Jemena Gas Networks (NSW) Ltd

Investment Brief
MDL Backend System

Jemena
bringing energy to life

Glossary

2020-25 regulatory period	The period covering 1 July 2020 to 30 June 2025
Current regulatory period	The period covering 1 July 2015 to 30 June 2020
I&C	Industrial and commercial
ICT	Information and Communications Technology
IoT	Internet of Things
JGN	Jemena Gas Networks (NSW) Ltd
LPWAN	Low Power Wide Area Network
MDHR	Medium density and high rise developments
MDL	Meter Data Logger
NGR	National Gas Rules
PSTN	Public Switched Telephone Network
RMP	Retail Market Procedures
RSA	Reference Service Agreement
RYxx	Regulatory year covering the 12 months to 30 June of year 20xx. For example, RY20 covers 1 July 2019 to 30 June 2020.
SaaS	Software as a Service

1. MDL Backend System

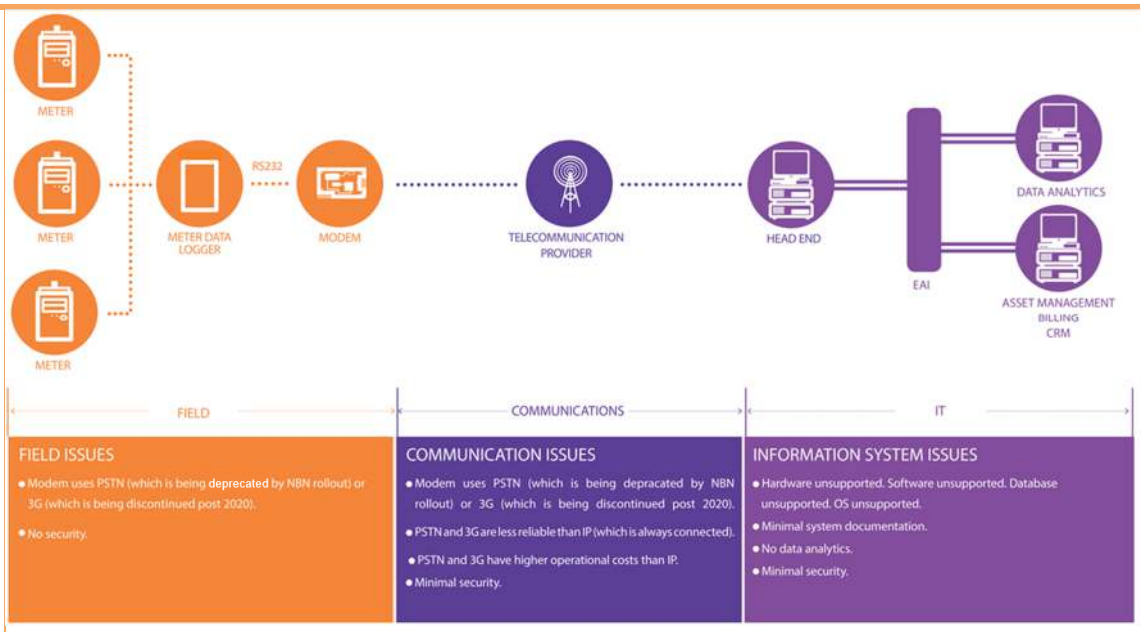
Issue	Jemena Gas Networks (NSW) Ltd (**JGN**) uses the Meter Data Logger (**MDL**) meter system installed in medium density and high rise developments (**MDHR**) to record gas and hot water consumption of customers in individual apartments. These customers represent approximately 16% of total customers on the JGN network. However, JGN is unable to obtain approximately 8.5% of actual meter reads for the approximately 225,000 customers read using the MDL system. This is predominantly due to the current limitations of the existing MDL systems and applications which are outdated and unsupported.
Objective	The objective of this investment brief is to efficiently maintain backend software systems related to the MDL system for high rise metering in order to maintain current service levels provided to customers and meet JGN's regulatory obligations.
Background	JGN has regulatory obligations to provide meter readings for market settlement and customer billing, which consist of the following customer segments: • industrial and commercial (I&C) • medium-density/-high rise (MDHR) residential • mass market (new and existing residential homes or residential non-MDHR). JGN meets its regulatory obligations for the above customer segments using independent metering solutions and different equipment types, communications systems, back end systems and vendors. JGN's systems to provide the meter readings are aged and in need of update. JGN's current meter reading and data transfer technologies are dependent on legacy applications and infrastructures, and coupled with technological obsolesce, they expose JGN to security vulnerabilities and increased risks to operational reliability and uptime. Legacy meter arrangements will also be affected by the progressive decommissioning of the communication infrastructure used to poll the meters (e.g. 3G, CSD, PSTN). Continued reliance on existing systems will increase the risk that JGN will not be able to maintain the current integrity of its metering services over the 2020-25 regulatory period. For example, failure to maintain the accuracy of meters to the required standards increases the likelihood of customers being charged the estimated amount for gas usage, which is one of the greatest causes of customer concern. For MDHR customers, JGN has been using the MDL system supplied by vendor ([redacted] for over 20 years to measure gas usage by high rise residential customers. [redacted] also provides JGN with a back-end system for managing the communications between JGN's corporate systems and the MDLs. Originally installed in 1997, all aspects of the system (other than the meters) are considered obsolete and prolonged outages have had material reputational impacts. The following core issues needs to be addressed: [redacted] **Commercial** • The vendor has modified its MDLs multiple times over the current regulatory period, with newer components not being backwards compatible for use as spare parts for the oldest units

