Market Guide for Advanced Distribution Management Systems

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Initiatives: Energy and Utilities Technology Optimization and Modernization

The energy transition is driving utilities to seek technology partners to address evolving digital grid challenges posed by increasingly decarbonized, decentralized and democratized energy provisioning. This Market Guide gives utility CIOs insights on the ADMS market and leading software providers.

Overview

Key Findings

- The confluence of the 4D megatrends (digitalization, decentralization, decarbonization and democratization) is driving structural changes in energy provisioning systems. To manage electricity delivery networks safely and effectively given the new requirements of the energy transition, utilities need a solution that serves as the “nerve center” of the digital grid.

- The advanced distribution management system (ADMS) market is maturing, but solutions offered are a mix of COTS and customized project-specific implementations. This is a reflection of most vendors having OT legacy and, consequently, they have not developed ecosystems of system integration partners that can implement their products as COTS.

- ADMSs are complex production environments crossing IT and OT that are extremely data-intensive, and implementations can take two to three years or longer. Vendor choices are not easily reversed.

- The rising adoption of distributed energy resources (DERs) is driving the next big wave of utility investment in ADMS, but it also creates confusion and overlap with the emerging distributed energy resources management system (DERMS) market.

Recommendations

When selecting ADMS products, utility CIOs focused on technology optimization and modernization should:

- Improve emergency response by aligning capabilities with customer service initiatives that drive improvements in estimated restoration times and dissemination of outage information to customers.
Market Definition

An ADMS is the decision support environment that provides a shared network model (a digital twin of an electric distribution network) and a common user experience for all roles that are required to monitor, control and optimize the secure operations of the grid. The ADMS assists electricity distribution system operators to proactively and safely guide outage restoration activities, manage and optimize networks for improved asset utilization and effectively manage the integration and impact of distributed energy resources (DERs). ADMS functions include:

- Distribution state estimation (DSE)
- Fault location, isolation and restoration (FLISR)
- Volt/volt-ampere reactive optimization (VVO)
- Outage management
- Conservation through voltage reduction (CVR)
- Peak-demand management
- Integration of distributed energy resources

Market Description

The conflict of two opposing forces — increased global demand for energy and the consequent environmental implications — is creating a global disruption across every industry, in particular, energy utilities. The pressure to maintain physical integrity and modernize aging infrastructure under changing climate conditions and consumption/production patterns continues, while technology-driven disruption at the grid edge challenges existing energy provisioning business models.
The confluence of these factors is manifesting as the 4D forces (see “Top 10 Trends Driving the Utility Industry in 2020”) are, at the same time, both drivers and indicators of the energy transition. This implies changes in energy sourcing, structural changes in energy provisioning systems and driving an exponential increase in the complexity of the energy ecosystem (see Figure 1).

Figure 1: 4D Forces Imposed Structural Change in Energy Provisioning

The energy transition fundamentally changes the traditional energy delivery network architecture by introducing a significant amount of new DERs, whether they are generation, distributed energy storage or aggregated demand-reduction resources. Democratization of energy provisioning has resulted in many (if not most) of these DERs being owned by consumers (residential or large commercial and industrial) and installed on their premises.

A digital grid (a more observable and controllable power delivery infrastructure; see “Hype Cycle for Digital Grid Transformation Technologies, 2019”) is required to address the impacts of new, intermittent, nondispatchable renewable resources. It also has to address the disruption coming as a result of innovation happening at the edge of the grid (such as residential solar and storage). The exponential price performance improvements in consumer energy technology have resulted in grid parity in many markets. This is overturning long-held business model assumptions of the primary energy product being generated centrally at scale (see “The Energy Transition Question: Do We Need the Grid?”).
The grid must fully engage consumers (some of whom are now prosumers, with more options for going off-grid or providing energy back into the grid). Regulators are considering new market structures and incentives to help utilities improve system observability and maintain controllability under these new operating conditions. The digital grid must address policymakers’ concerns about the long-term sustainability of energy by enabling consumer energy-efficiency initiatives. Utilities need the digital grid to implement load flexibility across customer segments to match and schedule loads against the intermittent generation pool. In the residential segment, utilities will need to manage the impact of electric vehicles (EVs) and integrate consumer energy technologies such as home energy management (HEM) systems, smart inverters and smart thermostats.

As the global utility sector experiences the energy transition, utilities must modernize their energy delivery networks to resolve current operational challenges as well as enable new business and operating models that monetize the use of the digital grid's expanding services. To safely and effectively manage the delivery infrastructure, utilities need a solution that serves as the “brain” and “nerve center” of the digital grid. The solution must consolidate and integrate the necessary software into a real-time platform. This platform will orchestrate how all the functional network components and parties from the extended ecosystem (including consumers and DERs) can operate, coexist and interact in the new democratized energy markets.

Given these requirements, utilities need a comprehensive enterprise application suite — an ADMS that addresses a wide range of distribution operations scenarios. To meet new requirements, ADMSs need to extend across traditionally separated IT and OT domains, as well as support the extension of monitoring and control capabilities with integration of smart devices in the consumer technology (CT) domain. As depicted in Figure 2, ADMSs also need to provide a single user experience (single pane of glass) and common network models for monitoring, operation, restoration, analysis and optimization of the modern energy delivery network. The same integrated environment must support network operators managing the grid under normal operating conditions and support emergency restoration following a storm.

Figure 2: ADMS Functional Scope
Most Common Functions an ADMS Needs to Support

The following are the most common functions an ADMS needs to support.

