

Awakening: The Australian Outlook for Smart Grid Investment to 2029

A Confidential Report for Strategic Research Clients

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 of 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.

Contents

Overview	1
Figures	3
1.0 Introduction	5
1.1. Scope	5
1.2. Definitions	6
1.3. Structure	6
2.0 Policy and Regulation	8
2.1. International	8
2.2. Australia	13
3.0 Customers and Markets	15
3.1. Market Evolution	15
3.2. Fault Detection, Isolation and Restoration	16
3.3. Active Volt-VAr Control	25
3.4. Asset Condition Monitoring	34
3.5. Distribution Monitoring	38
4.0 Solutions and Products	40
4.1. Fault Detection, Isolation and Restoration	40
4.2. Active Volt-VAr Control	43
4.3. Sensors	45
5.0 Industry and Strategy	50
5.1. Industry Structure	50
5.2. Strategic Positioning	51
5.3. Market Shares	51
6.0 Outlook	53
6.1. Drivers	53
6.2. Market Demand	56
6.3. Products and Solutions	60
6.4. Industry and Strategy	60
7.0 Glossary	61

Figures

Figure 1 – Smart Grid Applications Impact Framework	5
Figure 2 – A Best Practice Smart Grid Policy Framework	9
Figure 3 – International Smart Grid Funding Programs	10
Figure 4 – International Smart Grid Spending	10
Figure 5 – International Smart Grid Standards	12
Figure 6 – Regional Distribution of Smart Grid Projects	15
Figure 7 – Number of Trials and Rollouts by Application	16
Figure 8 – Key International FDIR Implementations	17
Figure 9 – SAIDI and SAIFI Reductions in DOE Funded FDIR Implementations	17
Figure 10 – Average SAIDI and SAIFI by DNSP 2007 - 2012	18
Figure 11 – Comparison of Planning Approaches	19
Figure 12 – VCR per NEM Region	20
Figure 13 – Australian (Victoria) and International Value of Reliability	20
Figure 14 – Current Revenue at Risk	21
Figure 15 – Assets by State	23
Figure 16 – Required Switching Operations Based on the Number of Mutually Supporting Feeders	23
Figure 17 – Number of Switches Required per Network Segment (NSW)	24
Figure 18 – Number of Switches by State and Network Type	24
Figure 19 – FDIR Costs and Benefits 2014 (NSW per Feeder)	25
Figure 20 – Key International AVVC Implementations	26
Figure 21 – Overall and Peak Demand Reductions in International AVVC Trials	26
Figure 22 – Line Loss Reductions in DOE Funded AVVC Trials	27
Figure 23 – System Peak Demand by State	28
Figure 24 – DNSP Growth-related Capital Expenditure	28
Figure 25 – Schematic of a Distribution Feeder with PV Clustering	29
Figure 26 – Solar PV Installed Capacity by State and Feeder Type	29
Figure 27 – Forecasted QLD Solar PV Related Infrastructure Costs	30
Figure 28 – DNSP HV Line Losses	31
Figure 29 – SGSC Voltage Profile With and Without AVVC	31
Figure 30 – Number of AVVC Devices per Feeder per Network Segment	32
Figure 31 – Number of Installations by State and Network Type	33
Figure 32 – AVVC Costs and Benefits 2014 (NSW per Feeder)	33
Figure 33 – Leading International ACM Implementations	34
Figure 34 – Faults Caused by Asset Failure	35
Figure 35 – Common Asset Maintenance Tasks	36
Figure 36 – ACM Costs and Benefits (Urban Rollout)	38
Figure 37 – Distribution Monitoring Costs and Benefits 2014	39
Figure 38 – Selected Reclosers	40
Figure 39 – Dedicated Recloser Controllers	41
Figure 40 – S&C IntelliRupter	41
Figure 41 – Selected Switches and Reclosers Assessment Matrix	42
Figure 42 – FDIR Product Costs	42
Figure 43 – Selected Capacitor Bank Controllers	43
Figure 44 – Selected Voltage Regulator Controllers	44
Figure 45 – Selected AVVC Controllers Assessment Matrix	44
Figure 46 – AVVC Product Costs	45
Figure 47 – Ausgrid DM&C Solution	46
Figure 48 – Selected Environmental Sensors	46
Figure 49 – Selected DGA Monitors	47
Figure 50 – Selected Partial Discharge Monitors	47

