



---

## **Beyond silos:**

advanced network management  
for the digital utility

# Managing in the era of convergence

What does it mean to “manage” a utility network today? Technology has evolved rapidly over the past three decades, bringing new levels of meaning to the word and new challenges for utility leaders.

Until the last quarter of the 20th century, “managing” was “monitoring.” Distribution and outage management could be said to consist of “systems” mainly in the sense of protocols or practices. In the 1960s, adoption of SCADA<sup>2</sup> brought a true systems-based capability to “see” operational status across the transmission systems and at least to the feeder breakers in distribution substations.

## Defining ADMS

The US Department of Energy describes an advanced distribution management system (ADMS) as “a software platform that integrates numerous utility systems and provides automated outage restoration and optimization of distribution grid performance. ADMS functions can include automated fault location, isolation, and service restoration (FLISR); conservation voltage reduction (CVR); peak demand management; and volt/volt-ampere reactive (volt/VAr) optimization.”<sup>1</sup>

As grid technology advanced, intelligent autonomous controls emerged, including intelligent electronic devices in substations and in devices along the distribution feeders. Smart switches began to be placed across the entire T&D infrastructure. With their ability to not merely monitor but also to command or control autonomously, these devices represented a new level of advanced management.

The next iteration of control arose with systems that could combine monitoring and controlling functions, and deploy both centralized and distributed intelligence. While aspects of these combined capabilities can be seen in generation management systems (GMS), transmission management systems (EMS), and distribution management systems (DMS), as well as certain distribution automation devices or outage management systems, it was the advanced distribution management system (ADMS) that began to truly revolutionize network management.

The ADMS added a new capability, not only controlling but coordinating and optimizing various operations, generally with a hybrid of distributed and centralized intelligence. Distributed intelligence systems began to push beyond the boundaries of the distribution system in their ability to both monitor and control, and they continue to do so today.

The scope and pace of change facing utility operators can seem daunting. A new management approach is needed, but where to begin? Establishing priorities to meet the greatest needs can help.

**This paper examines four ADMS characteristics that are poised to make the biggest impact:**

1. **A single, common user interface**
2. **Scalability of advanced data management**
3. **Smarter switching**
4. **Better training tools**

**These four areas offer a clear focus for utilities seeking more effective grid control.**

# 1. A single, common user interface

—  
The unified platform and user interface are the future of utility management.

ADMS technology is continually evolving, driven by increasing volumes of data from internal devices and coordination of SCADA, OMS and power network applications as well as external systems. Today's grid operators look to the systems to interact with outside data as well, including market electricity prices, weather, and wind & solar forecasts, or engaging with independent power provider service and pricing. As data accrues, it can yield important insights.

The unified platform and user interface are the future of utility management. The ADMS must now reach across silos, bringing together data – and borrowing approaches from the formerly distinct operational areas of generation, transmission and distribution. Today's utility management requires the kind of advanced network applications traditionally found only at the transmission level.

A report from the Environmental Defense Fund summarizes the trend:

“With the advent of diverse cost-effective sensing and monitoring solutions, the ability to ‘see’ what’s happening across the electric grid has dramatically improved. Many of these solutions have been found more prominently across the transmission system on high voltage lines or major substations. Now, similar solutions are finding their way down into the distribution system. System operators are able to sense how equipment across the system is behaving, the status of outages, the state of power flows, and more, all in near real time.”<sup>3</sup>



The more complex the grid becomes, the more operators need a level of network visibility that crosses the traditional boundaries of transmission and distribution. The days when separate products and monolithic applications can work for utilities are rapidly coming to a close. SCADA, transmission network applications, distribution network

applications, outages, distributed energy resources and training modules need to sit on a centralized platform using one common “as operated” network model, accessible from a single user interface. And each of these functional areas must provide advanced functionality as well, as shown below:



#### **Supervisory control and data analytics (SCADA)**

Operators need their supervisory control and data acquisition to provide high performance, easy availability of data, cyber security, intelligent alarm and event handling, and an integrated data historian.