Create and maintain a network model. Provide a shared network model and a common user experience for all roles that are required to monitor, control and optimize the secure operation of the electrical distribution network under normal and emergency operating conditions:

- User experience:
  - Geospatial network display
  - Schematic network display
  - Automatic feeder and station display generation
  - Major event mode
  - Operator training simulator
  - Role-based workspaces
  - Collaboration support (shared field displays, streaming video)
■ Visualization support (surface table displays, virtual reality)

■ “As operated” network model:
  ■ Model manager
  ■ Data quality capabilities to flag data and fix data errors
  ■ Topological tracing/coloring for single-phase and three-phase networks
  ■ Switching plan visualization
  ■ Temporary network elements
  ■ Safety tagging and interlock checks
  ■ Tagging lockout

■ Distribution supervisory control and data acquisition (SCADA):
  ■ Alarm processing
  ■ Substation/distribution automation system interface
  ■ Intercontrol center interface
  ■ Communication front-end processor

■ Interfaces to external systems:
  ■ Geographic information system (GIS) model import and incremental model build
  ■ Enterprise asset management (EAM)/ERP/work management interface
  ■ Interactive voice response interface
  ■ Customer information system (CIS)/customer portal interface
  ■ Mobile workforce management (MWM) interface
  ■ SCADA system interface (if SCADA is not included as a native capability)
  ■ Meter data management (MDM) system interface
  ■ Demand-response management system (DRMS) interface
  ■ DER management system (DERMS) interface
Track and restore outages. Proactively and safely guide distribution operators during severe storms and when they are conducting outage-related restoration activities:

- Trouble call processing
- Meter power off notification (PON) processing
- Outage analysis
- Outage event summary
- Estimated time to restore
- Autogenerated switch plans
- Resource needs prediction
- Crew management
- Switch order management
- Calculation of reliability performance indexes
- Storm modeling and impact analysis
- Storm replay analysis

Analyze and optimize network. Enable distribution operators to manage network loading across the load profile and to optimize the network for improved asset utilization and overall network efficiency and reliability:

- Distribution power flow
- Fault location, isolation and service restoration (FLISR)
- Conservation through voltage reduction (CVR)
- Volt/volt-ampere reactive (VAR) optimization
- Distribution state estimation (DSE)
- Protective relay coordination
- Predictive feeder load flow/peak planning
Assess impact of DERs. Enable distribution operators to assess the impact of DERs and network operating conditions, as well as influence DERs (either through direct control or economic incentives) to be relied on as grid control resources:

- DER aggregation, forecasting and optimization
- Scheduling for microgrid and distributed generation (DG) operation
- Impact assessment of DERs on switching actions
- Modeling and interfaces for EV to grid interaction
- Modeling and management of energy storage services

**Market Direction**

Gartner estimates ADMSs are currently managing electric delivery infrastructure that provides electric service for more than 1 billion electricity customers worldwide cumulatively (more that 850 million are served just by the vendors reported for this Market Guide). Yet, the ADMS market is still a mix of COTS and customized project-specific implementations. Several ADMS vendors are demonstrating a strong, deliberate focus on mastering COTS development and delivery processes. Leading vendors are starting to deliver rearchitected products to adopt more flexible and modular architecture in line with the modern digital technology platforms. Although software quality assurance and release management processes are improving overall, in most cases, the results are not yet evident in customer feedback. Consequently, in addition to focusing on product functional scope and feature functionality, Gartner recommends that ADMS buyers assess overall product architecture as well as vendor product development and delivery maturity. Pay specific attention to support, patch management, automated regression testing and deployment processes.

From the functional standpoint, vendors of comprehensive ADMS solutions have made significant advancements in the last few years toward a digital platform architecture. Here are some examples:

- Price-sensitive load modeling
- Net load management
- Capacity/load allocation
- Near-term load forecasting
- Optimal network reconfiguration
- Peak demand reduction
- **Modernizing the operator’s user experience:** ADMS vendors continue to revamp their products’ user interfaces and overall user experience. These efforts range from extensive revamping (for example, engaging user experience design firms from outside the industry) to adopting the latest tools from software development vendors.

- **Improving situational awareness with more information sources:** Distribution operators working with a more complex grid are depending on more and more external information feeds. These feeds might provide detailed information about solar irradiance, fire encroachment, precipitation, wind and lightning; or they might be social media feeds that enable operators to pinpoint outage causes.

- **Deploying ADMSs for low-voltage (LV) networks:** Most current ADMS deployments are addressing the needs of medium-voltage distribution networks. As new requirements drive toward tighter integration of consumers and their on-site generation and energy efficiency capabilities, ADMS products are expanding downward toward LV secondary networks.

- **Supporting distribution system planning:** The rich detail of the network models within ADMSs is advancing the state of distribution system planning. Rapid adoption of DERs requires these processes to become more continuous, locational and granular. ADMS products must analyze the effect of DERs on 24-hour load curves, the seasonal impacts on operations and the potential of alternatives for system reinforcement (such as demand response in lieu of investing in substation and feeder upgrades).

- **Supporting advanced metering infrastructure (AMI) integration:** The ADMS can leverage meters as sensors for outage determination and restoration verification. It also should be able to send out status queries to meters for a “virtual callback function,” as well as an association of notifications detailing trouble events. Some ADMS vendors are now offering AMI event-filtering capabilities for selected MDM platforms.

