AusNet

Electricity Distribution Metering AMS – Metering Comms Upgrade Strategy

2024-2025

Thursday, 30 January 2025

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1. Background

AusNet's smart meter (AMI meter) fleet supports our customers through a range of market services including meter data collection, on demand reads and remote connection and disconnection (when customer's move property). In addition, the AMI network supports the electricity distribution business by providing power quality data and alarms/alerts that enable improved management of the network, outage detection and identification of potential safety issues.

1.1.1. Current Solution

AusNet Services regulated smart metering network delivers metering services to 830,000 customers daily and is underpinned a Mesh technology solution. The Itron meshed solution assists AusNet in meetings its metering obligations by seamlessly integrating to Backoffice systems via web services.

The current backbone of the Mesh solution is comprised of:

- 680 Access Points
- 4,700 Micro Access Points (**MicroAPs**)
- 810 Relays

Communication backhaul services between individual meters and our internal systems via Access Points and MicroAPs is over the Telstra 4G network.

1.1.2. Scope

The scope of this document is providing upgrade or design recommendations as part of the Metering Asset Management Plan.

This covers from the Neighbourhood Area Network (**NAN**) comprising of all field-based infrastructure include of Access Points, MicroAPs, Relays and metering endpoints connects via mesh endpoint to the network management service more widely known as UtilityIQ (**UIQ**).

2.   Recommendations

AusNet's asset management strategy is based on a framework of continuous improvement and requires the periodic assessments of our metering assets, systems and processes. In late 2024. Itron undertook a technical assessment and provided us with an AMI Performance Assessment report identifying areas requiring improvement with recommendations in relation to Mesh augmentation, current system performance, and performance optimisation.

This strategy document summarises our recommendations and approaches for improving our customer metering services and deliver higher levels of data delivery resilience and reliability.

Recommendation 1 – Define our meter data and power quality specification

Benefit:

- Provides a clear understanding of both regulatory and network requirements which assist tailoring the current and future solution to meet the requirements.
- Minimise the additional cellular data costs associated to returning unnecessary data and builds a network that meets the proposed requirements.

Risk: By not defining the current and potential future business requirements the AMI Solution will not cater for future regulatory obligations or business needs when selecting future technologies when supporting Metering and Power quality data regulatory and business initiatives.

Deliver By: Q1/2025

Recommendation 2 - Baseline mesh firmware for both mesh Generation 4 and Generation 5 devices to Firmware 5.4.X

Benefit: by implementing the recommendation the following benefits are realised:

- Mesh module firmware is supported until 2027
- Current fixes for mesh firmware defects and will allow AusNet to baseline to one firmware revision rather than the 2 current firmware streams
- Significant performance improvement in power quality data delivery which will reduces data cellular cost. This will have a direct impact on AusNet's PQ data delivery options

Risk: Doing nothing put any further field metering technology changes such as meter types at risk as there will be no factory acceptance testing completed on Mesh module firmware that is end of extended support.

Deliver By: Q1/2025

Recommendation 3 – Deploy additional battery backed mesh infrastructure into AusNet's top 20 worst performing feeders

Benefit:

- Provides a more granular view of smaller outages that will not be picked up
- Improved reactive approach to small transformer or tree down outages that is less likely to be picked up outside of major network event.
- Reduces customer minutes off supply and further reduces STIPUS total and cost impact

Risk: By not deploying additional infrastructure AusNet will not have granular insight into smaller outages and thereby have greater exposure to STIPUS Total.

Deliver By: Q1/2025

Recommendation 4 – Updating servers and supporting infrastructure

Problem Statement:

Existing servers and supporting infrastructure that are part of our AMI meter data service delivery and meter management are approaching or past recommended useful and supported life.

Benefit:

Upgrading servers and supporting infrastructure mitigates the risk of meter delivery failures and supports the implementation of UIQ, SIQ and other key applications.

Risk: Not upgrading key infrastructure for our AMI solution puts the reliability of our meter data delivery services and regulatory obligations at risk. Additionally, there is a risk that security vulnerability and underlying software application suite cannot be modified with current version of UIQ.

Deliver by: Q2 2025

Recommendation 5 - UIQ suite upgrade

Feature:

- Provides certainty around 5-minute meter read growth and decline of 30-minute meters through sizing estimate and Backoffice performance health check

Benefit: by implementing the recommendation the following benefits are realised:

- Defects and work arounds since previous upgrade (3 years) to be resolved.
- Solution is covered under support and maintenance agreement under normal support
- Provides SIQ power quality performance upgrade pathway
- Supports new meter variants through meter plugin availability
- Supports AusNet application stack upgrade
- Supports **potential** ODS implementation

Risk: Not upgrading the AusNet AMI solution will not be supported for defect fix or upcoming new meter type support. There is also a risk that security vulnerability and underlying software application suite cannot be modified with current version of UIQ.

