Awakening: The Australian Outlook for Smart Grid Investment to 2029

A Confidential Report for Strategic Research Clients

ENERGEIA

Overview

Smart grid technologies in Australia have to date predominantly been deployed on a selective, or trial basis. Energeia expects smart grid technologies to ultimately become a cost effective way for Distribution Network Service Providers (DNSPs) to manage network performance and investment, unleashing a new era of electricity industry transformation and regulatory reform.

In this confidential report for our Strategic Research clients, Energeia examines the emerging market for smart grid technologies in Australia, focused on Fault Detection, Isolation and Restoration (FDIR), Active Volt-VAr Control (AVVC), Distribution Monitoring (DM) and Asset Condition Monitoring (ACM). The report analyses the market's key drivers, barriers, customer segments, technologies, products and industry players to gain insight into its medium to long-term outlook.

The smart grid industry has grown rapidly over the last decade, which can to a large extent be attributed to substantial government funding initiatives. Most industrialised countries have an explicit smart grid policy and funding program, with governments investing over USD $7 billion in smart grid development programs to date. The growth of the industry has triggered the development and adoption of key standards to address communications and interoperability.

Energeia's research has found that while few institutional barriers exist, Australia lacks a formal policy or regulatory framework for smart grid development. It is not clear whether the recommendations from the now concluded Australian government flagship smart grid project; *Smart Grid, Smart City,* will achieve traction and government support going forward. Further, with funding for Standards Australia's *Smart Grid Standards Roadmap* seemingly dried up, there is a current lack action with respect to relevant standards development.

Improving grid reliability and reducing capacity-driven investment are the key drivers for grid-side smart grid technologies. Energeia sees the greatest potential for the technology on urban and short rural networks, where the combination of relatively high customer density, high solar PV penetration and favourable network topology (meshed) create a strong business case.

Products are available in the market today for the smart grid applications discussed in this report. Most products tend to have a set of standard functions, with more advanced solutions available at a premium. Energeia expects significant reductions in product costs to occur over the coming years through the convergence of sensors in all devices and falling production costs.

The smart grid space is dominated by the top-tier control and automation companies, with niche players mainly emerging in the sensor and monitoring segments. The major players are positioned across the full suite of products and services required for the smart grid applications discussed in this report. Energeia expects successful niche companies to be swiftly absorbed by larger competitors.

In Australia, Energeia sees slow growth in the near term, with Distribution Network Service Providers (DNSPs) adopting most smart grid technologies discussed in this report towards the end of this decade. Falling solution costs, a stronger incentive to improve network reliability, the potential to harness distributed energy resources (DER) for demand management and the need to cost-effectively connect high penetrations of solar PV are all contributing factors influencing future uptake.

Energeia's outlook sees DNSPs increasingly adopting smart grid technologies towards the end of this decade. Falling solution costs, a stronger incentive to improve network reliability and a continuation of the widespread adoption of solar PV will all be key drivers of adoption, potentially triggering over $1 billion of smart grid investment by 2029.

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1.0 Introduction

Distribution Network Service Providers (DNSPs) have traditionally relied upon manual inspections to collect data, manual switching and feeder patrols to locate faults and oversizing of network assets to address uncertainty in demand. The key value proposition of smart grid technologies is the potential to deliver the same or better outcomes at lower cost via remote monitoring and automation.

This report discusses key smart grid technologies and solutions that can deliver improvements in; asset management through remote monitoring; reliability using remote controlled switches and; capacity and power quality via improved voltage management.

1.1. Scope

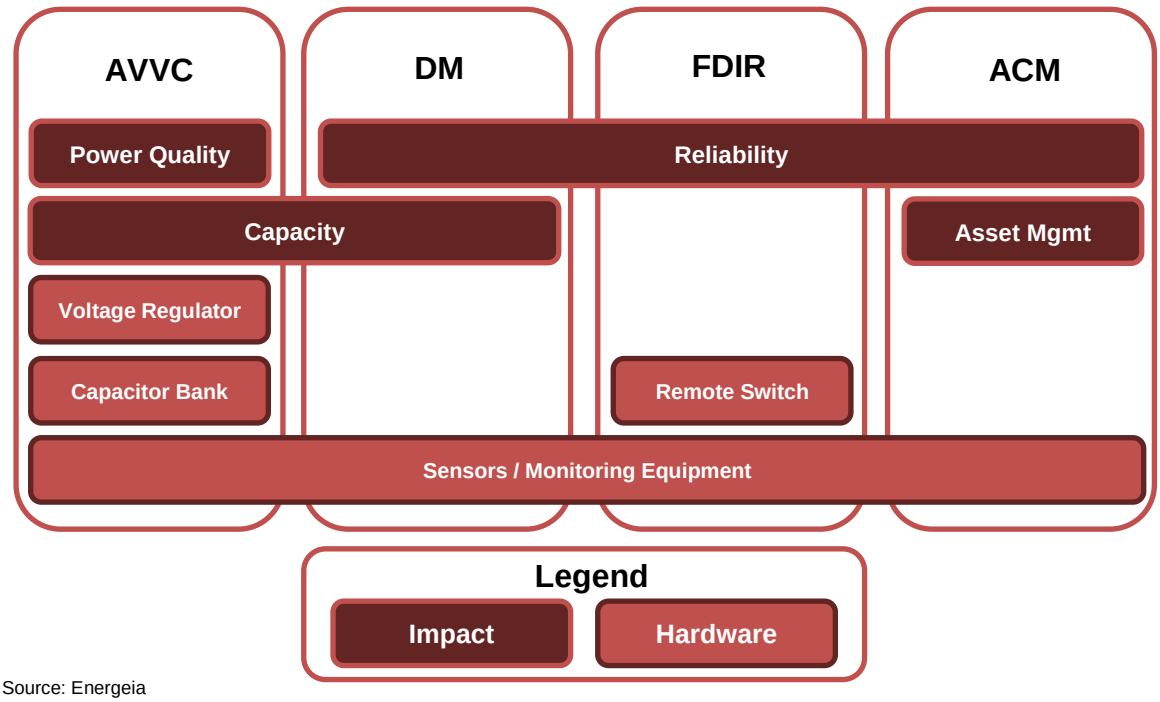
This report is part of Energeia's Strategic Research service, focusing on the emerging energy technologies for consumers and networks. The report addresses the market for smart grid technologies over the next fifteen years, relevant solutions and products, and the industry value chain that develops, manufactures and distributes them.