- **Integrating DERs and managing microgrids:** In regions where solar photovoltaic (PV) systems and other types of DERs are growing quickly, utilities are deploying systems to coordinate and manage them at the grid edge. These systems are usually referred to as DERMSs. All ADMS vendors are working on their own DERMS capabilities — sometimes within ADMSs and sometimes as a related, stand-alone product offering.

- **Improving model management:** Utilities deploying ADMSs often find the development of an accurate and fully detailed “as built” model in the GIS to be quite challenging. Most utilities find it difficult — if not impossible — to keep the GIS and ADMS models completely synchronized. Model management tool enhancements are, therefore, aimed at helping utilities minimize the risk of network data inaccuracies and subsequent operator errors. Data verification tools become critical when active control is extended to LV where the LV network is often estimated and then iterated over time to improve the data quality.
The energy transition is expanding buyers’ requirements for ADMS. Utilities seeking to effectively integrate renewable DERs will benefit from investing in modern, modular ADMS technology. However, ADMS does not comprehensively address all the aspects of the DER impact on utility businesses such as:

- Improving analytics and reliability reporting: Vendors are improving their reporting and postevent analysis capabilities by relying more on commercial analytics software. This enables distribution engineers to more effectively analyze the volumes of data that can be produced by the outage-reporting functions and to improve distribution reliability analysis.

- Exploring centralized and distributed control schemes: ADMS vendor solutions must effectively integrate with substation software and feeder automation using a combination of centralized and distributed control schemes.

- Investing in comprehensive integration with mobile workforce management systems: ADMS vendor solutions can support field actions, in particular during the emergency restoration process.

In addition to being able to model and analyze DER impact on network operation, ADMS products are focused on turning those resources into a control lever for distribution network operation. The mutual focus on DER creates some confusion between product boundaries for ADMS and DERMS products, and raises questions about relative product functional scope. To resolve this confusion, Gartner’s position is that ADMS should address the network operator aspects of DER penetration and operation. DERMS functionality, on the other hand, should extend the commodity management aspect of DERS required by market operators (flexibility markets) or aggregators and retailers (DRMS/virtual power plant [VPP]). For more information, see “Market Guide for Distributed Energy Resource Management Systems.”

New network business and operating models also impact the functional scope of the ADMS product. In the traditional DNO model, the owner and operator of the grid is responsible for maintaining reliability, availability and operational integrity of the grid with enough bandwidth to safely meet customers’ demand at any point in time. For DNOs, ADMS products should provide insight into the operating condition of the grid, optimize performance and ensure safe operation. In the DNO context, DER are considered a “nuisance” that should be analyzed to mitigate and prevent negative impacts on grid operation.
Increased penetration of DER in some energy markets has triggered a transition from the DNO model into a distribution system operator (DSO) model. In this model, the role of the grid owner and operator is moving from being a grid operator toward being an operator of a platform that enables DER orchestration into local energy markets such as transactive energy markets. Potentially, in the future, this platform may be an open-access energy exchange platform. In that context, DSOs are starting to focus on using an economic-value-based network control concept while considering grid reliability constraints. That sets up an effective mechanism to integrate and orchestrate DERs into the local energy market. But it may require the ability to calculate distribution marginal prices, congestion management and, potentially, create a need to calculate real energy delivery cost based on electrical impedance as a proxy (see “Industry Vision: Utilities as Platform Providers for the Energy-Sharing Economy”).

In 2020, the stress on utilities has been sharply increased by the COVID-19 pandemic. Utilities are well-versed in working through crises like cyberattacks and natural disasters like hurricanes and earthquakes, but they aren’t fully prepared to deal with protracted catastrophic global events like the COVID-19 pandemic. This is a serious problem because experts agree that global events like the COVID-19 pandemic may emerge again, and may well increase in frequency. Control rooms are normally under pressure when the system peaks or a natural event occurs that physically damages the grid. If a natural event were to occur in parallel with the current pandemic disruption, the natural event would be compounded across both grid operators and field crews. Such a compound event would cause prolonged outages by limiting the ability of the utility to respond and repair damaged infrastructure.

Performing mission-critical work under prolonged pandemic conditions has begun to challenge some assumptions about architecture, deployment practices and usability of operational technology in control centers. Flexible work practices require agile and flexible control center technology. As one example, emergency restoration work traditionally orchestrated from control centers on designated applications such as ADMS — which include emergency restoration capabilities with client/server architecture — can now be performed from the field. By changing the user interface architecture to HTML5 web clients and reconfiguring roles and responsibilities, utilities can designate restoration work to personnel who are not physically located in the service center.

Market Analysis

The earliest OMSs were developed in North America, where utilities have significantly more overhead lines and radial network designs, and, therefore, are more vulnerable to severe weather. By contrast, distribution management system (DMS) vendors first emerged in Europe, where distribution systems have a higher load density, are more networked and generally have higher reliability.

Unusually intense storms in the U.S. several years ago — particularly for East Coast utilities — have spurred a renewed focus on OMS functionality and scalability. Buyer focus is now shifting back to
advanced distribution applications — with a continued focus on FLISR and VVO — and DER management in areas with growing penetration of renewables. Utilities in EMEA and Asia/Pacific are still purchasing mostly DMS-focused solutions, since outage management requirements are less demanding.