	• The supplier will not provide like-for-like parts for these MDLs after 2020, which will prevent repairs and require full replacements when these MDLs fail. **Telecommunication** • The modems on the MDLs are either public switched telephone network (analogue) modems or 3G modems. The Public Switched Telephone Network (**PSTN**) is being progressively deprecated with the NBN rollout and Telstra (and other carriers) flagging that 3G will be discontinued post 2024. The existing communications infrastructure will therefore need to be replaced • The use of analogue communications results in a communication expenditure that is almost an order of magnitude greater than that which can be achieved using digital communications • The MDL communication infrastructure used to poll the meters is being progressively deprecated (approximately 2,800 MDLs supplied by [redacted] that are obsolete).  Due to above challenges, where a meter read is not able to be collected remotely the customer's consumption is estimated (the NSW Retail Market Procedures (**RMP**) set out parameters for estimation). Estimated energy bills are a major pain point for JGN customers and leads to poor reputation outcomes for JGN and Jemena (see below). It is frustrating for customers and can lead to bill shock when an actual read is obtained and is higher than the read that was previously estimated.
Regulatory compliance	JGN is obliged to read the gas meter at customers' premises or, where it is unable to do so, to estimate the meter reading (RMP (Chapter 3) and Reference Service Agreement (**RSA**, clause 17.1). Use of actual meter readings, rather than an estimate, improves the accuracy of billing. JGN must test the accuracy of its gas meters and replace them when they become inaccurate to comply with Schedule 4 of the Gas and Electricity (Consumer Safety) Regulation 2018.

[1] JGN has different suppliers and/or metering arrangements for industrial and commercial customers and mass-market (small business and residential non medium density/high rise) customers.

Customer Importance	The MDL system is used to produce accurate billing for gas usage by customers. This is a critical requirement for managing the gas network. Customers expect accurate billing. JGN has observed lower levels of satisfaction and customer complaints when accurate metering tasks cannot be conducted, and bills are instead estimated. JGN has received feedback[2] from customers during customer engagement exercises supporting this observation. JGN is unable to obtain approximately 8.5% of actual meter reads across 4,300 MDL sites. This is predominantly due to the current limitations of the existing MDL systems and applications which are outdated and unsupported. If JGN's MDL system does not provide an actual meter read it can lead to incorrect billing, customer confusion and frustration. [redacted]
Strategic Approach	Meter reading is an integral service to the operation of JGN's network. It is also the main touchpoint that JGN has with its customers, who otherwise deal only with JGN through a retailer. JGN has a strategic objective to maintain existing meter reading service levels and avoid deterioration of these services, such as falling back to estimated meter reads due to a failure of a legacy and unsupported software system. This is also consistent with feedback from customers that they value and expect accurate meter reading and billing.
Current IT systems	The MDL system is comprised of a number of components including: • 225,000 water meters and 181,000 gas meters, which are connected into 16,000 MDL panels across 4,300 sites which convert meter pulses into aggregated consumption • The MDL head end periodically polls (over PSTN and 3G modems) the MDLs to retrieve the [redacted] • The MDL head end performs interrogation of the meters for scheduled and special on-demand reads, tracks the MDL assets, and performs quality assurance on the received reads. The issues with the various components are outlined in figure below, but include: • The infrequent polling results in a situation where the health of the meters and the MDLs are undetermined until the data is required. • There are no formal support arrangements with the original vendors for any of the components. Rectification of issues with any of these components are on a best effort basis. • Most process steps involve manual intervention, introducing inefficiencies in the process and increasing the risk of human error.

