Jemena Electricity Networks (Vic) Ltd

Future Networks Investment Brief – Data Visibility and Analytics

Non-recurrent

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Glossary

AER	Australian Energy Regulator
AMI	Advanced metering infrastructure
Capex	Capital Expenditure
CER	Customer Energy Resources
Current regulatory period	The period covering 1 July 2021 to 30 June 2026
DEECA	Department of Energy, Environment and Climate Action
DER	Distributed Energy Resources
DERMS	DER Management System
DPV	distributed solar photovoltaic
DVA	Data Visibility and Analytics
DVM	Dynamic Voltage Management
EV	Electric Vehicle
FNS	Future Network Strategy
GIS	Geospatial Information Systems
ICT	Information and Communications Technology
Jemena	Refers to the parent company of Jemena Electricity Network
JEN	Jemena Electricity Network
LV	Low Voltage
Next regulatory period	The period covering 1 July 2026 to 30 June 2031
NPV	Net Present Value
opex	Operating Expenditure
RYxx	Regulatory year covering the 12 months to 30 June of year 20xx for years in the Next Regulatory Period. For example, RY25 covers 1 July 2024 to 30 June 2025
SME	Subject matter experts
SNAP	Strategic Network Analytics Platform
totex	Total Expenditure
VRR	Voltage Regulating Relay

Data Visibility and Analytics

Description and objectives of the program	This Data Visibility and Analytics (DVA) program forms part of Jemena Electricity Network's (JEN) Future Network Strategy (FNS). It supports JEN's strategic objective of connecting its customers to a renewable energy future, by facilitating the integration of Distributed Energy Resources (DER) into the electricity distribution network and facilitating the electrification of the economy. The DVA program has three key components: • Implementing a Strategic Network Analytics Platform (SNAP) to replace the current digital analytics solution which is reaching end-of life. SNAP is an optimal solution because it will also support our other Future Network initiatives. • Enhancing the smart metering infrastructure to deliver near real-time (5 minutes) smart meter power quality data to enable further operational and safety improvements such as near real-time power quality investigations and predictive fault detection. • Implementing a program of network analytics application to improve operational efficiency and effectiveness, improve safety, and respond to emerging customer and regulatory needs over the next 10 years and beyond. The objectives of this program are to: • increase JEN's ability to use network data and analytics to drive operational and planning improvements • position JEN to manage the energy transition and uncertainties ahead by having a flexible and adaptable data and analytics capability • build foundation data and analytics capabilities once and then use it to support future network analytics initiatives and avoiding duplication of capabilities.		
Non-recurrent ICT sub-categorisation	☒ Maintaining existing services, functionalities, capability, and/or market benefits	☒ Complying with new/altered regulatory obligations/requirements	☒ New or expanded ICT capability, functions, and services
Background and key drivers	JEN is faced with operating in a rapidly changing energy landscape. Disruptive impacts on distribution networks are triggered by the way electricity networks are used by customers and transition to distributed renewable energy resources, as we know it today. **Growth in CER** Customer Energy Resources (CERs) are continuing to increase in numbers and will ultimately become a crucial resource in future to support, manage and utilise within the distribution network. Already JEN has seen strong growth in network-connected, passive distributed solar photovoltaic (DPV) system installations by its customers, and this is likely to continue well into the future. Other emerging, potentially more active CER technology (including customer and community storage, and electric-vehicles), present further challenges and opportunities for network integration of CER and the accelerating pace of electrification. **Existing solutions reaching end-of-life** Jemena has currently developed a number of network analytics applications on a digital prototyping (single on-premises) platform. Although these applications (such as broken supply neutral detection and voltage compliance reporting) have delivered operational		

	benefits, the existing prototyping platform is not of commercial grade, is not supported by Jemena Digital, and is reaching end-of-life. Jemena currently has a backlog of prioritised analytics applications for development. **Regulatory Compliance** Jemena also needs the ability to adapt to emerging customer and regulatory needs. For example, providing data and analytics products to 3rd parties as explored through the Australian Energy Regulator (AER)/Department of Energy, Environment and Climate Action (DEECA) Victorian Network Visibility data trials[1] in Victoria. Further network analytics capabilities are also required to help us maintain compliance with Energy Safe Victoria Act, Essential Services Commission, and the Electricity Distribution Code of Practice. **Potential for cost efficiencies, operational, and customer safety improvements** SNAP is a data and analytics enabler, that is more cost-effective and efficient if built once for use by multiple Future Network initiatives rather than building on a project-by-project basis, therefore driving cost efficiencies. Additionally, using analytics to automatically detect power quality issues, avoid on-site visits, and for future network planning will make the network safer and improve long-term operations.
Customer Importance	**Our customers' expectations** Our customers want electricity prices to be affordable. Many of our customers recommended that we digitise and automate the network to make it smarter, efficient, more responsive and ready for future energy-related issues. Our customers also expect us to operate sustainably and to support decarbonisation and renewable energy transition.[2] Here are some examples of recommendations that we have received during our customer engagement from 2023 to mid-2024: • The Mental health customer voice group wants us to invest in the network to adopt new technologies by digitising and automating the network to be prepared for future energy-related issues. It is important to customers that we stay at the forefront of technology and maximise the benefits of a smarter network. • The Young people customer voice group wants us to ensure the electricity network is able to handle the shift to 'green' energy and we can help incentivise and drive EV, solar and battery use by customers. • Our large commercial and industrial customers and retailers want us to provide more information in real time or in advance where possible, to help them make informed decisions on services, operations or production supply, and the deployment of resources. • Our small and medium customers expressed strong interest in transitioning to renewable energy sources and the role JEN could play in empowering businesses to achieve their sustainability and energy goals. In response to our Draft Plan released in August 2024, customer respondents reiterated their concerns about affordable prices.[3] They also ranked high the following JEN initiatives in terms of preparing the electricity network for the future: • Upgraded systems to keep customers better informed with near real-time information at times they need it the most (2nd ranked)