ADMS vendors with native SCADA offerings do have a market advantage in most cases, but ADMS projects that integrate with external SCADA systems have also been successful. As an example, Oracle’s acquisition of LiveData in 2020 added the ability to offer native SCADA as well as provide the opportunity to integrate with legacy SCADA solutions via an OT middleware. That addressed perceived weakness of Oracle ADMS solutions in the eyes of traditional buyers. On the other hand, buyers of ADMS offerings from vendors with a historical focus on distribution SCADA may find that outage management functionality is less developed. The historical roots of these product offerings now matter less. The overall product sector has matured to support the full range of ADMS capabilities. Products support the utilities’ traditional business model (i.e., DNO), which benefits directly from infrastructure-related initiatives such as improved asset utilization and loss minimization (via VVO and CVR) and from emergency restoration (via FLISR and integration with OMSs). ADMS products are also starting to support emerging business models through DER modeling and integration.

Figure 3 depicts the license revenue per region for all vendors, which can serve as an indication of the ADMS investment activities by utilities in a particular area.¹ Buyers in a particular region can use this graphic as an indication of regional market maturity, which will indicate access to available references to check product and vendor capabilities, as well as availability of references.

**Figure 3: ADMS Vendors, Product Revenue per Region**
Figure 4 provides an indication of vendor revenue from the ADMS market split into three categories, which to some extent can indicate the maturity of the COTS offering as well as reliance on external vendors during the implementation.

**Figure 4: Vendor ADMS Revenue Split**

**Vendor ADMS Revenue Split**

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Maintenance and Support Fees</th>
<th>Implementation Services</th>
<th>License Fees</th>
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<tbody>
<tr>
<td>Hitachi ABB Power Grids</td>
<td>10%</td>
<td>47%</td>
<td>43%</td>
</tr>
<tr>
<td>ETAP</td>
<td>40%</td>
<td>50%</td>
<td>10%</td>
</tr>
<tr>
<td>GE</td>
<td>23%</td>
<td>57%</td>
<td>20%</td>
</tr>
<tr>
<td>Indra (Minsait ACS)</td>
<td>30%</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>Open Systems International (OSI)</td>
<td>45%</td>
<td>35%</td>
<td>20%</td>
</tr>
<tr>
<td>Oracle</td>
<td>24%</td>
<td>40%</td>
<td>36%</td>
</tr>
<tr>
<td>Schneider Electric</td>
<td>18%</td>
<td>61%</td>
<td>21%</td>
</tr>
<tr>
<td>Siemens</td>
<td>37%</td>
<td>16%</td>
<td>47%</td>
</tr>
</tbody>
</table>

n = 9
Source: 2020 Gartner ADMS Market Vendor Survey

Figure 5 provides ADMS vendor market share measured as a cumulative number of customer service endpoints served by distribution network operators with vendor ADMS products fully implemented (as reported by vendors).

**Figure 5: ADMS Vendor Market Share by Endpoints Served**
Figure 6 provides market share growth as reported by vendors based on the new ADMS contracts won in the last 12 months.

Figure 6: ADMS Vendor Market Growth by Endpoints Served, Last 12 Months

ADMS Vendor Market Growth by Endpoints Served, Last 12 Months

- Schneider Electric: 32M
- GE: 21M
- Open Systems International (OSI): 12M
- Hitachi ABB Power Grids: 8M
- Siemens: 4M
- ETAP: 2M
- Indra (Minsait ACS): 1.5M
- Survant Technology: 1.1M

n = 8
Note: Oracle didn’t respond.
Source: 2020 Gartner ADMS Market Vendor Survey
Representative Vendors

Market Introduction

Table 1 contains a list of leading ADMS vendors that offer products and implementation services globally. Table 1 contains vendor and product names, the latest generally available product releases, and the percentage of customers in production on the latest version of the product (see Note 1).

The nine vendors named in this Market Guide were selected based on the fact that their solution is available globally and their product's functional scope matches the functionality defined in the Market Description section. Each vendor offers a comprehensive distribution grid management solution that covers three key ADMS use cases:

- Restore outage
- Analyze and optimize network under normal operating conditions
- Integrate and assess the impact of DERs

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Headquarters</th>
<th>Product Name</th>
<th>Current Generally Available Version</th>
<th>Percentage of Customers on Latest Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETAP</td>
<td>U.S.</td>
<td>ETAP Grid</td>
<td>ETAP Grid v.19.5</td>
<td>90%</td>
</tr>
<tr>
<td>GE</td>
<td>U.S.</td>
<td>GE Advanced Distribution Management Solutions (ADMS)</td>
<td>Composed of v.3.9 of former PowerOn Advantage and Alstom e-terra IDMS products v.6.5 with common components and new modules</td>
<td>10%</td>
</tr>
<tr>
<td>Hitachi ABB Power Grids</td>
<td>Switzerland</td>
<td>Hitachi ABB Power Grids Network Manager ADMS</td>
<td>Network Manager ADMS v.9.1</td>
<td>70%</td>
</tr>
</tbody>
</table>
### Vendor Profiles

**ETAP**

Operation Technology (trading as ETAP) provides enterprise power system software and hardware. ETAP is a privately held company founded in 1986, headquartered in Irvine, California, U.S., with offices around the world providing support in local languages. It offers the Electrical Transient Analyzer Program (ETAP), a power system software for the design, simulation, analysis, operation,