[2] JGN Benchmarking September 2017



Options

JGN has considered two options to efficiently maintain the ICT back-end for MDLs used for high rise residential metering. These options are (1) to retain the currently installed system and manage the risks associated with this system until the 2025-30 regulatory period, at which time the system would be replaced and (2) to replace the system during the 2020-25 regulatory period after conducting a market search for an appropriate solution (including internal software development).

Option 1: Retain currently installed system

Description

This option retains the existing MDL backend software over the 2020-25 regulatory period. To ensure this can be done, JGN will need to negotiate a five-year extension to the arrangement with the current vendor. However, as the vendor no longer develops or supports the software, there is a risk that an extension will not be approved or be prohibitively costly. In this case, JGN will be required to find and implement an alternative solution and may have to fall back to the estimated meter reads for a period of time; this will cause JGN to fail to meet its meter reading obligations in accordance with section 3.5 of the RMP.

JGN has assessed whether it can defer replacement of the obsolete MDLs during the 2025-30 regulatory period. However, these MDLs are already obsolete, are no longer supported, and like-for-like spare parts cannot be obtained after 2020. JGN could attempt to maintain the existing fleet of obsolete MDLs through the 2020-25 regulatory period, but the risks and uncertainty of this approach through to the 2025-30 regulatory period are substantial as if anything goes wrong JGN will not have a backup plan.

Under Option 1, the MDL back-end replacement will be undertaken at the start of the 2025-30 period to ensure that a system compatible with modern MDLs is in place before the current devices being replaced.

Direct Unescalated Costs (mid-year 2018)

$2018	RY21	RY22	RY23	RY24	RY25	RY26	RY27	RY28	RY29	RY30
Non-recurrent										
MDL backend replacement						1,105,104	1,105,104			
Recurrent										
MDL Lifecycle			400,752							

Under this option, JGN will necessarily incur costs for lifecycle management of the back-end system during the 2020-25 regulatory period. As the software is no longer supported by the vendor, JGN's options to maintain it will be extremely limited.

JGN will incur costs to replace the MDL back end during the 2025-30 regulatory period. This cost will not be avoidable as JGN will no longer be able to maintain the existing obsolete MDLs (spare parts for at least 2,800 MDL's will not be available after 2020) and will require back-end systems capable of communicating with another vendor's equipment.

The replacement costs were estimated using JGN's standardised IT Project Estimation Tool as described in the Technology Plan under the section on Forecasting Method. The forecast is based on the complexity of the system, the testing required and the likelihood of the requirement for a bespoke application build when coming to replace the system. Based on experience with the size and complexity of the current system, JGN assesses that this is a very large project that will take up to 2 years to implement and is of significant complexity.

Risks

Quantifiable

$2018	RY21	RY22	RY23	RY24	RY25	RY26	RY27	RY28	RY29	RY30
Manual meter reading risk				35,600	70,488	104,678				

There is a reasonable likelihood that the software will become unusable in the latter part of the 2020-25 regulatory period as a result of delaying the replacement. Assuming this occurs, JGN will need to undertake manual meter reading until a replacement system is implemented. Based on current meter reading contract costs, if the MDL back-end was not available and manual meter reading required, JGN would incur additional opex of $1.8m per annum (that is, based on 500,000 meters requiring manual meter reads costing $0.89 each, four times per annum). However, manual meter reading carries a high risk of failing in obtaining actual reads for these sites. This is because these meters are housed inside individual apartments and access would be limited which would result in estimated reads and increased customer dissatisfaction. Manual meter reading would need to continue until 2027 assuming development of a replacement does not begin until 2025 and takes two years (as per the Option 2 schedule). JGN has assumed a 2% per annum probability of the software becoming unusable (one in 50 year likelihood).

The modems on the MDLs are either PSTN modems or 3G digital modems. The PSTN is being progressively deprecated with the NBN rollout and Telstra (and other carriers) have flagged that 3G will be discontinued post 2024; that is, JGN has no option but to replace the existing communication infrastructure to the meters. This change in metering comms puts pressure on the existing system and there are no guarantees that it will be able to accommodate the changeover.