Deliver By: Q1 2026

Recommendation 6 – UIQ back-office tuning and optimisation following recommendations 1, 2 and 3 implemented

Benefit: by implementing the recommendation the following benefits are realised:

- performance improvements in data delivery to market systems and to network business initiatives.
- performance improvements of Power Quality data to network business requirements and initiatives.

Risk: not tuning and optimising the Backoffice applications will likely put downstream systems at risk of high utilisation and unnecessary data throughput

Deliver by: Q4 2025

Recommendation 7 – Augment Access Points for improved field performance

Problem Statement:

Consistent with the recommendations in Itron's AMI Performance Assessment and our need to improve meter data delivery to 99.9% every day of the year and increase service availability for network operations, we will need to augment our mesh network canopy with an additional Access Points to improve the reliability and resilience of our regulatory compliance delivery.

Our mesh network (or NAN) can currently meet requirements (i.e., delivering 99.9% of actual meter data to the market and collecting PQ data) in normal conditions with current requirements. However, with the other network requirements and the need to improve the reliability and resilience of mesh network we need to increase the mesh canopy by an additional 280 Access Points. This reduces mesh hop depth for outage detection and reduces the Access Point loading (2000:1). This will improve meter read performance, service reliability and resilience.

Benefit: Adding an additional 280 Access Points to the existing network design and in conjunction with the above recommendations the Itron Mesh meter to network management solution has the capability of:

- Reading 98% of the current meter fleet within 12 minutes
- Reading 98% of the meter fleet PQ 5-minute data set within 6-8 minute read jobs
- Providing additional outage detection data to make informed decisions for outages that can be efficiently fed into the ADMS solution

Risk: Augmenting access points mitigates the risk of regulatory non-compliance with our AMI Service Level Specification obligations and improving the level of performance for distribution network management

Deliver by: Q4 2027 (starting in 2026)

Recommendation 8 – Plan developed for the implementation of a mixed protocol meter variants and ANSI c12.19 solution.

Problem Statement:

Business needs to understand the impact on metering when using different protocol meter variants such as Device Language Message Specification (**DLMS**), Companion Specification for Energy Metering (**COSEM**), and ANSI c12.19 regarding meter management inclusive of programs and power quality data being read from different table structures.

Benefit: mitigates risk around current L+G meter offering at end of life and unavailable for purchase by Q1/2026

Risk: Not developing an integration plan places AusNet metering obligations at risk by no meter solution available for faults and new connections

Deliver by: Q4 2026

3. Mesh Solution Upgrade

As part of maintain an up-to-date AMI metering solution over time components needs to be upgraded. These are generally driven by security, reliability and compatibility requirements.

To maintain a minimum level of security, reliability and compatibility with other systems we are required to upgrades our AMI metering solution including:

- UIQ Digital infrastructure
- Mesh Hardware
- Mesh Firmware upgrade
- Meter Firmware standardisation

3.1. UIQ Digital Infrastructure

The mesh network management system UIQ normally would undergo an upgrade every 4 years due to the support arrangements, however the support and maintenance model has now changed to 2 years of support and 1 year of extended support meaning an upgrade should be scheduled around these times. While AusNet can choose to elect to not upgrade it will mean there will be no resolution to any defects raised on an older version of UIQ.

While support is one driver for upgrading there are several defects that have been fixed in future releases that AusNet will continue to operate if one is available. Not upgrading also limits other applications in the stack such as SIQ which cannot be upgraded to the latest release without a shared services component that works with all the modules.

The table below provides a current view stack. It is proposed that AusNet take a UIQ 6.x and associated applications early 2025. This will also allow for meter plugins for future metering hardware that AusNet will have to take in 2026 when our current meter fleet c12.19-meter options will no longer be available.

Description	current	AusNet Install	EOS	EOES	Proposed	By When
AMM	5.0.9	Sep-21	31-Jan-24	31-Jan-25	6.1	Mar-25
FWU	4.16.5	Sep-21	31-Jan-24	31-Jan-25	4.18.1	Mar-25
Gridscape	2.3.7	Sep-21	28-Jul-23	28-Jul-24	2.5.1	Mar-25
MPC	4.16.5	Sep-21	31-Jan-24	31-Jan-25	4.18.1	Mar-25
SIQ	3.2.3	Apr-23	8-Jul-23	8-Jul-24	4.X	Mar-25
FSU SAM	5.2.4	Sep-21	31-Jan-24	31-Jan-25	5.3.3	Mar-25
HCM	2.5.2	Sep-21	1-Apr-23	1-Apr-24	2.7.3	Mar-25
CAAS	1.11.4	Sep-21	31-Jan-24	31-Jan-25	1.9	Mar-25
Network Centre	1.8.4	Sep-21	31-Jan-24	31-Jan-25	1.1	Mar-25
SSC	2.8	Sep-21	31-Jan-24	31-Jan-25	2.10.X	Mar-25
meter plugin	1.8	Sep-21	31-Jan-24	31-Jan-25	1.11.11	Mar-25
ODS	N/A	N/A	N/A	N/A	N/A	N/A

Note: as part of an upgrade recommendation is to engage Itron in a statement of work to build out environments and provide an upgrade pathway. Internal review of current environments should also be considered and whether there is a need to maintain a development environment that has never been used.