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Country</th>
<th>Software Name</th>
<th>Version</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indra (Minsait ACS)</td>
<td>Spain</td>
<td>Onesait Grid</td>
<td>Onesait Grid 2019</td>
<td>40%</td>
</tr>
<tr>
<td>Oracle</td>
<td>U.S.</td>
<td>Oracle Utilities Network Management System</td>
<td>Oracle Utilities Network Management System v.2.4</td>
<td>15%</td>
</tr>
<tr>
<td>Open Systems International (OSI)</td>
<td>U.S.</td>
<td>OSI Advanced Distribution Management Systems</td>
<td>monarch 2018</td>
<td>70%</td>
</tr>
<tr>
<td>Schneider Electric</td>
<td>France</td>
<td>EcoStruxure ADMS</td>
<td>EcoStruxure ADMS v.3.8</td>
<td>12%</td>
</tr>
<tr>
<td>Siemens</td>
<td>Germany</td>
<td>Spectrum Power ADMS</td>
<td>Spectrum Power ADMS 7 v.2</td>
<td>35%</td>
</tr>
<tr>
<td>Survaleent Technology</td>
<td>Canada</td>
<td>SurvalentONE ADMS</td>
<td>SurvalentONE ADMS v.19.0</td>
<td>40%</td>
</tr>
</tbody>
</table>

Source: Gartner (July 2020)

*The vendors listed in this Market Guide do not imply an exhaustive list. This section is intended to provide more understanding of the market and its offerings.*
control, optimization and automation of generation, transmission, distribution, renewables and industrial power systems.

ETAP ADMS is a combined integrated planning and operation solution to manage, control, visualize, analyze and optimize electrical power distribution networks. Capabilities include electrical SCADA, distribution management system (DMS), distribution network applications (DNA), integrated protection management, fault management, distribution automation outage management system (OMS) and MWM. This functionality is offered on an integrated network model of the grid for design, planning, protection, control, reliability and operation.

ETAP offers standardization with the majority of industry applications and easy integration with legacy and third-party software. The functional scope includes distribution state estimation, VVO, CVR, FLISR, outage prediction, load forecasting, unified AC and DC power flow, DG modeling, protection and load shedding.

In November 2019, ETAP announced the release of version ETAP 19.5 with a new set of integrated power analysis modules, electrical safety capabilities and operational compliance solutions to serve the needs of generation, transmission, distribution, industrial, transportation, data centers and low-voltage industries.

In addition to offering its own ADMS solution, ETAP also works globally as a partner and system integrator of Oracle solutions. In February 2019, ETAP and Oracle announced a strategic alliance to bring innovative distribution capabilities to global electric utilities.

ETAP reported 20 companies using its ADMS software in production. Those 20 companies cumulatively serve 20 million customers. In the last 12 months, ETAP has assigned seven new ADMS contracts, which added two million new service points to its market share. The largest ETAP ADMS client is Indian utility Noida Power, with 450 feeders and 700,000 service points.

**GE**

GE, headquartered in Boston, is a publicly owned company that provides equipment, solutions and services across the entire energy system. GE acquired Alstom's power generation and grid businesses in 2015 and combined them with GE's existing grid business to form GE Grid Solutions, which is now part of GE Digital. GE’s portfolio of digital energy solutions, within which the ADMS product belongs, is used by over 1,000 generation and grid operators, which support 40% of the world’s electricity.

GE is evolving both the e-terra distribution ADMS (formerly the Alstom Grid IDMS product) and GE’s PowerOn Advantage ADMS product into a single, microservice-based, modular GE ADMS solution. This multiyear product development initiative provides incremental modular releases of new DER-aware applications and outage response functions to ensure timely delivery of new capabilities while enabling both customer groups to move to a single ADMS platform. These modular releases focus on specific capabilities including a common user interface and advanced workflow to enhance user experience. The ADMS incorporates advanced analytics and compliance reporting,
microservices for integration and security, grid modeling, and a uniform mobile user experience. To enable that process, GE has developed an internal native integration that contributes to architectural modularization of future ADMS releases. GE’s functional R&D is focused on developing an autonomous mode of operation for the grid operation and the effective integration of DERs.

The GE ADMS functional scope can be clustered into three pillars:

- **Distribution optimization** — Builds on traditional SCADA and DMS functions with advanced applications that are both adaptive and able to optimize across multiple objective functions including ability to model and leverage DER as a control resource.

- **Outage response** — Expands beyond traditional centralized OMS functions with added mobile solutions, damage assessment and predictive storm analytics to reduce and minimize disruptions from outages seen by utilities.

- **DER orchestration** — DER-aware ADMS includes modeling the technical and contractual parameters of DERs that support power apps that are fully DER-aware.

GE has customers with distribution SCADA, DMSs (including FLISR and volt/VAR optimization [VVO]), OMSs and combined energy management systems (EMSs)-ADMSs in production globally. GE has more than 180 utilities with its distribution solutions in production (including legacy GE PowerOn Control and Alstom e-terra IDMS), serving more than 271 million customers cumulatively. In the last 12 months, GE added 11 new ADMS contracts. GE has a number of large investor-owned utilities (IOUs) in the U.S. using GE’s ADMS solution. The largest customer has 8 million customers served.

**Hitachi ABB Power Grids**

Hitachi ABB Power Grids is a joint venture entity formed on 1 July 2020 between Hitachi (80.1%) and ABB (19.9%), with approximately $10 billion in business volume. Headquartered in Zurich, Switzerland, Hitachi ABB Power Grids is founded on the two companies’ offerings to the electric utility industry and the transportation and infrastructure sectors with products, engineering services and solutions. The company is focused on solutions enabling the energy transition by combining capabilities across sustainable energy and advanced digital technologies, including its Network Manager ADMS.

Network Manager ADMS, from Hitachi ABB Power Grids, is a platform that offers a common user experience for SCADA, OMS and DMS applications on a common network model. It provides productized integration to MWM and includes outage analytics capabilities.

