

Australia's United Energy mines deep ADMS value



Source: United Energy, 2021

A leading distribution utility drives continuous reliability and safety gains with automated switching, predictive analytics, and an integrated mobility solution

Among electric distribution utilities, United Energy (UE) is exemplary for the success of its distribution automation initiative that launched in 2018. In designing its initiative, UE adopted a sophisticated approach to smart grid technology, network reliability, and performance-based rate making with the support of its regulators. Its track record of continuous improvement has positioned it well for the next phase of the evolving industry in the state of Victoria, Australia.

Serving one of Australia's biggest metropolitan areas

Figure 1: United Energy's service territory



Source: United Energy (reused with permission)

United Energy (UE) distributes electricity across east and south-east Melbourne and the Mornington Peninsula to 680,000 customers in the state of Victoria, Australia. The regulated, privately held utility serves approximately one quarter of Victoria's population and a sizable portion of the third largest metropolitan area in Australia. It has an extensive, actively managed low-voltage network, a summer peak of 2,000 megawatts (MW) and a customer base that is approximately 90% residential.

The utility recently earned the maximum possible performance bonus for system reliability – a feat that had never been achieved before by any distribution utility

“Oracle Utilities NMS provides us with a more holistic view of the network and allows us to make better decisions than we could otherwise make.”

Dave Denny
Special Projects Manager,
Electricity Networks, United
Energy

ADMS value creation vectors

United Energy has driven big performance gains on several fronts using its advanced distribution management system (ADMS), including:

- Fault location, isolation and system restoration (FLISR)
- Outage management system (OMS)/ advanced meter infrastructure (AMI) integration
- Integrated field management

in the State of Victoria. “Over the past year, we achieved our best reliability and fault response metrics ever, and we maxed out our performance incentive for the first time,” said Adam Gellie, General Manager for Service Delivery during a [recent PowerGrid International virtual customer panel](#). “It was a wonderful culmination of many years of hard work and alignment across IT, network, delivery and field operations.”

Value creation on multiple fronts

Gellie and members of his team shared some of their recent successes implementing advanced distribution management system (ADMS) features running on Oracle Utilities Network Management System (NMS).

1. Deploying switching automation like FLISR

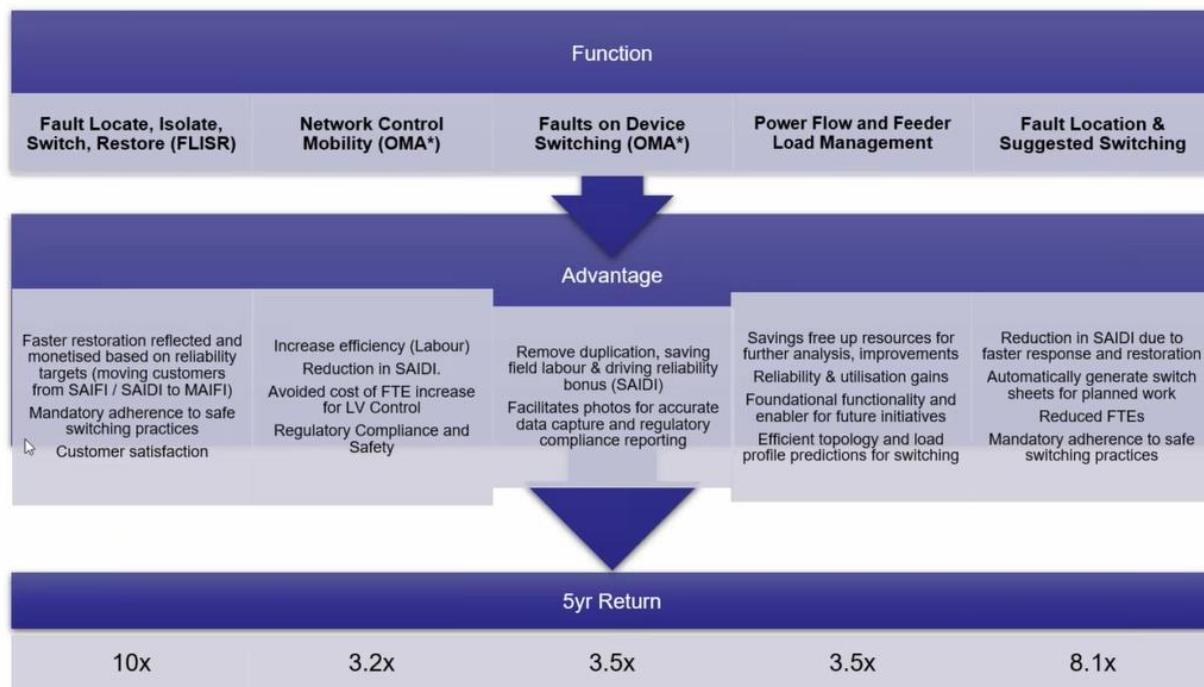
Through careful study and a highly disciplined approach toward implementation, UE has become one of the distribution utility industry’s best examples of fault location, isolation and system restoration (FLISR) deployment. “The benefits we’ve seen from FLISR have been tremendous,” said Gellie. “Since implementing FLISR five years ago, we’ve seen a 10x return on investment.”