3.2. Mesh Field Hardware

There is currently no change to the Itron mesh hardware in the foreseeable future. The mesh solution comprises of mixed network of both generation 4 and generation 5 hardware. Generation 4 mesh hardware is now end of life with generation 5 being deployed for all Access Point and MicroAP sites. As generation 4 mesh module and relays fail, they will simply be replaced with an equivalent generation 5 unit.

While AusNet has adopted generation 5 modules as generation 4 modules went end of life in 2018 and unavailable for further order. In additional to this, where generation 5 modules are surrounded by other generation 5 modules they have the capability of a much higher transmission rate. It should be noted in mixed generation4 and generation 5 areas the modules will gear shift to the lower 300Kbs transmission rate.

3.3. Mesh Field Firmware

Generation 5 Access Points, Relays and MicroAP's have all currently been baselined to mesh firmware 5.4.3. other than several orphaned devices on firmware 5.4.0 this has been completed.

The benefits of upgrading from the current firmware release are:

- Current generation and generation 5 firmware is end of extended support and upgrading will provide defect resolution

- 5.4 firmware will be used on all meter integration going forward, no vendor testing will be done on our current firmware releases

- Significant improvement in PQ data payload reductions which is the primary cellular cost of the solution

- Improvements in High frequency PQ jobs to downstream systems

- 5.4 firmware stream removes several critical defects that puts AusNet's metering solution at risk during sustained outages.

Firmware testing will shortly commence for Generation 4 and 5 mesh module devices that are on:

- 3.12.2 or 3.12.8 which are older generation 4 modules

- 4.8 generation 5 modules

Note: Modules will go directly to 5.4.4 as opposed to the current 5.4.3 firmware running on pole top equipment.

Note: This has largely been driven by the firmware issue present in 5.4.3 but fixed in 5.4.4 where older generation devices can be orphaned after entering lower power mode in a fault or outage condition.

3.4. Metering hardware and firmware

Metering hardware is not expected to change over the next 12-18 months.

- U1200/U3300 metering has now been sunsetted with no further firmware upgrades from R43

- U1300/U3400 metering is the standard meters currently being deployed. These meters are subject to meter firmware changes but will likely be maintained between R54 and R59. Ideally standardising to one release to manage is preferred.

Note: L+G has notified AusNet that the next meter type will be an DLMS/COSEM meter which will be general audience releases Q1/2026. AusNet needs to understand what implications there are for running a mixed c12.19 and DLMS metering regarding meter and power quality data.

4. Current Initiatives
4.1. Activities in Flight

4.1.1. AMI Mesh 3G to 4G Migration

The Metering team have retired all 3G capable devices form the network with 4G installations now complete. There are several no access sites that will continue to be targeted up until the Telstra 3G shutdown.

Several 4G sites have poor 4G comms or are continuing to churn between 3G to 4G cellular connections. for cellular connections that churn between 3G and 4G the Metering team will wait until the 3G closure occurs on the 28th of October 2024 and then review sites that fail to transition back to a 4G cellular service.

For 4G pole mounted Access Points these will be packaged up with a site survey activity to find a more suitable location.

4.1.2. 5.4.4 Mesh Firmware Testing

Pole top infrastructure being Access Points and Relays (gen 5 only) were upgraded to Utilios firmware version 5.4.3. Mesh module testing using Utilios firmware 5.4.4 is to start in the non-production environments with a small number of loaded via the FSU in the Production staging area. While testing is underway in the non-production environments a BAU UAT activity will occur on meters preloaded with 5.4.4 to validate current operational procedures.

4.1.3. Access Point faults and installations

As of the start of September 2024, AusNet has engaged Service Stream for its new pole top installations and faults. This will provide a timelier response to installations and faults. The previous DOMSA agreement had no clause for AMI pole top installation support and no service levels were considered which meant installation were taking up to 12 months to complete. The new contract now has a 20-business day SLA on acceptance of the work package.

4.1.4. Outage detection on Worst Performing Feeders

AusNet has a number or worst performing feeders that have trending data for at least the last 5 years, these sites have clear customers off supply metrics. By deploying a larger volume of battery backed relays into the top 25 worst performing feeder it would provide an increased awareness of outage detection into the areas. Geographically the further you go from residential areas the greater increase in mesh hop depth which means the less likely we will receive last gasp outage information. The proposal would be to have an economic look at the top 5 feeders with a focus on impacts of transformer failure of lines down that may not be picked up in a timely manner and would result in a reactive approach to customers notifying of a fault. The feeder review would not be targeted at a storm even though there would be greater benefit for more accurate outage data in these instances but to allow the control centre to respond quicker to smaller outages that may occur.