Hitachi ABB Power Grids’ solution supports conservation through CVR and VAR management functions. It can run VVO in real time or in an advisory mode. It can forecast demand at any network point, reflecting hourly price sensitivity. Its DSE can act on a combination of data from AMI
and SCADA. The user experience, which used to have a tabular look and feel and sometimes created crowded displays, has recently been updated to improve operator usability.

The product has good capabilities for modeling microgrids and analyzing the impact of DERs on network operation. Its Restoration Switching Analysis evaluates restoration scenarios based on load profiles scaled by load percentage and forecasts based on day-type inverter profiles, as well as solar irradiation and other weather data. It can simulate microgrid operation in islanding and grid-connected modes.

Hitachi ABB Power Grids has a customer base of more than 110 utility companies using Network Manager ADMS, collectively serving 62 million customers. Hitachi ABB Power Grids has signed eight new Network Manager ADMS contracts in the past 12 months. Its largest ADMS sites in production consist of 5,500 feeders and 10 million customer service points.

**Indra (Minsait ACS)**

Indra is a privately held digital transformation consultancy and an IT solution and service provider headquartered in Madrid, Spain. Indra entered the utility space through the acquisition of Soluziona in 2007. In 2018, Indra acquired Advanced Control Systems (ACS), a vendor headquartered in Norcross, Georgia, that supplies SCADA, ADMS, substation automation solutions and distribution automation solutions to the global electric utility market. Following that acquisition, Indra combined ACS’s ADMS Precise Real-Time Information Systems Management (PRISM) offering with its own InGRID product into an ADMS offering rebranded as Onesait Utilities Grid, the most recent version released in December 2019.

The core of Onesait Utilities Grid is the Minsait Active Grid Management (AGM) industrial IoT platform that provides edge on-premises and cloud capabilities and analytics. ACS’s PRISM ADMS product, which is based on a real-time SCADA platform, is integrated into the AGM IIoT platform using the Minsait real-time message bus iSPEED. Onesait Utilities Grid, in addition to the Indra legacy InGRID application, contains:

- GridVu — consumer engagement
- POWR — mobile workforce management
- PRISM Real-Time Outage Management System — OMS
- PRISM DMS — distribution application
- PRISM EMS — transmission application
- PRISM SCADA, NTX — substation automation
- Centrix — feeder automation
Onesait Utilities Grid users can operate network devices from the geospatial representation. Integrated volt/VAR control is full-featured and can simulate the effects of sudden load changes to predict voltage violations. Operators can also run ad hoc offline studies in analysis mode (without the simulator) during day-to-day operations on any set of saved cases. The FLISR function operates in a closed-loop mode across 2,000 distribution feeders. Onesait Utilities Grid supports meter pings for outage verification. Load models support conforming and nonconforming loads, which are reflected in optimal switch planning to address impacts. An engineering tool can be used to inspect and visualize distribution-connected resources. DER control is fully integrated into the Onesait platform and can be deployed both as part of an ADMS and as a distributed architecture.

More than 210 companies globally use the Minsait ADMS solution, serving more than 26 million end customers. Onesait Utilities Grid's largest implementation site is Bangalore Electricity Supply (BESCOM), a distribution utility in India with 2,500 feeders and 9.2 million customers. Minsait reported signing seven new ADMS contracts in 2019, representing 1.5 million new utility end customers.

Oracle

Oracle is a large, publicly traded enterprise software and cloud service company headquartered in Redwood Shores, California, with a 2019 fiscal-year revenue of $39.5 billion. Oracle offers a wide range of business applications in the utility sector via Oracle Utilities, its utility-industry-focused business unit.

Oracle extended the initial OMS focus of its Oracle Utilities Network Management System (NMS) by adding DMS capabilities such as power flow, optimal network reconfiguration, fault location analysis and VVO, leveraging a common real-time operating model and user interface. Although Oracle Utilities offers advanced applications, such as VVO and peak-demand reduction, most Oracle Utilities NMS customers have pursued an "OMS-first" approach with subsequent expansion to advanced switch management, fault location analysis and FLISR. Recent projects show increasing involvement with DER integration, including support for edge-of-grid monitoring and control.

Oracle Utilities NMS has a comprehensive set of functional capabilities that covers grid operational analysis and optimization under various configurable operating conditions. It can analyze various operating conditions for VVO and offers different objective functions, including newly added power factor correction. Its feeder load management (FLM) module uses SCADA telemetry and AMI data (as pseudomeasurements) to determine the network state. Oracle claims that its NMS solution can support modeling of price-sensitive loads and load reduction through a price-bidding scenario via integration with its Opower offering.

In 2020, Oracle acquired LiveData Utilities to address a perceived lack of capabilities expressed by buyers who want ADMS offerings with integrated native SCADA and the ability to access data from a variety of sensors and field devices. With LiveData Utilities’ Operational Technology Message Bus now offered under the name Oracle Utilities Live Energy Connect, Oracle Utilities
NMS is addressing issues with real-time operational data ingestion needed for ADMS model instantiation.

Oracle Utilities NMS has good modeling capabilities that support the impact analysis of a high level of PV penetration and microgrids. The NMS FLM module can provide DER profiles under changing weather conditions. It models customer load separately from generation capacity on the same node, and can separately model a wide variety of energy resources. Oracle Utilities NMS can use AMI data to model load and can use solar irradiance factors to model PV contribution.