Qualitative

There are no formal support arrangements with the original vendors for any of the components. Rectification of issues with any of these components are on a best effort basis.

[redacted]

Because the software is no longer supported by the vendor and cannot be updated, continuing to use this system is also not prudent from a cybersecurity perspective. Operators of critical infrastructure[3] should ensure that computer systems are supported and patched. JGN is adopting the Australian Signals Directorate's (ASD) *Essential 8* recommendations in addition to elements of the cybersecurity standards developed by the US National Institute of Standards and Technology (NIST) Cybersecurity Framework (CSF). These standards require software systems to be running on vendor supported versions.

[3] Security of Critical Infrastructure Act 2018 https://www.legislation.gov.au/Details/C2018A00029

Continued use of the current system therefore poses a higher cybersecurity risk. The direct impact of an incident would be inaccurate or estimated customer bills and a decrease in customer satisfaction. Furthermore, vulnerable software, such as the [redacted] system, can be used by attackers to gain access to other systems that are critical to the operation of the business and could have a catastrophic impact on JGN's ability to operate the gas network.

[redacted] This will accelerate additional issues should a failure of the hardware or software occur, as parts would not be available for the existing MDLs and the back-end would not be capable of communicating with another vendor's MDLs. This may prevent JGN from purchasing replacement MDLs from an alternate provider in the case of equipment failure due to the inability to modify the back-end to communicate with another vendor's equipment. It would require a whole new meter reading system to be implemented to match the new vendor's protocols and then be interfaced into the billing process.

Benefits

There are no additional benefits associated with this option as it is about maintaining existing services.

NPV Analysis

This option has an NPV of $-2,247,301.

See attachment "JGN-IR029 Attachment 7 (Q20)-ICT-NPV-MDL Backend" – NPV Calc|Option 1.

Summary

Option 1 aims to maintain the existing systems at low cost but it comes with unacceptable business risk including uncertainty as to the sustainability of the vendor and concerns about the risks that JGN and its customers will be exposed to from reliance on unsupported software that cannot be updated.

Option 2: Replacement of the MDL backend

Description

This option replaces the back-end product for JGN's MDLs and implements the most appropriate solution available in the market and includes developing the software in-house. This option implements an established architecture for meter reading in 2019 based on developments in communication technologies and open standards. See the Appendix for JGN's approach to future metering system upgrades.

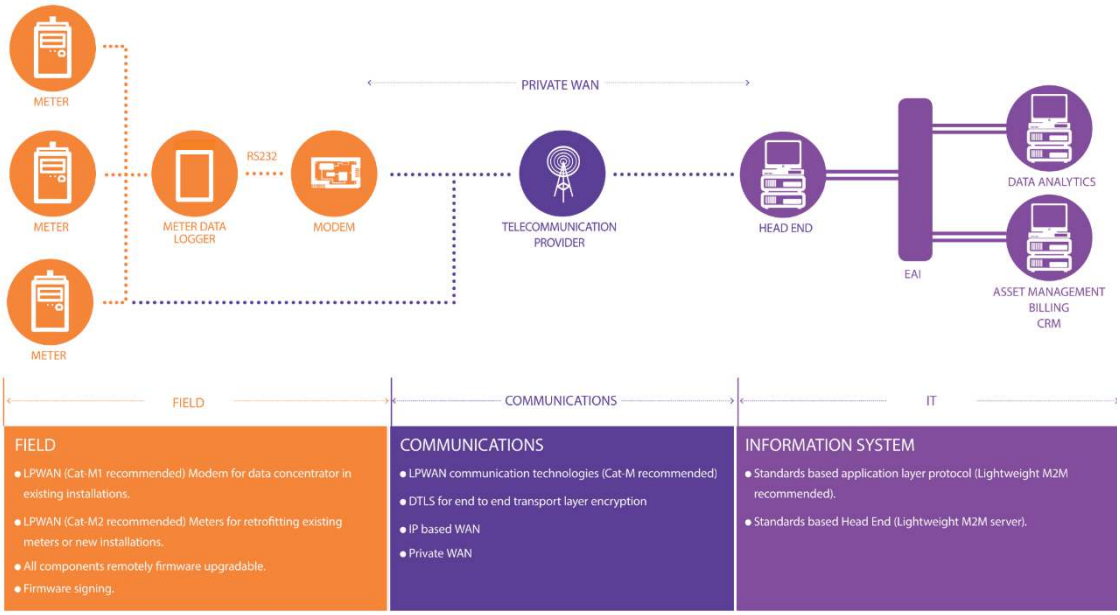
As there is a reasonable expectation that vendor will continue to trade for a few years, JGN will stockpile MDLs to meet demand for a few years as part of a least risk transition strategy. This would allow time to replace the back-end before shifting to an alternative MDL vendor to meet ongoing requirements of approximately 200 MDLs per annum plus replacements of existing MDLs as is necessary.