Note: Rural last feeder performance is likely to be around 5-10% last gasp capability, by performing network analysis and deploying an additional 25 Access Points and 100 Relays into poor performing feeder areas the last gasp capability can be lifted to 15-20% which is sufficient to reduce STIPIS payout by early outage detection.

4.2. Tasks Underway

4.2.1. Known issues

Access Point Firmware

The metering team are currently working through Access Point issues with the 5.4.0. There have been around 60 Access Points go unreachable on the network which have been related to the PIL-23-154 – potential loss of communications to Access Point 5.0 with some carrier networks. This has likely occurred with all the Telstra changes on the network which has causes these devices to gradually lose connection to the modem via the devices ethernets interface. The remedy that is being used for this is to simply in field firmware upgrade these devices to Firmware 5.4.3 which has resulted in the devices coming online after a reboot.

Most of the devices have been rectified with some failing the upgrade process. The field work will have been completed by the end of September 2024 with any further devices not communicating switched out and returned for further testing.

AMI Mesh 4G coverage Issues

The metering team has recently completed and augmentation design prior to transitioning to 4G backbone design which includes pole top Access Points and residentially installed MicroAPs. The recent replacement had a design principle that the coverage moving from an 850MHz 3G network to a 700MHz network would largely be a like for like replacement

Delivery Partner Faults Performance

Since mesh faults performance has been outsourced the AusNet metering has not been able to meets its 10-day obligations in relation to site faults being fixed. Adding to this the increase in no access sites means the AusNet maintains a higher-than-normal unreachable meter population that is estimated. A review of field operations and management is proposed under the new organisational structure changes commencing September 2024

Utilios Firmware versions

Currently there is a variation in firmware revisions on the network which are primary 3.12.8 for generation 4 cards with a small population of 3.12.2 sites. Mesh 5 modules are currently on 4.8. firmware baselining activities will occur later this year where Access Point, MicroAP and relay will be upgraded to firmware 5.4.3 with the remaining 800,000 plus mesh population moved to firmware 5.4.4 which is driven by the defect fixed in this release due to beacon transmission impacting generation 4 devices.

URD areas

Currently does not have a good solution for URD areas which will become more of a problem in the future as the low voltage network is removed and is placed underground. The problem that this is creating now is that it takes our median 2-3 hops mesh depth network and moves it towards 4-5, read performance is still fine but this will have a marginal impact on last gasp responses in a significant outage.

4.2.2. System initiatives

Global meter readers (GMR) performance

Currently the AMI metering solution runs two global meter reading services which both have a PIF setting of 40 which provides a combine 80 packets in Flight. With the future upgrade optimisation activities this figure may further be tuned.

Note: Further recommendations from Itron are required on changing this configuration setting and should be done in conjunction with any gateway configuration change as changing one configuration will impact the others performance.

Gateway performance

Gateway currently has packet rate limiter set which enables a minimum and maximum packet rate limit, these are set to 20 and 240 respectively. Further advice from Itron is required as to whether we should consider increasing the

minimum rate from 20 so that this doesn't become a throttle point for the network or whether there is any benefit on turning the packet rate to disable.

Note: Further recommendations from Itron are required on changing this configuration setting and should be done in conjunction with any gateway configuration change

SIQ Job performance

SIQ Job performance has recently seen to be an issue with some jobs failing and or downstream systems impacted by the volume of data. An interim recommendation has been provided to change the time that jobs kick start, so they start closer to the meter read but allow a longer time for reading within the hour window. Having said this, 99% of data is generally delivered within 15 minutes of each read job and issue have been noted on downstream systems rather than the delivery to the JMS que.

Note: SIQ profile selection criteria should be revisited as there is out of date criteria assigned and duplicates of meters either due to poor criteria

Note: Future changes to job frequency read rates of profiles are not to be undertaken until Mesh firmware 5.4 has been deployed, SIQ has been upgraded and Itron has been engaged to assist with JMS/Tibco tuning

Access Point Faults and Growth areas

There are several Access Point faults on the network which are a mixture of the following:

- Firmware 5.4.0 faults

- Cellular coverage issues causing delays in read performance

- Removal of pole top equipment in URD areas creating a fault

Most devices have been moved into an investigate status for resolution while cellular performance issues are yet to be started.

Access Point configuration

There are some slight configuration recommendations to be implemented on AP gridscape profiles, a broader review should be consider ensuring there is no further configuration parameters that should be tweaked.