Figure 51 – Selected Distributed Temperature Sensing Solutions	48
Figure 52 – Sensors Assessment Matrix	48
Figure 53 – Sensor Costs	49
Figure 54 – Smart Grid Industry Structure	50
Figure 55 – Market Positioning of Key Smart Grid Players	51
Figure 56 – Market Share of DMS Vendors in the US and Australia by Population	52
Figure 57 – Solar PV Forecast by State	54
Figure 58 – Peak Demand Forecast by Region	55
Figure 59 – Smart Grid Devices Cost Projections	56
Figure 60 – Smart Grid Technologies Cost-effective by Network Type	56
Figure 61 – Number of FDIR Installations	57
Figure 62 – Feeder Utilisation as a Function of the Number of Supporting Feeders (N)	58
Figure 63 – Number of AVVC Installations	58

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

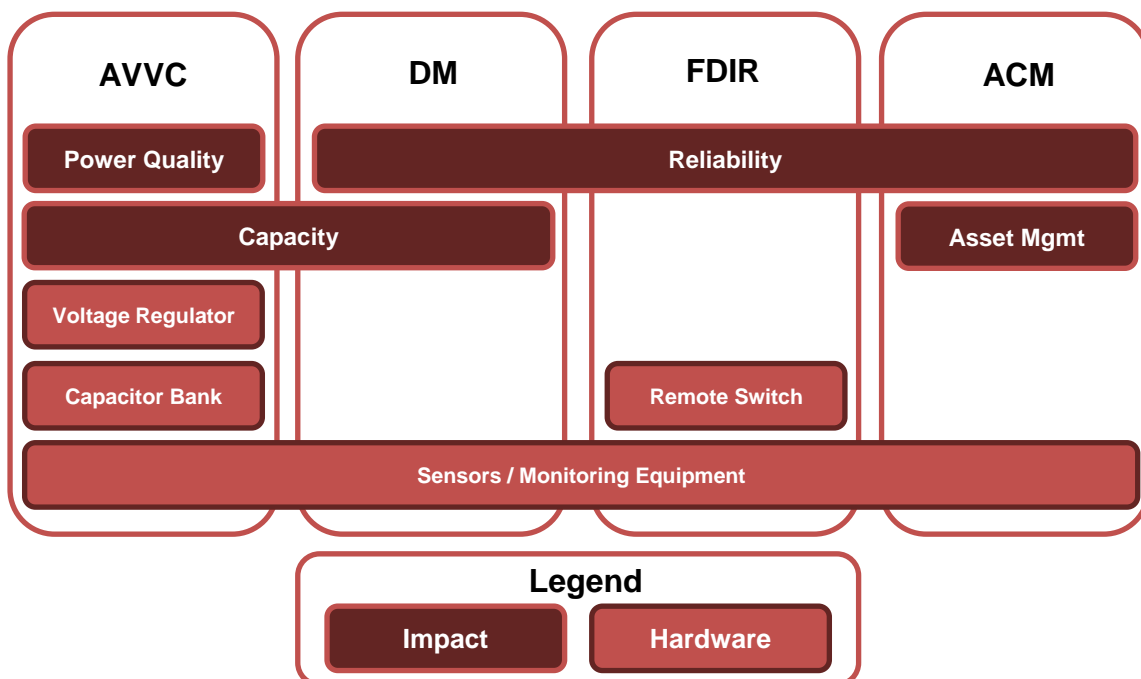
This report is part of Energeia's Strategic Research service, focusing on the emerging energy technologies for consumers and networks. The report addresses the market for smart grid technologies over the next fifteen years, relevant solutions and products, and the industry value chain that develops,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

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