#### **Outage management system (OMS)**

Operators need unified access to anticipate (and, if possible, prevent) outages, handle switching, address trouble calls, respond to storms, mitigate unexpected outages, and manage crews.



#### **Network applications**

Operators need coordination between DMS applications that are running simultaneously. For example, a VVO application needs to know a FLISR application is reconfiguring the network due to a fault and that the device settings for volt/VAR need to change.



#### **Distributed energy resource management system (DERMS)**

Operators need to keep the grid balanced and optimized in real time while maintaining system reliability and power quality, even when DERs (distributed energy resources) like rooftop solar and battery energy storage are present. DERMS applications can decrease voltage excursions and increase hosting capacity in networks with high DER penetration.



#### **Analytics**

Operators need a unified interface that simplifies the process of bringing together data from different formats and systems, providing the ability to find patterns and correlations that inform smart business decisions. Utilities are looking to the ADMS to apply analytics that yield actionable insights, for example, showing the levelized cost of energy for different resources so that operators can meet demand with the resources that make sense both economically and operationally.

To manage all this complexity, operators need an efficient way to view all applicable data from multiple systems in a single pane of glass. No longer will tables suffice; utilities need to dig into the data, to see it on a map, to open schematics, to be able to drill down into the state of the grid – and they need to do so readily, without needing to open and close different software systems or software applications.

Utilities are moving at a faster pace; it should not be necessary to engage in lengthy and unwieldy data format conversion processes in order to compare data. Across the utility, field workers, dispatchers and others all need to access the user interface from where they are, with a view that provides situational awareness to help them do their jobs with the latest safety, system status, and equipment data at their fingertips.

---

## 2. Scalability of advanced data management

With the last decade's system-wide SCADA adoption, many utilities embraced smart meters and deployed the advanced metering infrastructure. Operators could not only ping devices, they also began to deliver data backhaul to the utility operations center, bringing new insights into customer energy usage.

This widespread use of two-way communications ushered in much of what was heralded as the "smart grid" era and brought both cultural and technology change. Having visibility into customer usage data enabled savvy leaders to explore new ways to manage energy on the demand side. It enabled the use of time-of-use rates and new levels of engagement to persuade customers to change energy behaviors.

These changes, while exciting, opened the door to the massive data challenge that utilities are grappling with today. Volumes are already accruing from existing devices – thousands of meters transmitting every 15 minutes every day for decades. More devices are being added across the utility, too. And as the unifying interface allows different data points to be brought together and analyzed, a third stream of data emerges from their output. Operators need an approach that fits today's needs and readies them for this tremendous influx of data.

Speed and efficiency matter. The rate of data acquisition directly impacts the operator's ability to make sound decisions, acting on the most up-to-date information. A single data engineering tool makes it easier to import data and to migrate data, an important feature that supports standards-based integration of data, for example from geospatial information systems (GIS) and from a common information model (CIM).

How many signal changes per second can the system handle – 5, 10, 15 thousand? This is a measure of capability to consider when determining whether systems can process data effectively.

Once data is delivered, it must be analyzed and made actionable quickly, which requires more powerful data processors. Advanced systems can provide this vital capability.

---

The rate of data acquisition directly impacts the operator's ability to make sound decisions, acting on the most up-to-date information.



## 3. Smarter switching

Upholding reliability will remain a core utility priority – unchanged amidst any industry changes. Switching is the daily task of the operator. It has become significantly more complex as a result of the increased penetration of renewable resources, which interconnect with the grid in more places than traditional generation sources and operate at more frequent and irregular intervals (due to the natural intermittency of the sun and wind). As a result, they require more active engagement. Operators must constantly assess: What is the real load that is being switched? How much DER rides through; how much disconnects? What happens to the margin if cloud cover occurs?

Smarter switching and managing DER ties directly back to the benefit of a single interface. In his 2017 analysis of Newton-Evans Research on EMS, SCADA, DMS and OMS usage in North America, Peter Arvan Manos observed, “Importantly, of the 29 respondents using or planning to use an ADMS, none indicated that their SCADA functionality and

network modeling presently include distributed energy resources (DERs). However, most of this sub-group (82%) plans to include DERs in their ADMS functionality in the future.”<sup>4</sup> Utilities that can manage active power management and volt/VAr optimization as part of their ADMS gain a significant advantage.