Note: Verify AP secondary threshold change set to >8,000, this should also include of gridscape config/profiles set in system including trap spammer limits.

Meter Time Drift

The current AusNet meter fleet now has a high population of older meter types that are 15 years or approaching the 15-year engineering life of the product. The likelihood of meter having time correction is likely to grow and consideration may be required to have a more aggressive time synching policy.

The typical ± 20 second drift permitted for collection of a meter's interval data is not acceptable for PQ data. AusNet has a requirement to maintain a 2 second maximum drift across the metering fleet.

5. Dependant systems

5.1. MDMS and market systems

AusNet currently collect meter reads every 4 hours with UIQ providing data exports into EnergyIP the head end Meter Data Management System (MDMS). Bidirectional requests and service fulfilment for remote energisation and de-energisation services are managed with SAP CIS, performed by UIQ and sent via or Webmethods middleware in form of B2B transactions. Meter data delivery occurs around the clock, and remote energisation and de-energisation services normally occur during normal business hours.

5.2. SNET and downstream systems

Power quality data is collected from the network at regular intervals. The mesh network endpoint devices have either 3 or 4 Power quality profiles loaded.

Profile 1 PQ 5-minute samples returned hourly to 100% of meter fleet

Profile 2 PQ 1-minute samples read on an "on demand basis" deployed 100% of meter fleet

Profile 3 Brown out voltage band, asynchronously sent, deployed to 100% of meter fleet

Profile 4 Golden meter 9 voltage bands asynchronously sent when even it triggered, deployed to 110,000 meters

Note: the more profiles that are maintained on the mesh module will impact the amount of storage that is available to all profiles.

Data return to back to SNET and downstream systems is:

- Voltage
- Current
- Power factor
- Frequency

Hourly High Frequency read Volumes by Meter Type:

Delivery of 300 second PQ Sampling (5 minute sampling) with meter type job offset but read hourly (24 times a day)

5.3. Advanced Distribution Management System (ADMS)

ADMS requirements are primarily around meter events such as last gaps and power restore outage events. the events are not filtered for any false positive data which is handled through other processes.

The current solution also has some reliance on using a "bulk Ping "capability through a customer application which interfaces to AMM. There is some work underway to investigate the performance of bulk ping.

Note: The system is tuned to perform meter reading activities via 2 global meter readers (**GMR**) and is not tuned towards bulk ping capability. Whilst in a storm condition the mesh network read performance due to normal route poisoning and mesh churn due to outages which increase delivery of both meter read and PQ data performance times. To use "bulk ping" during a sustained outage without correct filtering will cause additional bulk ping traffic to impact system read jobs and impact the ability to get bulk ping responses.

Note: Itron's Outage Detection module is the recommended solution for manage a web services feed to ADMS as can only send relevant data and filtering unwanted data. this will have a further benefit on minimising all data that is currently being sent to EAI which may have detrimental effects to back-office performance.

5.4. Dynamic Voltage Management (DVM)

Requirement:

Delivery of PQ Data to downstream systems e.g. Compass, should be asynchronous/ streaming where possible, provided by a real-time queue arrangement. If file based, files should be completed within 5 mins of being created or limited to a maximum of 2% of meters for the entire fleet. Smaller files are preferable however performance is impacted if files do not contain enough records. Files should not exceed 10MB (compressed) in size

Note: Hourly data delivery for PQ data is sufficient to meet the current DVM/Compass objective which is already available to be consumed from JMS/Tibco.

6.   AusNet metering specification

AusNet's primary obligation for its AMI mesh network from its revenue grade meter is to read consumption data in accordance with its MC, MP and MDP obligations whilst also complying where possible with the DSDBI (DPI) performance specification.

In addition to the primary obligation a secondary obligation to deliver power quality data as a leveraged AMI benefit that assist AusNet to meet its distribution obligations. This involves the collection or power quality data such as voltage, current, power factor and frequency at set intervals. There currently are no mandate performance requirements for the delivery of PQ data however they are primarily retrieved on the hour or as an asynchronous trap triggered when a condition is met.

6.1. Victorian AMI meter requirements

Introduction

While AusNet has completed performance testing against the DPI requirements, most of this capability is not used and the default is meeting the 10-day market data obligations.

In some cases, it is not practical to directly measure the AMI System's performance of certain functions in the Minimum AMI Service Levels Specification (Victoria) September 2008 Release 1.1, and the Minimum AMI Functionality Specification (Victoria) September 2013 Release 1.2 and equivalent counterpart functions, or other representative tests were used to determine the AMI System's performance the methods and assumptions used to produce the performance assessments are captured in the relevant sections. For example, executing group load control functions on the production environment is not practical and an equivalent verification method is described.

Note: all performance statistics to be revalidated once tuning and optimisation are completed.