At the centre of the architecture is the introduction of widely accepted Low Power Wide Area Network (**LPWAN**) communication technologies developed for IoT applications (such as meter reading). LPWAN technologies include Cat M1, LoRa and sigfox.

This option replaces the existing modems (PSTN and 3G) with a NBIoT LPWAN communications modem, with data transfer over an IP based private WAN. JGN expects that the costs of the digital communications of this option will be at similar levels to the current option 1 analogue costs.

The head end software would also be replaced based on open standards introduced for communicating with IoT devices. Options here are numerous ranging from hosted (such as Eclipse Leshan) to Platform as a Service (PaaS) offerings such as Microsoft Azure IoT Suite to Software as a Service (**SaaS**).

The proposed architecture is depicted in figure below.



This option reduces operation and vendor risk, provides the additional flexibility associated with a modern software back-end and longer-term cost benefits gained from a competitive selection of devices and software. The option will also ensure that the software is supported and updated to meet strategic objectives concerning cybersecurity.

Costs

$2018	RY21	RY22	RY23	RY24	RY25	RY26	RY27	RY28	RY29	RY30
Non-recurrent										
MDL backend replacement		1,105,104	1,105,104							
Recurrent										
New System Lifecycle							400,752			

The cost of this option (Project ID ITGG19) is $2.2m and is to be spread over two years with the project completed during RY23. This estimate is calculated using JGN's standardised IT Project Estimation Tool as described in the Technology Plan under the section on Forecasting Method and reflects the cost incurred for previous projects of similar complexity. Based on experience with the size and complexity of the current system, JGN assesses that this is a very large project that will take up to 2 years to implement and is of significant complexity.

Recurrent lifecycle costs for this software are expected to be in line with costs for maintaining the currently installed software but will not be incurred until the 2025-30 regulatory period.

Risks

There are no material risks for this option, although a brief Proof of Concept would be recommended prior to pursuing this option.

Conforming capital expenditure

Rule 79(1)(a) of the National Gas Rules (**NGR**) states:

The capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

Undertaking this project, the proposed capital expenditure is consistent with the NGR rule 79 as it is:

1. Prudent – The expenditure is necessary to maintain flow of metering data through the billing process and to the market.
2. Efficient – The option selected is the most cost-effective long-term option that meets the necessary operational requirements in order to maintain compliance with legislative, regulatory market obligations and Australian Standards.
3. Consistent with accepted and good industry practice – Addressing the risks associated with continued provision of metering data to the market and maintaining positive customer satisfaction survey (CSAT) for customers and retailers is good industry practice. In addition, the reduction of risk as low as reasonably practicable in a manner that balances cost with risk is consistent with Jemena's Risk Management Manual and AS2885.

The project is also consistent with NGR rule 79(2)(c), because it is necessary to:

1. Maintain the integrity of service (79(2)(c)(ii)) – A failure of the MDL meter reading system effectively means that JGN is unable to obtain actual meter reads for some customers, which results in meter reads being estimated.
2. Comply with a regulatory obligation (79(2)(c)(iii)) – Chapter 3 of the RMP has general obligations in relation to reading meters, including timing for both reading meters and publishing data to the market, and section 4.4 contains provisions in relation to the replacement of aged meters. In addition, clause 17.1 of the RSA requires JGN to read or estimate the meter reading. Under both the RMP and the RSA, users are entitled to request special meter readings for a particular day. This project will facilitate accurate and efficient meter reading for all customers, consistent with these regulatory obligations.

Benefits

Quantifiable

There are no direct, quantifiable benefits for this option.

Qualitative

This option will remove Cyber Security risks associated with the existing MDL back-end, which is no longer supported by the vendor and cannot be patched for security risks. Operators of critical infrastructure should always ensure that computer systems are supported and patched[4]. This is the only option that will meet these requirements.