“FLISR has had a fantastic impact on our operations,” said Robert Simpkin, Secondary Assets Manager. “We conducted 109 operations over the past three years alone.”

Figure 2: ADMS Operational Value Comparison by Feature

Judging and Measuring Operational Value of ADMS

To ensure success, the initiative needs to be led by the operation, and the benefits need to be reflected into the operational KPIs. This creates more alignment about change and allows the best ideas to be funded with confidence.



Source: United Energy (as featured in “The Future of Distribution Grids,” a PowerGrid International webcast, February 25, 2021)

“The benefits we’ve seen from FLISR have been tremendous. Since implementing FLISR five years ago, we’ve seen a 10x return on investment.”

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"Three years ago, our average time to fix a fault was three hours," said Gellie.
"Since then, we were able to reduce that by 30 minutes."

2. OMS with AMI integration for faster restoration and reduced call center volumes

UE leveraged its outage management system (OMS) to capture the initial value from its advanced metering infrastructure (AMI) deployment mandated by the State of Victoria, and its smart grid journey progressed from there.

Its OMS enables automated outage ticket generation based on 'last gasp' AMI alerts as well as real-time outage map updates that keep customers informed of supply status. Its AMI ping capability eliminated customer outage reporting lag, which had previously been one to two hours, and reduced unnecessary truck rolls by 50% over the first two years following implementation. The real-time reporting via outage maps reduced call center inquiries since customers were able to check mobile, website, and social media for outage status.

3. Integrated control center and field for improved safety and efficiency

Through Oracle Utilities Operations Mobile Application (OMA), UE improved the operational efficiency and safety of network and field operations by giving field crews access to the real-time electrical network state and action confirmation that is essential for safety assurance.

"Our investment in OMA was initially driven by an initiative to improve switching safety on our LV (low voltage) network, which has historically accounted for 70% of safety incidents," said Gellie.

Its implementation of OMA in early 2021 has already made a difference for field safety. "Our field crews are so happy to have the real-time status of the network," said Gellie. "They can see a switch within seconds of changed state. Being able to see what the network controllers can see gives our field crews confidence and allows them to speed restoration safely."

OMA has helped reduce the number of safety incidents at UE, but the utility has seen tremendous efficiency benefits too.

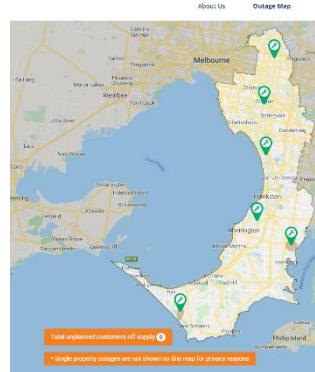
From a reliability perspective, UE saved a total of eight to nine minutes per fault and reduced its dispatch queue by six to seven minutes. From a labor efficiency perspective, UE saw a 3x improvement in the throughput of control center processing without having to increase staff.

"With OMA, we were able to cut down on the call volumes from field crews to control room staff," said Gellie. "That kind of efficiency gain is great any day of the year, but is especially valuable during unplanned outages caused by storms or other factors."

UE estimates it has saved an additional one to two minutes in restoration time per fault in capturing data from the field due to OMA's real time tagging, recording, and communications capabilities.

ADMS critical capabilities that enabled UE's success

Figure 3: United Energy Outage Map



Source: United Energy website

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UE's business and technical leadership can point to several ADMS capabilities that have been instrumental in helping UE to achieve distribution management excellence over the past five years.