AMI Functionality Specification – 4.1 Daily Meter Reads

Requirement – *All data from 99% of meters within 4 hours after midnight and All data from 99.9% of meters within 24 hours after midnight*

Status: 98% of meter data within 20 minutes, 99.8% with 60 minutes

Comments: subject to faults replacements being met which skew result

AMI Functionality Specification – 4.2 Remote Meter Reads (Individual)

Requirement – *The performance level required is:*

- Action performed at 90% of meters within 30 minutes.
- Action performed at 99% of meters within 1 hour.
- Action performed at 99.9% of meters within 6 hours.

Status: 99.76% read within 60 minutes on 6000-meter area sample

AMI Functionality Specification – 4.3 Remote Connect/ Disconnect

Requirement – *The performance levels required for individual meters is:*

- Action performed at 90% of meters within 10 minutes.
- Action performed at 99% of meters within 1 hour.

- Action performed at 99.9% of meters within 6 hours.

The total number of connect/disconnect commands to individual meters in any 24-hour period can be up to 2% of the installed, operational AMI meter population

Status: 100% within 10 minutes

AMI Functionality Specification – 4.4 Remote Load Control

Requirement – *The actions covered in this category are specified in section 3.6 for Controlled Load Management and for Utility Control of Other Loads. For broadcast commands to any primary, secondary or tertiary group of meters the performance level required is:*

- Action performed at 90% of meters within 5 minutes.

For commands sent to individual meters, the performance level required is:

- Action performed at 90% of meters within 30 minutes.
- Action performed at 99% of meters within 1 hour.
- Action performed at 99.9% of meters within 6 hours.

The total number of load control commands to individual meters in any 24-hour period can be up to 2% of the installed, operational AMI meter population.

Status: due to nature of test a get status command was used which has a similar packet size, 100% completed within 5 minutes.

Note: Remote control trial conducted in Mallacoota on small population, but no further test carried out.

AMI Functionality Specification – 4.5 Meter Loss of Supply and Outage Detection

Requirement – *Alarms to be received within one hour for 90% of meters.*

Note: Typically, 20-30% is sufficient for the mesh to provide understanding of sustained outage, however this fails requirement using a mesh solution

AMI Functionality Specification – 4.6 Emergency Supply Capacity Limiting

Requirement – *The actions covered in this category are specified in section 3.9.2 for emergency supply capacity control. For commands to any primary, secondary or tertiary group of meters the performance level required is:*

- Action performed at 90% of meters within 10 minutes.
- Action performed at 99% of meters within 1 hour.

For commands sent to individual meters, the performance level required is:

- Action performed at 90% of meters within 30 minutes.
- Action performed at 99% of meters within 1 hour.
- Action performed at 99.9% of meters within 6 hours.

The total number of load control commands to individual meters in any 24-hour period can be up to 2% of the installed, operational AMI meter population.

Status: 12,700 random group load control attributes were pushed to 99.78% within 10 minutes and 99.92% within 60 minutes

Note: *AusNet does not currently use this functionality*

AMI Functionality Specification – 4.7 Remotely Altering Settings in Meters

Requirement – *The performance levels required for individual meters is:*

- Action performed at 90% of meters within 30 minutes.
- Action performed at 99% of meters within 1 hour.
- Action performed at 99.9% of meters within 6 hours.

The total number of commands to alter settings at individual meters in any 24-hour period can be up to 2% of the installed, operational AMI meter population.

Note: this capability isn't adopted by AusNet and changes are completed meter program change

AMI Functionality Specification – 4.8 Remotely Reading Settings and Status indicators from Meters

Requirement – *The performance levels required for reading all the settings of an individual meter is:*

- Action performed at 90% of meters within 30 minutes.
- Action performed at 99% of meters within 1 hour.
- Action performed at 99.9% of meters within 6 hours.

The total number of commands to read settings from individual meters in any 24-hour period can be up to 2% of the installed, operational AMI meter population.

AMI Functionality Specification – 4.9 Remotely Read Event Logs

Requirement – *The performance level required for reading the full event log that pertains to an individual meter is:*

- Action performed for 90% of meters within 30 minutes
- Action performed for 99% of meters within 1 hour; and
- Action performed for 99.9% of meters within 6 hours.

The total number of commands to read the full event log pertaining to individual meters in any 24-hour period can be up to 2% of the installed, operational AMI meter population.

To read the event logs pertaining to all meters:

The data pertaining to 99.5% of meters in 1 week; and

The data pertaining to 99.9% of meters in 2 weeks.

AMI Functionality Specification – 4.10 Home Area Network Instructions

Requirement – *The AMI system shall support up to 6 HAN instructions per day being sent to the ESP.*

- The performance level required for HAN instructions is:
- HAN instruction received by 98% of ESPs in 3 hours.
- HAN instruction received by 99.9% of ESPs in 12 hours

Note: due to AusNet having less than **100 HAN connected devices** the 4-hour read was used as an equivalent packet size.

