peak demand management; and volt/volt-ampere-reactive optimization. In effect, ADMS transitions utilities from paperwork, manual processes, and siloed software systems to systems with real-time and near-real-time data, automated methods and integrated systems. [1] This deployment requires collaboration from an operational standpoint (i.e. installing new line equipment) and an informational standpoint (i.e. data points received from deployed devices through an integrated communications network.)

STAGE 4

Data Analytics Processing

After a design is implemented, an extraordinary amount of data is anticipated to be available for the utility's consumption. Data can be obtained from a multitude of locations depending on which technologies were implemented in Stage 3. Many of these devices house data in different sites, using different systems to access it based on the manufacturer. For devices implemented in large quantities that deliver frequent data (i.e. an Advanced Metering Infrastructure (AMI) system) a separate management system may be required to ensure the information is processed and stored properly. An integration plan needs to be developed for this network of systems to function properly and the framework must be in place to ensure the maximum amount of data is captured and secured adequately.

Being able to accurately capture this data is only the first step in this process. Deciding how to interpret that data is an entirely different challenge. With data continuously being transmitted and captured, it is imperative that it is reviewed, analyzed, and acted upon on an ongoing basis. Laying out and enabling the correct processes will help ensure that this information is used to the utility's maximum benefit.

Benefits and programs that can be put into place, depending on the technology implemented, can include:

- Asset Management & Health Monitoring
- Load Forecasting
- Advanced Distribution Management System
- Distributed Energy Resource Management System
- Integrated Volt-Var Optimization
- Conservation Voltage Reduction
- Visibility to the Customer
- Autonomous Data Management

Since emerging technology is being implemented on the system at a high rate, this step is proving to be very overwhelming for many utilities. However, if this stage is managed properly it can prove to be incredibly beneficial.

Conclusion

From improving your system reliability to preparing your distribution grid for future DERs, implementing a cost-effective Grid Modernization strategy is crucial. To best navigate the process, work with a qualified provider who can analyze your business and tailor a unique solution to fit your needs.

Ulteig can deliver customized Grid Modernization solutions to fit your specific initiatives. We'll work with you on the front-end to develop a unique grid modernization plan. Our networking and communications experts are ready to help you navigate the various technologies available. Ulteig understands distribution systems and the equipment necessary for successful implementation.

Once the communications infrastructure is in place, Ulteig will serve as the engineer and program manager to implement your system upgrades. This will be completed through technology scouting using our Advanced Center of Technological Excellence.

Working with our partner network to gather data, we'll teach your employees how to work with and interpret that data to operate a truly modernized grid.

Contact one of Ulteig's Grid Modernization experts listed below to get started with a free consultation.

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1. U.S. Department of Energy: Office of Electricity Delivery & Energy Reliability. Insights into Advanced Distribution Management Systems. (2015)