In the coming DER-integrated grid, manual switching will still be required, but automated electronic switching will be even more essential – for both planned and unplanned events. Operators need an ADMS that can simulate a switching plan, particularly to anticipate and manage the impact of connected resources, evaluate alternatives and design the best approach.

Operators also need the ability to communicate electronically to the field in real time. This improves safety, by reducing the risks associated with miscommunication, and improves field crew efficiency.

—  
In the coming DER-integrated grid, manual switching will still be required, but automated electronic switching will be even more essential.

## 4. Better training tools

While widely known and anticipated, the coming retirement of a large percentage of energy industry workers remains a challenge to the industry. As early as 2009, the shift was noted: “Of the 120,000 to 160,000 electric power workers that will be eligible for retirement or leave the industry for other reasons by 2013, industry surveys suggest 58,200 will be skilled craft workers and another 11,200 will be engineers,” said the Task Force on America’s Future Energy Policy.<sup>5</sup>

Many older workers may have worked on since that time, which granted utilities a reprieve to prepare for a smart transition, but this can actually exacerbate the problem. As the report noted,

“There is a concern in the industry that delayed retirement could lead to more acute worker shortages at some point in the future if many workers retire around the same time.”<sup>5</sup>

A training simulator plays an essential role in an ADMS. Utilities have an opportunity to capture institutional knowledge from senior workers to inform training modules. Younger workers with “native” digital skills often bring skillsets that respond to simulator training, including self-service training, and this asset can be leveraged to bring new workers up to speed to take on increasingly complex roles.

---

# Anticipating the digital grid with today's ADMS

---

The ADMS is the tool that makes a digital platform possible.

Change is happening now, confronting grid operators with the need for a new approach to grid management. There is a growing consensus that today's grid "is quickly becoming a digital platform...through software, control centers, communications and data analytics."<sup>6</sup>

The ADMS has become the tool that makes a digital platform possible, equipping utilities to reach beyond the old silos; to see, manage and optimize their operations across all distribution operations. When the network model includes subtransmission

and transmission, the generation, transmission and distribution can be optimized with network applications on the same platform.

As DER integration, changing demographics and an increasingly interconnected world continue to drive change, utilities must set priorities to equip them with the most important tools. An ADMS that provides the ability to train workers, oversee smart switching, expand use of advanced data management – and do it all from a unified platform – will best equip utilities to meet these challenges.

---

**There's more to discover!**

Click below for additional information.

**LEARN MORE**





---

**abb.com/network-management**  
**info.pges@abb.com**

---

#### Endnotes

1 US Department of Energy, Office of Electricity Delivery & Energy Reliability. "Voices of Experience: Advanced Distribution Management Systems", February 2015. [https://www.smartgrid.gov/files/ADMS-Guide\\_2-11.2015.pdf](https://www.smartgrid.gov/files/ADMS-Guide_2-11.2015.pdf)

2 "Two decades of SCADA exploitation: A brief history", by Simon Duque Antón ; Daniel Fraunholz ; Christoph Lipps ; Frederic Pohl ; Marc Zimmermann ; Hans D. Schotten. <https://ieeexplore.ieee.org/document/8270432>

3 "Grid Modernization: The Foundation to Climate Change Progress" by the Environmental Defense Fund, 2016.

4 "New Study on Upgrades of EMS, SCADA and DMS Capabilities," T&D World, May 11, 2017 by Peter Arvan Manos. <https://www.tdworld.com/outage-management/new-study-upgrades-ems-scada-and-dms-capabilities>

5 "Task Force on America's Future Energy Jobs", 2009 by National Commission on Energy Policy. <https://bipartisanpolicy.org/wp-content/uploads/sites/default/files/NCEP%20Task%20Force%20on%20America's%20Future%20Energy%20Jobs%20-%20Final%20Report.pdf>

6 "Grid Modernization: The Foundation to Climate Change Progress" by the Environmental Defense Fund, 2016.

