THE IMPORTANCE OF SYSTEM DATA AND COMMUNICATIONS FOR GIS AND SYSTEM INVENTORY

The utility industry is being transformed by grid modernization, including smart grid, distributed energy resources (DER), cybersecurity requirements, utility-scale renewables, and integrating the rapidly-growing demand for electric vehicle charging infrastructures.

Before utilities can effectively manage in this new environment, they must be able to gather high quality, comprehensive, accurate, and timely data from the field - data that will enable them to understand their networks, equipment performance, and operating conditions, and the impact that these are having on their customer service performance. The ability of utilities to ensure the correct inputs from their system and operations data enable them to significantly improve the quality, cost, efficiency, and effectiveness of their operations.

Traditional GIS

Of course, Geographic Information Systems (GIS) technology has long been what utilities have relied on in order to know what is on their networks. The GIS platform features tools and technologies that can manage the locations of the connections that represent the network. Basic GIS, for example, helps utility workers locate substations, transformers, and other equipment in the system, as well as where cables and wires originate and terminate.

However, while GIS is able to provide a lot of information in the traditional sense, it has some limitations when it comes to the new requirements of today's grid.

For example, traditional GIS is built from a design and as-built perspective, rather than from an operations perspective. As a result, it is often unable to provide operations personnel with information that reflects the existing operating state of the network. In other words, while it provides accurate data of the "as built" grid, it is often unable to provide current "as operating" information.

In addition, while traditional GIS is helpful in terms of providing network information, it often falls short in the ability to allow utilities to stay abreast of the latest technologies in grid modernization, which require integrating data sources into a cohesive information source that can help utilities make the correct decisions on an ongoing basis related to customer demand.

New GIS Requirements

With the advent of grid modernization, new demands are being placed on GIS. One of these is distributed energy resources (DER). In the past, utilities often had a single major generating station. These days, with the advent of DER, grids may now include thousands of mini-generating plants, such as customer-sited solar, microgrids, etc. Utilities need to know the locations of the DER installations that are connected to their grids and how much power each unit is capable of producing. Furthermore, GIS needs to do more than just identify and map these assets. It needs to provide real-time data on system performance. Today's GIS needs to allow utilities to quickly locate "prosumers" (customers who are generating their own power at times) who have excess DER power that can be bought, sold, or redistributed. In addition, GIS needs to be able to monitor fluctuations in the consumption and production of this DER equipment.

Another key area relates to outages. Utilities need real-time GIS information in the event of powerful storms, so that they can understand which segments of the grid may be most at risk, how these risks can be mitigated, and what steps the utilities can take to reroute power to avoid segments of the grid that may become non-operational as a result of the storm. In addition, GIS also needs to be able to assess the status of the grid when there is an outage (storm-related or otherwise) on part of it, and find other generation and lines on the grid that can provide back-up until the outage is repaired.

A third area relates to the growing popularity of utility-scale batteries that more and more utilities are building, and especially solar+battery installations. GIS needs to be able to monitor when solar+battery units are fully charged, such that the power is available for sale to customers and not needed by the utility itself to meet peak demand on a given day. This real-time GIS feature can not only save money for utilities, but can also increase revenue, again, by knowing what equipment is generating excess energy that can be sold.

A fourth area relates to siting of new equipment and technologies. For example, besides reporting on where existing equipment is located in a geographic region, GIS (with its store of information on Google maps, drone imagery, government-protected land, etc.) can help utilities assess where it makes the most sense to locate new equipment and generation units, such as utility-scale solar farms. This feature is even more valuable, since GIS stores information on the location of existing equipment and the implications of interacting with that equipment for the new solar farm.

Another area relates to advanced technologies that are being introduced to grids. For example, with the introduction of Advanced Distribution Management Systems, which are able to make operations decisions without human interaction, utilities need a GIS system that provides complete, accurate, and up-to-the-minute information.

These challenges to GIS will also continue to grow as utilities introduce Internet of Things (IoT) technology and the smart devices that are included, which will introduce new data points multiple times a minute. In sum, GIS technology will need to go well beyond simply providing information on what is located where. It will need to provide real-time information on every piece of equipment on the grid, what each of those pieces of equipment is doing at each and every moment, and how these changes are affecting each other and the grid as a whole.

This is where Finley Engineering can help. As noted, there is a lot of good technology in the field, but getting the most from it is dependent on having access to complete, accurate, and timely information from the field as to its location, functioning, and interactions.

This requires dynamic modeling, which is the time-dependent aspect of GIS. Dynamic modeling relates to the temporal changes in the states of equipment and devices on a utility's grid. This means not only the current condition, but transitions as they occur, and specific events that trigger changes. Currently, few utilities have this level of detail and accuracy in their system models.

Contact your Finley Engineering representative for more information on how to bring you GIS technology up-to-date, so that it can provide you with the real-time information on the functioning of everything on your network.

About the Author:

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