1. An electrical network model that serves as the “single source of truth”

With significant and growing complexity of its own distribution grids, UE views its electrical network model as the foundation for distribution grid management, automation and innovation. “We run a number of essential systems, but among them, ADMS is really one of the most important,” said Gellie. “It provides the most accurate representation of the real-time network.”

The network model at the heart of UE’s Oracle Utilities ADMS is highly accurate, reliable and stable.

“The stability of the network model that underpins the operation of the network is really important,” said Dave Denny, Special Projects Manager for Electricity Networks during a subsequent panel discussion.

Already crucial for current distribution operations, Denny foresees the value of the Oracle Utilities electrical network model growing over time with the growth in distributed energy resource (DER) adoption and with the next phase of industry restructuring on the horizon. “We have a rapidly changing environment with looming onset of distribution system operator model. Integration will be a key challenge,” said Denny. “Without a network model to coordinate [all the different types of data] in one place, we’re going to struggle to understand all the aspects of the network.”

“Our ADMS provides us with a more holistic view of the network and allows us to make better decisions regarding the operations than would be possible with a conventional real-time system,” said Denny, noting that predictive analytics, FLISR, feeder load management (FLM), and fault location analysis (FLA) are all important for driving improvement.

2. A robust optimization engine that handles and extracts value from all data types at high speed

When it started rolling out AMI a decade ago, UE quickly learned the value of having an ADMS that was built to handle and extract value from not just SCADA data, but AMI, weather and other data as well.

“SCADA is just another data source,” said Denny. “It used to be the ‘end all, be all’ of distribution operations, but today it’s as much about AMI, GIS and other data as it is SCADA.”

The value of other data types was immediately borne out with UE’s OMS upgrade in 2014, which provided AMI meter status to grid operators and helped to reduce the number of unnecessary truck rolls by 50% over the first two years.

The AMI data improved the overall situational awareness of UE’s grid operators, which translates into better safety, reliability and efficiency in control room operations. “Having a lot of AMI data gives us a good understanding of our LV network,” said Denny. “Being able to integrate that with our ADMS was a big help.”

UE has come to appreciate the Oracle Utilities NMS platform for its robustness and flexibility. It has a powerful real-time optimization engine that can handle a wide array of data at massive scale. Architected to be deployed as either an ADMS, an OMS or a distributed energy resource management system (DERMS), it comes with pre-built adapters for all types of third-party SCADA, energy management system (EMS), GIS and AMI systems.

“NMS’ integration with GIS, AMI, SCADA and other data has been very important for us,” said Denny.

3. Powerful applications: power flow, fault location analysis and FLISR

"We found FLISR to be a fantastic starting point for our ADMS journey," said Gellie. Early on, UE identified switching automation as an opportunity to drive better field safety and performance, and since deploying FLISR through Oracle Utilities NMS, they've been thrilled with the results. Operational performance is key because a sustained outage was defined as one minute or more by the regulators, so FLISR has had to respond in less than a minute in order to classify the outage as a momentary and not count against sustained outage reliability metrics.

"We're looking forward to expanding the capability of FLISR to implement fast outage response on HV (high voltage) feeders," said Simpkin. "We're also looking to implement bus outage management for feeders."

Beyond FLISR, the utility sees its next efficiency and reliability opportunity in the deployment of Power Flow State Estimation (or "power flow" for short), an increasingly popular and valuable ADMS feature especially with the growth of DERs which often result in two-way power flow, a relatively new phenomenon on modern power grids that requires different operating procedures and investments to ensure safety and reliability.

In addition to power flow, the utility also expects to deploy feeder load management and fault location analysis to accelerate outage restoration. Suggested switching is also on the roadmap, along with operations planning integration and optimized crew dispatch.

"Implementation of FLISR was a big leap for us," said Denny. "There'll be more big leaps to come."

"Implementing real time power flow is the next frontier for us," said Gellie, referring to UE's anticipated upgrade to NMS Version 2.5 with its next generation power flow state estimation capabilities. But UE is also building on its success around holistic distribution management and predictive analytics. "Step by step, we're getting closer to asset management nirvana," Gellie said.