This option would also allow JGN to update its modem and MDL technology to a system with additional functionality. This includes the capability for alerts to be sent for power failure or breakdown of MDLs and to use devices that send index readings rather than pulses, which will improve the accuracy of meter readings and reduce the need for field staff attending customer premises to realign MDLs following a power failure. Pulse based MDLs require a field services visit to the customer premises to realign readings in the MDL after a power failure. In some cases, this requires access to all units in a building. The net benefits of these additional investments are not yet known by JGN and will be determined following a market review of available products.

NPV Analysis

The NPV of this option is $-2,231,415.

See attachment "JGN-IR029 Attachment 7 (Q20)-ICT-NPV-MDL Backend" – NPV Calc|Option 2.

[4] Australian Signals Directorate's (ASD) *Essential 8* recommendations

	Summary Option 2 is expected to establish a more sustainable software environment that will enable JGN to continue to provide existing services. The replacement back-end and retrofit communications will be fully supported by the vendor, updateable and allow JGN's systems to communicate with MDLs supplied by other vendors.
Guiding Principles	JGN has considered the following guiding principles to objectively compare the various options: <u>Field principles</u> • Architecture should be able to leverage existing MDL (for retrofit installations). This will materially reduce the cost of any solution. • Architecture must also offer a solution that does not use MDL (for future installations). • Capital costs must support business strategy. • Must be secure (i.e. use basic security principles of encryption, authentication, integrity and non-repudiation). <u>Communications principles</u> • Communications technology must be supported for the life of the asset (i.e. 10+ years). • Communications should be IP based (increased reliability through proactive monitoring). • Operational cost must support business strategy. • Must be secure (i.e. use basic security principles of encryption, authentication, integrity and non-repudiation). <u>Information System Principles</u> • Head end must support automation and exception management. • SAP is the authoritative source (that is it holds the master data) for Asset Management. • Application layer must be standards based. • Must support monitoring and analytics. • Must be secure (i.e. use basic security principles of encryption, authentication and authorisation).

Options Summary

The table below summarises the quantitative and qualitative differences between the analysed options.

	NPV $2018	Qualitative Risks	Qualitative Benefits
Option 1	-2,247,301	Unacceptable	None
Option 2	-2,231,415	Low	Medium

Assessment against the principles is as follows:

Option	Field Principles	Communication Principles	Information Principles
Retain Currently Installed System	✗	✗	✗
Replace MDL communications & backend	✓	✓	✓

JGN selects its appropriate preferred option by considering the direct differences between the options as expressed in the NPV analysis and indirect or qualitative differences in risks and benefits.

What We Are Recommending

Option 2 is the preferred option. [redacted] It avoids the risk of the MDL back-end failing, which would require JGN to increase the number of manual meter reads and potentially precipitate a mass replacement of meters.

Furthermore, as Telcos decommission 3G coverage by 2024, JGN will be prepared for the future mobile network options.

Relationship to ICT Capital Forecast

The preferred option for this business case is contained in the ICT investment plan as a non-recurrent project under Project ID ITGG19.

Appendix: JGN's approach to future metering system upgrades

Consistent with good industry practice, in upgrading its metering systems JGN plans to prudently take an integrated metering systems view supported by industry accepted architectural principles. As IoT (Internet of Things) offerings continues to be increasingly widespread, the need for connectivity solutions grows to ensure that the metering devices are working correctly, accurately capturing and analysing data, as well as securely managing data. Adapting IoT as part of JGN's future meter reading and transfer solution will maintain JGN's service level agreements and uphold its regulatory obligations while providing ease to maintenance and future upgrades and monitoring capabilities to address security vulnerabilities.

JGN will intrinsically apply similar design and implementations principles in the next wake of solutions upgrades, installations and remediations across its metering systems (I&C (Metretek), residential and medium-density/high rise residential (MDL)). This means that JGN's proposed metering solution will entail the following principles:

1. A focus on vendor-agnostic solutions rather than single vendor end-to-end solution for long-term contracts
2. Interoperable tele-communication and open source standards (maximises adaptability and enables seamless integration with existing end to end metering topologies)
3. Flexible deployment options - on-premise or cloud-based
4. Importance of the partner ecosystem (a group of solution aggregator and partners that have the resources, expertise, and service offerings needed to deliver holistic, end-to-end solutions).

The above principles are also founded on customer behaviour, which is central to the technology design and implementation.

With a fully integrated platform for data collection and management, and ability to remote meter monitor, JGN can improve the output from metering assets, avoid unplanned downtime, implement preventive maintenance, and better equipped for future upgrades and address security threats.