6.2. Power Quality requirements

The AMI mesh network is currently configured to return power quality data form AusNet's revenue grade metering which is recorded in C12.19 tables. Data is returned either through a regular hour high frequency read, an on demand read or as an asynchronous event-based trap.

Note: It is worth noting these meters should be considered as provide power quality indicator information as they are not a high-end power quality meter.

Power Quality data is provided via a JMS in two forms:

- High Frequency Reads of Power quality data read hourly and placed on the JMS Que as High Frequency Read Results

- Voltage Threshold Events which are asynchronous events that are sent as alarms/traps when a threshold set point has been met and are publish on the JMS Que as Voltage Threshold Event.

High frequency read jobs return 5-minute meter samples every hour which include frequency, voltage, current and power factor. Metering is also setup with 1 minute power quality data that is only returned on an "on demand" basis. High frequency jobs are separated into single phase, single phase two element and 3 phase groups which are then staggered to improve read performance and not impact the primary meter read jobs or remote services.

Asynchronous events are return when an event has occurred. All meters are setup with brown out voltage profile deployed and when the threshold requirements are met is sent to the JMS que. A further population of meters has a4th profile which is typically classified as "golden meters". Like the brown out profile deployed to all meters the "golden meter" profiles have 9 voltage banding set points and similar when a conditional threshold set point is reach an alarm is triggered with the trap asynchronously sent to the back office.

Power Quality benefits

Power Quality data is used across AusNet's business, timely delivery of data can contribute to the following business goals across the following 4 areas:

Area	Benefit
Safety	• Early detection and accurate location of faults
	• Reduction in shocks to AusNet Services Customers
	• Reduction in fire starts caused by candling fuses and HV wires down
Business & Asset Performance	• Reliability Improvement - Early Warning of potential overloads through the Plant Utilisation Factor calculations and reporting
	• Reliability Improvement - Reduction in outage times through Fuse Candling
	• Quality of Supply - Improvement in quality of supply through voltage profiling
Financial	• Identification and reduction in theft of power (non-technical losses)
	• Savings on afterhours attendance to voltage complaints meters (Loss of Neutral)
	• More efficient and effective network planning (Plant Utilisation Factor)
	• Reduction in Fire Starts (Detection of Wires Down, Candling Fuses and Brown Outs)
Customer Service	• Improve customer service by reducing the time Brown Outs occur which can damage customer's equipment

6.3. Future Requirements

6.3.1. Metering

Our Metering Asset Management Plan includes strategy review both current and future metering solutions from different vendors. The following metering vendors have been engaged and have future offerings that the Metering team will review when metering samples are available

- L+G
- Secure
- EDMI
- Itron

Note: L+G's next release of metering will move away from typical ANSI C12.19 based metering to a DLMS/COSEM metering option. The c12.19 standard being an older standard it is expected that new meter variants will also opt for DLMS/COSEM metering, therefore the future version of UIQ must be at a level where meter plugins can be developed.

Note: We will continue to review these meter options and where possible present offerings to the business for future benefits that may become available such as harmonics and phase angle which would be an alternative to Power Factor data.

6.3.2. Meter Read and Power quality read performance

There are currently no define service levels or KPI's set for power quality data. The current default support level for the delivery of data is hourly PQ data that is in alignment with AusNet metering obligations and not necessarily to the AMI meter functionality performance specification. In this example if metering data is delivered at 99% within the hour, then the data delivery for power quality data would not exceed that requirement.

Note: There is further capability to optimising frequency sampling and how often the data can be returned, however there are no business requirements to drive the change. Prior to any change business requirements need to be clearly define on delivering revenue grade PQ meter data and what impact that would have on AMI data market obligations and functions.

7. Approach to Itron's AMI Performance Assessment recommendations

The following table shows Itron's AMI Performance Assessment recommendations and our indicative approach.