Gartner estimates Oracle Utilities NMS is used by utilities that collectively serve close to 50 million service points. Based on our review of external sources consulted for this Market Guide, the largest implementation instance remains Con Edison of New York, with 3,400 feeders serving 3.3 million customers. Oracle didn't disclose the number of new ADMS contracts signed in the last 12 months.

Open Systems International (OSI)

Open Systems International (OSI) is a privately held company based in Medina, Minnesota, with a 2019 annual revenue of more than $105 million. OSI software solutions address generation, transmission, distribution, smart grid and substation automation needs. OSI has an expanding portfolio of network management software addressing operational technology (OT) utility needs across the electric, gas, transportation and pipeline industries.

In the ADMS market, OSI offers a modular ADMS product suite based on OSI’s Multi-platform Open Network ARCHitecture (monarch) SCAD platform. The Spectra DMS solution comprises modules for distribution power flow and laid allocation, switch order management, FLISR, feeder reconfiguration, CVR, VVO, fault protection analysis, a distribution operator training simulator and a state estimator. Additionally, Electra OMS; Integra DERMS; OSI Compass, a mobile field crew app; and CHRONUS, OSI’s historian, are available for purchase as part of the comprehensive product suite.

VVO, CVR and FLISR are supported with a three-phase, unbalanced power flow analysis and detailed models of relays, tap changers, regulators, controllers and automatic throw-over devices. DSE and optimal feeder reconfiguration (OFR) capabilities are notably mature. Detailed modeling of rotating machines and inverters is supported. DER contributions are modeled and displayed at the device level, which can be used to analyze the impact of solar intensity on feeder profiles in the operator training simulator.

OSI’s ADMS customer base has grown steadily at roughly a 15% increase in new contracts yearly. OSI reported signing 24 new contracts for ADMS capabilities in the past 12 months, representing more than 12 million end customers. The company also reported that over 77 utility companies use one or more of its ADMS modules in production, with more than 53 million utility customers served. The largest full system deployment (DSCADA/DMS/OMS) is Oklahoma Gas and Electric, which services approximately 1,400 feeders with roughly 900,000 customers served.

Schneider Electric
Schneider Electric is a publicly traded global vendor headquartered in Paris, France, with $29 billion in revenue. It offers products, services and technology solutions across multiple markets, including energy management, building automation, data centers, infrastructures and industries. Within the power sector, its focus is on energy management and automation in the medium voltage (MV) and low voltage (LV) segments.

Schneider Electric's EcoStruxure ADMS originated as a DMS product focused on the European market. After entering the North American market, Schneider Electric rearchitected its DMS on AVEVA's OASyS SCADA infrastructure, ported and redeveloped OMS functionality from Telvent's Responder OMS, and added EMS functionality. Leveraging its sizable R&D resources in Novi Sad, Serbia, Schneider Electric offers a wide range of advanced features including VVO closed-loop operation and volt/VAR watt optimization for DER management. The company continues to invest significantly in functional and architectural ADMS product innovation.

Schneider Electric's ADMS is perceived in the market as having the richest set of distribution network analysis functionality. It uses closed-loop VVO with high usability and has the best load modeling capability. VVO can be triggered by detected voltage deviations and includes a new watt control component that leverages DER to mitigate network grid constraints. Its state estimator identifies loads at all network nodes for radial and meshed structures and combines AMI and SCADA, as well as load data/profiles derived from historical data of daily real and reactive power and peak and average. In addition, its distribution state estimation uses AMI data and can model price sensitivity of load resources.

Schneider Electric's ADMS can support the modeling and analysis of residential solar and other renewable resources on MV and LV networks. It supports microgrid integration and analyzes the impact of islanded and reconnected modes. It can be used to control DG settings and can interface with solar inverters for voltage control to dispatch autonomous smart inverters. DER management also includes a configurable DER dashboard that contains relevant DER information.

Schneider Electric's ADMS is used by 96 utility companies globally that service 110 million customers. Schneider Electric has signed nine new ADMS contracts in the past 12 months, adding 32 million service points to its cumulative end-customer base. The largest installation site is Enel, with approximately 28,000 feeders and 30 million metered service points.

Siemens

Siemens, headquartered in Munich, Germany, is a global electrical engineering and electronics company with more than €86 billion in revenue for 2018. Siemens has a long legacy of developing and manufacturing products, as well as designing and installing control and software solutions in the utility sector.

Siemens' ADMS is based on the Spectrum Power platform, which shares a common codebase with EMS, DERMS, its Spectrum PowerTM Microgrid Management System (MGMS) and other grid software offerings. The Siemens Spectrum Power ADMS includes advanced distribution network...
analysis and optimization functions, as well as end-to-end DER management. In addition to SCADA and distribution automation functions, Siemens has subsequently expanded the Spectrum Power platform by adding OMS and crew management capabilities.

Spectrum Power ADMS supports a number of distribution network applications, such as optimal feeder reconfiguration, FLISR and VVO with configurable objective functions and look-ahead capability. These applications are supported with distribution system state estimation (DSSE). Spectrum Power ADMS supports DER management by displaying directional power flows and overloads. Integrated volt/VAR control (IVVC) can generate recommendations for energy storage operation as well as DG setpoints. It can simulate different scenarios on DER in-feeds, causing overload situations, which are resolved with use of IVVC optimization applications managing aggregated PV. The Active Network Management (ANM) functionality is fully integrated in Spectrum Power ADMS.