The report specifically focuses on the following smart grid applications:

- Active Volt-VAr Control (AVVC)
- Distribution Monitoring (DM)
- Fault Detection, Isolation and Restoration (FDIR)
- Asset Condition Monitoring (ACM)

Figure 1 shows the smart grid applications evaluated in this report, the required solutions and hardware, and the areas impacted by each application.

Figure 1 – Smart Grid Applications Impact Framework



Source: Energeia

1.2. Definitions

Figure 1 shows that there is significant impact and hardware overlap between applications. The different applications and their impacts are summarised below.

1.2.1. Active Volt-VAr Control

AVVC uses monitoring devices to measure the voltage, current and power factor across the network. Automation algorithms process the information from the monitoring devices and automatically operate actuation and control devices such as voltage regulators and capacitor banks to alter the voltage and power factor as conditions change.

Improved voltage and power factor management through AVVC can be used to reduce line losses and peak demand on the network. This frees up capacity and can defer network augmentation investments that would otherwise be required. Dynamic voltage control can also be used to address power quality issues resulting from high levels of solar PV penetration.

1.2.2. Distribution Monitoring

DM refers to technologies that remotely monitor and collect standard metrics such as voltage and current across a range of distribution assets. DM is a foundational technology used for a range of applications, including AVVC and FDIR.

DM technology can unlock capacity benefits by providing DNSPs with continuous information regarding the state of the network. It can also deliver reliability improvements by helping operators to more quickly identify the likely location of a fault.

1.2.3. Fault Detection, Isolation and Restoration

FDIR involves utilising monitoring devices to detect fault conditions combined with remote controlled switches for automated isolation and restoration. Automation algorithms process the monitoring information and either automatically operate switches or provide advice to the control room operator on recommended actions.

The key benefit of FDIR is improving reliability on the network by reducing the frequency, duration and the number of customers affected by faults.

1.2.4. Asset Condition Monitoring

ACM includes a range of technologies used to remotely monitor the state of the network and condition of assets, including partial discharge (PD), dissolved gas analysis (DGA) and thermal monitoring to enable dynamic line rating (DLR).

ACM technology can be used to improve asset management operations by eliminating the need to deploy field staff for routine inspections and data collection. It can also be used to detect pre-fault conditions, and thereby remedy prior to any reliability impacts.

1.3. Structure

The report is structured into the following main sections:

1. **Overview** – Provides a high level summary of the report and its key findings.
2. **Introduction** – Outlines the scope and structure of the report and provides technical definitions and assumptions.
3. **Policy and Regulation** – Reports on Australia's policy and regulatory framework as it relates to smart grid technology at the Federal level against international best practice.
4. **Markets and Customers** – Reports on the Australian market for smart grids, including the estimated size, profile and potential of key market segments.
5. **Solutions and Products** – Reports on smart grid solutions, products and services, including an assessment of their commercial and technical performance against market requirements.

6. **Industry and Strategy** – Reports on the industry value chain by segment including key challenges and opportunities, the number and type of players, and player strategies.

7. **Outlook –** Reports on Energeia's proprietary models and outlook for policy and regulation, energy and product pricing, market demand, products and services and industry value chain.

Sections 3 through 6 provide the results of Energeia's research and analysis of historical and contemporary information. Section 7 is forward looking, and mostly concerned with describing the key inputs and assumptions underpinning our twenty year outlook.

Energeia
Suite 2302, Level 23, 1 Alfred Street, Sydney NSW 2000
T 02 8097 0070
E energeia@energeia.com.au **W** www.energeia.com.au

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