

Power generation landscape continues to evolve

 By [Stuart Mchie](#)

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As the world decarbonises its energy system, electricity will be the backbone. There is an accelerated shift from fossil-based to renewable power generation, with growing electrification of the transportation, industrial and building sectors.



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To manage this, digital and energy platforms are needed for the enormous power system energy transition challenges of increased complexity and additional capacity requirements. These platforms will enable greater grid resilience and help manage the shift to a more complex power generation landscape by matching fluctuations in power supply and demand dynamically.

A significant aspect of resilience is in cybersecurity. The world needs a cybersecure ecosystem for a resilient electric future. Energy is among the top three target sectors for cyberattacks globally. As energy grids become more resilient through the application of digitalisation, attention must be paid to the design and implementation of cybersecurity.

Load shedding, BESS and SCADA

Load shedding is a blunt tool used to manage the current mismatch between electrical energy availability and demand for that energy by removing load from the power system. Today some larger power consumers can manage their own reduction in power usage rather than being disconnected from the grid. Implementation of digital energy management solutions extends this ability to more energy users, allowing dynamic load reduction to take place across more of the power network and reduce the need for load shedding through disconnection of supply.

Utilities in South Africa are becoming increasingly aware of the advantages of outage management software solutions to manage the supply to their customer base. Outage management helps utilities identify and prioritise actions to restore power after a failure occurs in the network. This is becoming increasingly relevant as the effects of load shedding are impacting the reliability of distribution networks. Some utilities have begun to implement these solutions, while others are considering such a step.

Eskom has embarked on its Battery Energy Storage System (BESS) programme, with the first sites under construction and more projects expected in the market. BESS is suitable for distributed deployment, so there is much activity in the commercial market to consider BESS for local energy security.

Some municipalities are considering deploying Supervisory Control and Data Acquisition (SCADA) and Distribution Management Systems (DMS) to better manage their networks. Deploying SCADA is useful to manage the network operations required to implement load shedding.



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Self-generation, grid connection and smart grids

Through changes in regulation and technology, large power users are now able to generate and use their own electrical energy. As this self-generation becomes more prevalent, I expect users will start to trade power with each other, with the grid being the trading platform for such exchanges. Sophisticated software solutions are available to manage such trading, allowing real-time exchange of power between users and settlement of the resultant commercial transactions.

With the rapid deployment of self-generation underway, it is easier and cheaper to save a kWh of demand than build generation to cater for that demand. Improved energy efficiency is essential if the world is to decarbonise successfully. The digital solutions available today support the implementation of energy efficiency, both through the identification of where energy is being used and the actions needed to use it more efficiently. Solutions such as low-loss transformers and variable speed drives are available that enable better use of electrical energy. Power factor has been well-managed in South Africa, so the gains through improvement here are limited.

As the power generation landscape evolves in South Africa, the demand for grid connection solutions is increasing rapidly. It has taken many decades to build the power grid that exists today. There is not enough time to meet the demand for new offtake and grid integration solutions unless new solutions such as prefabricated substations are considered to speed up the deployment of such grid connections.

Smart grid solutions consist of three basic components: The devices to collect data and control the grid, the communications network that connects these devices together and the software solutions that enable management of the grid.

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Internet of things and software solutions

The internet of things has enabled smaller, cheaper devices that can be deployed more easily and deeper into power networks. In the home, the smart meter can be the hub, enabling fine control of electricity demand and outage management.

The continued expansion of mobile technologies, such as 4G and 5G, and the continued rollout of fibre, has enabled connectivity like never before. Implementation of new security standards enables safe and secure connections to protect customer data.

Software solutions that manage the grid and the maintenance of the grid are maturing fast. Distributed Energy Resource Management (DERM) software allows utilities to manage the integration of dispersed generation in their networks as an extension of the DMS already in place. Asset Performance Management (APM) solutions take advantage of Artificial Intelligence and expert models to predict the remaining lifetime of electrical network assets and are prioritising maintenance of assets to ensure continued and safe operation.

Enterprise Asset Management (EAM) solutions are becoming more widely deployed. These aid utilities to record their asset base, understand the status of assets and manage the maintenance. New to the market are APM solutions. APM dynamically monitors the conditions of the assets, using existing and new sensors and data, to predict the state of the assets and their life expectancy. APM filters out the real problems from the data and prioritises EAM to ensure rectification actions are undertaken and recorded. Utilities around the world are starting to see the benefit of APM, leading to an increased demand for such solutions.

The days of energy supply continuously being available and varied to match the power system demand are behind us. Regardless of Eskom's supply challenges, as the grid decarbonises through the implementation of more renewable resources, every energy user will be required to be aware of their usage and manage it. Today this is possible through energy efficient solutions, digitalisation providing increased visibility and increased ability to self-provide and store electrical energy.

ABOUT STUART MICHIE

Stuart Michie is an experienced sales and marketing manager with a demonstrated history of working in the electrical manufacturing industry. He is skilled in digitalisation, smart grid, SCADA and the electric power industry.

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