Siemens notes that 176 distribution companies, with 190 million customers, are using its Spectrum Power platform — and most of them are SCADA and DMS users, with only 30 using integrated OMSs (mostly outside of North America). In the past 12 months, Siemens signed six new Spectrum Power contracts in the distribution sector, representing 4 million end customers served. The largest ADMS site for Siemens is Oncor, with 3,300 feeders and 3.2 million customers served.

Survalent Technology

Survalent Technology is a privately held vendor, based in Brampton, Ontario, Canada. It markets SCADA, outage management, distribution management and substation automation solutions globally to electric, gas, water and transit utilities. It has evolved its distribution SCADA product to meet emerging ADMS needs in its target market, which is composed of mostly midsize and smaller utilities in the U.S., as well as larger top-tier utilities in Canada and international markets.

The SurvalentONE ADMS platform consists of SurvalentONE SCADA, SurvalentONE OMS and SurvalentONE DMS. All Survalent product capabilities are shipped in one installation package with a license activation for ADMS functions. The company partners with Kx for historian capabilities and with Clevest for MWM.

Fault detection, isolation and restoration (FDIR)/FLISR, loss of voltage, VVO, CVR, short-circuit analysis, distribution state estimation, protection coordination and security analysis are supported. The visualization of switch orders and smart meter indications has been improved; however, optimal network reconfiguration is on the roadmap plan. Survalent’s ADMS has capabilities to import DER assets from GIS sources for monitoring, visibility and control in the microgrid configuration, and has API integration to some DERMS vendors. However, Survalent does not offer currently specific packaged capabilities related to DER management or DG controls.

Survalent reports that its software is used by 635 customers in more than 30 countries, representing more than 81 million metered customers. The company signed 20 new contracts in the past 12 months for implementation of both SCADA and ADMS functions. Survalent reports
that about 200 customers have activated ADMS functions, although these may be singular capabilities — for example, outage management, FDIR, VVO or CVR. Survalent's most extensive ADMS implementation is PLN in Indonesia, with around 1,780 feeders and more than 10 million customers.

**Market Recommendations**

Organizations evaluating advanced distribution management system (ADMS) products should understand that ADMSs can be adapted to different organizational objectives and use cases. Selecting the best ADMS vendor for your needs is an important decision, and it's a critical success factor for achieving success in the targeted use cases. These systems are complex production environments that are extremely data-intensive, and implementations can take two to three years or longer. Vendor choices are not easily reversed. Vendor capabilities are evolving, along with the regulatory frameworks.

Though the vendors’ offerings are maturing, some project failures and setbacks can still be expected. ADMS project deployments are challenged by requirements for high-quality network models (developed from GISs) as well as tight integration with many other systems (including customer information, meter data management systems, SCADA and potentially DERMS).

Creating an operational model for distribution network analysis and uploading data from various systems such as GIS, MDM and SCADA are two of the most critical contributors to ADMS implementation success. Importing new components as they are added to the system and updating current topology based on the switching actions are critical for maintaining the connectivity model of the grid. Importing the current loading from the SCADA and MDM systems and combining it with the network connectivity model — a process known as model instantiation — is crucial for ADMS providing useful results. That process is effectively creating a digital representation of the current operating condition of the distribution network — essentially creating the digital twin of the grid that can be used for simulation and operational optimization. Indeed, most ADMS implementations either completely fail or run over time and over budget, not because of vendor inability to provide accurate network algorithms, but rather by vendors’ (and utilities’) inability to create and maintain digital network models. Failure to create an instantiate model may not necessarily be a result of vendor inability. Rather, it may result from an inaccurate data source, in particular when it gets asset data from the original sources such as GIS used to determine network connectivity and calculate electric parameters (such as line impedances and capacitances). Thus, source data cleansing and validation needs to be treated as one of the critical components of an ADMS implementation project.

Utility CIOs must carefully evaluate implementation challenges upfront, and take steps accordingly to mitigate project risks. Although a range of comprehensive ADMS products is now available across all global markets, most implementations will still involve some custom development, and buyers should plan accordingly.
Since providers are coming from the OT domain, they have not developed an ecosystem of system integration partners that can implement an ADMS product. Thus, CIOs need to be aware of the limited options for ADMS implementation and dependence on product vendors, which may introduce additional risk.

Evidence

Gartner received associated material from the nine ADMS vendors evaluated in this Market Guide during April and May 2019. Gartner also surveyed secondary research sources for information on market trends and vendor activities, and used internal data on client search on gartner.com and client inquiry.

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Note 1: Representative Vendor Selection

The nine vendors named in this Market Guide were selected based on their demonstrated capabilities to meet market requirements for an integrated solution. These vendors’ solutions offer the functionality required to monitor, control and optimize the secure operation of the electric distribution network under normal and emergency restoration conditions.

Out of several dozen vendors that are offering a portion of the distribution network management functionality, these nine vendors stand out based on the completeness of their offerings. In addition, they are the vendors for which Gartner has received the most interest (based on gartner.com searches and inquiries) from clients searching for ADMS solutions.

Recommended by the Authors

The Energy Transition Question: Do We Need the Grid?
Top 10 Trends Driving the Utility Industry in 2020
Industry Vision: Utilities as Platform Providers for the Energy-Sharing Economy

Recommended For You

Critical Capabilities for Sales Force Automation
Summary Translation: 2020 Retail Digital Transformation and Innovation Trends
Summary Translation: How to Build a Successful Business Case for Desktop Virtualization
IT Organization’s Role in Enterprise Innovation
Digital Citizen Equity Index: Translate the Language of Digital and Include All Segments of the Population