4. An integrated field management solution

An integrated field management mobile application can drive additional gains in field safety and efficiency. UE has discovered this with its recent implementation of Oracle Utilities Operations Mobile Application (OMA), which provides real-time situational awareness and integrated communications capabilities to both field crews and control center operators.

"OMA is a brilliant application that integrates planned work scheduling and execution, all within the ADMS," said Gellie. "Being able to see what the network controllers can see gives our field crews confidence to execute restoration work more quickly," explained Gellie.

The application has been embraced by the control room and the field to the point where operators are now comfortable with field crews updating switch status from their mobile devices.

"Step by step, we're getting closer to asset management nirvana."

Adam Gellie
General Manager for Service Delivery, United Energy

"Everyone sees the same information on both sides," said Gellie. "A field tech can see a switch within seconds of a changed state. Collectively, they can make sure no mistakes are made."

OMA also improved reporting quality through the capture and real-time posting of network fault photos as visual aids in reliability studies and regulatory reporting. "With OMA, you get a reliability benefit, a labor benefit, and more detailed data collection," said Gellie. UE has also benefitted from OMA's ease of integration with third party databases and enterprise systems. "The integration has been excellent," said Gellie.

5. Configurability to accommodate distribution technology diversity and standardization

"Configurability is king" when it comes to driving and scaling distribution automation and standardization, said Denny. Denny explained that configurability was essential given that UE has many years of different technology on its network, just like all utilities. "We found Oracle's ADMS to be very configurable," continued Denny, "such that when we're adding new pole top devices or other features to our network, it takes minimal effort to incorporate those assets into our FLISR scheme."

6. Open data structures that support predictive analytics using third party tools

Like several of Oracle Utilities' ADMS customers, United Energy leveraged the open, standards-based architecture of Oracle Utilities NMS and back end data access capabilities to develop its own analytics applications that complement those available through Oracle Utilities.

For example, UE has developed its own proprietary predictive analytics tools that allow it to predict neutral faults on its low voltage network, allowing it to take preemptive action that reduces reactive tasks and speeds restoration by reducing outage workloads.

"The opportunity to create our own applications is something we really value," said Gellie, "and the support that Oracle has shown us has been great."

That modest investment has paid off handsomely in driving further reliability and efficiency gains. According to the company, its predictive algorithms are able to identify neutral integrity and service issues with better than 95% accuracy, which has reduced the number and impact of customer outages.

"Using smart meter data, we've had success detecting neutral conductor integrity issues a couple of weeks before a fault," said Gellie. "In addition, we've been able to detect voltage issues that we are able to manage with automation and manual intervention. That has meant fewer faults in the queue and faster turnaround times on restoration."

Our network analytics capabilities gave us the ability to get 20% to 50% of the upside at low cost," said Gellie. "We don't want to duplicate Oracle investment, just invest ahead of it where it makes sense."

Supporting DER adoption and industry evolution with smart grid technologies

Like all utilities, UE is constantly evaluating its technology investment options, and that includes building upon its successes and upgrading its ADMS to layer on additional advanced applications. "We are looking hard at anything we can do to improve network operations," said Denny.

United Energy is also exploring technologies for improved DER management and integration. "DER integration is becoming a big area of focus for us," said Denny. "Government subsidies and an abundance of sunlight is leading to an abundance of solar PV on our network. With having so much distributed generation on the network, we are

definitely seeing operational issues with reverse power flows. It's an issue that we're really keen to get ahold of," said Denny. "Pretty soon, DERs are going to shape what we do more than any else in our day to day operations."

"There will be constant change, moving forward," said Simpkin. "We need to do the best we can to get ahead of the game. No longer can you expect that what's in place will be there for the next 30 years."

About Oracle Utilities Network Management System

Oracle Utilities Network Management System (NMS) empowers you to fully model, monitor, and control in real time the distribution grids and networks of electric, gas, water and wastewater utilities. From distribution to the connected customer, we're giving operators the ability to optimize every corner of your system, including distributed energy resources (DERs) owned by utilities, customers and third parties. Oracle NMS arms you with accurate, actionable intelligence—improving reliability and performance across your territory when it matters most.

About United Energy

United Energy is a regulated electric utility serving more than 680,000 customers in an area to the east and southeast of Melbourne, the state capital of Victoria, Australia. United Energy's service area is about 1,500 square kilometers with 13,000 kilometers of distribution lines. Electricity is received via 78 subtransmission lines at 47 zone stations.

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