	ITRON'S FINDING	ITRON'S RECOMMENDATION	AUSNET APPROACH
ITR01	25 Micro APs with an average	Prioritise augmentation of Micro APs >50-1	Recommendation 7
ITR02	30 Micro APs with an average Round Trip Time > 40,000ms	Investigate Comms, Antenna status	Immediate action
ITR03	46 Access Points with an average dependent device count > 3000	Prioritise augmentation of Access Points >3000-1	Recommendation 7
ITR04	1 Access Point with an average Round Trip Time > 30,000ms	Investigate Comms, Antenna status	Immediate action
ITR05	Meters returning multiple Time Sync events	1. Meters consistently returning Time Sync events should be identified and replaced 2. Implement dynamic time-sync script	Our planned targeted meter replacement program
ITR06	Meters returning multiple Memory Error events	Meters consistently returning Memory Error events should be identified and replaced	Our planned targeted meter replacement program
ITR07	Meters with No Secondary Access Point	Deploy Secondary APs where no secondary counts are high	Recommendation 7
ITR08	Scheduled job contention	1. Assign business owners to scheduled jobs 2. Review scheduled jobs and remove any unnecessary jobs 3. Remove duplicate "AP and Relay NIC Event Log Read (copy)" 4. Offset Enable and Deploy SIQ Profile jobs as they execute at the same time 5. The 12pm Subscribed Meter Data should be rescheduled to a time where it does not intersect the NIC Event Log Read or New Data Read	Recommendation 6
ITR09	Job priority contention between NIC Event Log reads and HF Reads	1. Set the "Aggressive Read Schedule" priority to high 2. Set all SIQ "Read_Dyn*" Job Priorities to low 3. Set all NIC Event Log Reads to lows	Recommendation 6
ITR10	Large volume of "No New Data is Available" result status messages for the NIC Event Log reads	Remove the duplicate NIC Event reads & consider reducing the schedule frequency pending business requirements	Recommendation 6
ITR11	3x Access Points with low device counts and high failure rates	Further investigation required for AP2821950252, AP2821950231 & AP2821950384	Recommendation 6
ITR12	Network Center Ping Job targets "Dummy NICs"	Remove dummy NICs from Ping job or suspend job	Immediate action
ITR13	Network Center SNMP Metrics job - 100% failure rate	Suspend or reconfigure SNMP metrics job	Recommendation 6
ITR14	FWU Job executed during New Data Read	Revise operational procedures to ensure mesh intensive jobs are executed during times of low mesh activity (i.e. outside of NDR)	Recommendation 6

ITR15	Outage Performance is low	1. Mesh Augmentation 2. AP & Relay Battery Installations/Battery Test enablement 3. Meter replacements with SuperCap ready meters 4. Implement GridAware in areas with limited backbone devices or no direct path to a SuperCap meter	Recommendations 3 & 7
ITR16	KeyKeep certificates expire Sat Nov 30 2024	Renew KeyKeeps ASAP	Complete
ITR17	Oracle version is outdated, EOL April 30 2026	Patch to 19c + JAN 2024 CPU Patch	Recommendation 4
ITR18	RHEL is EOL with no further support	Upgrade to RHEL 8.8 as outlined in the Itron GenX Compatibility Requirements Matrix, AusNet to implement regular OS patching	Recommendation 4
ITR19	Tunnel Router Cisco EOL/EOS December 2020	Tunnel Router upgrade to C8000V	Recommendation 4
ITR20	Tunnel Router IOS is out of support	Tunnel Router IOS upgrade	Recommendation 4
ITR21	CryptoMap is no longer supported by CISCO	CryptoMap to DVTI conversion	Recommendation 4
ITR22	DPD is disabled on the tunnel router	Enable DPD	Recommendation 4
ITR23	SXi refresh - CPU was released 2014, end of service updates in 2021	ESXi Infrastructure refresh	Recommendation 4
ITR24	714,000 meters still running NIC firmware 3.12.x	NIC Firmware 3.12 is nearing EOL – upgrade NIC firmware	Recommendation 2
ITR25	UtilityIQ Database sizing to accommodate 6-year growth projection	Database storage to accommodate 14TB database size by 2031	Recommendation 4
ITR26	SIQ JMS Messages will expire in 30-minutes in the event of a consumer outage	Set SENSORIQ_JMS_MESSAGE_TIME_TO_LIVE =0, Tibco sizing needs to cater for minimum 8-hour consumer outage	Recommendation 4
ITR27	Current Tibco sizing will not support 15-minute HF reads on the entire meter population	Evaluate expected Tibco throughput and outage requirements	Recommendation 6
ITR28	A Single Tibco instance supporting both UtilityIQ and SensorIQ is exposed to risk of performance issues impacting both applications	Implement secondary Tibco for SensorIQ – this protects the UtilityIQ billing data exports in the event of a SensorIQ consumer outage causing a large backlog of JMS messages	Recommendation 4
ITR29	No redundancy for SensorIQ	Implement Secondary SensorIQ Node	Recommendation 5
ITR30	Gateway settings require tuning	Disable PIF limiter as per engineering guidelines, increase packets per second initial from 5 to 7, assess impact	Recommendation 4
ITR31	Increase Outage Accuracy	Implement ODS	ADMS phase 3 project
ITR32	Increase Mesh performance & redundancy, maintain high success rate for billing data, increase SIQ Read Rates	Reduce Meter/AP Ratios inline with NetLabs recommendations	Recommendation 7
ITR33	Certificate Management (currently KeyKeep)	Implement HSMs to manage certificates, implement	For consideration
ITR34	Utility IQ 5.0 out of support from January 31, 2025	Upgrade to UIQ 6.x and SIQ 4.x	Recommendation 5

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