[1] https://www.aer.gov.au/industry/registers/resources/reviews/network-visibility
[2] JEN, 2026-31 Draft Plan, August 2024, chapter 2.
[3] JEN, Feedback on 2026-31 Draft proposal, September 2024.

	• New digital technologies to improve electricity system management and enable new sustainable products and services (3rd ranked). Many of the respondents also support our future network strategy. **How we've addresses our customers' expectations** The DVA Program's SNAP component is an enabler to our other future network initiatives such as the Volt-Var Control and Distributed Energy Resources Management System and Dynamic Operating Envelopes.[4] These are initiatives that facilitate the integration of more CER into our network in the future without compromising the safety and security of our network. The second component which will enhance the smart metering infrastructure to deliver near real-time (5 minutes) smart meter power quality data will enable further operational and safety improvements such as near real-time power quality investigations and predictive fault detection. This means we can provide our customers with near-real time information when they needed it. The third component which is network analytics applications will improve operational efficiency and effectiveness, improve safety, and respond to emerging customer and regulatory needs over the next 10 years and beyond. Our preferred approach is prudent and efficient. It is the least cost among the options considered and generates the highest net present value for our customers. Doing nothing or delaying the implementation of the DVA will not address our customers' expectations. See details below. On balance, we consider that our proposed DVA has addressed our customers' priority expectations discussed above.
Key Considerations	In exploring options to address the above, JEN has aimed to develop a solution that could: • Deliver operational (e.g. detect network faults and wrong GIS (Geospatial Information Systems) records and safety (e.g. detect broken supply neutral conductors) improvements • Facilitate compliance with current and evolving regulatory requirements (e.g. voltage compliance reporting, and data visibility sharing with 3rd parties) • Enable JEN to adapt to DER growth with data-driven tools (e.g. DER growth hosting capacity forecast tool) and solutions (e.g. Dynamic Voltage Management (DVM), and DER Management System (DERMS)) • Increase JEN's ability to use network data & analytics to drive operational and planning improvements • Position JEN to manage the energy transition and uncertainties ahead by having a flexible and adaptable data & analytics capability • Build foundation data & analytics capabilities once and then use it to support future network analytics initiatives and avoid duplication of capabilities.

[4] For details see our Investment Brief and Program document for Voltage and PQ Management and Grid Stability and Flexible Services.

Options

JEN has considered three alternatives to deliver the capability articulated above:

(1) Do nothing
(2) Project-by-project Data Analytics
(3) SNAP, Near Real-Time Smart Meter Data, & Network Analytics Program (preferred)

Option 1: Do nothing

Description

Jemena to not invest further in a network analytics platform and applications. The existing prototype analytics platform to be decommissioned at end of life (December 2024).

Benefits

- There are no benefits under this option

Risks

- The current JEN analytics prototype platform is reaching end-of-life, therefore under this do-nothing option:
    - JEN will need to re-instate the on-site 1 in 10-year Neutral Supply Test for each customer, at a cost of ~$3M p.a.
    - There will be an ongoing cost of ~$0.75M p.a. for remote power quality investigations and avoided on-site power quality investigations
    - There will be a loss of ~$1.2M of recovered revenue from the lack of meter tampering detection
- Without SNAP, each Future Network initiative will have to implement data and analytics in a project-by-project basis resulting in cost and time inefficiencies
- There is a high risk that JEN will not be able to meet emerging regulatory compliance requirements in a timely and cost-effective way without near real-time smart meter power quality data and network analytics application.

Direct Escalated Costs

JEN's costs for this option is outlined in the table below.

$2024M		RY27	RY28	RY29	RY30	RY31
Capex	Digital	$2.4	$2.4	-	$1.0	$1.0
	Asset					
Opex	Digital Non-recurrent					
	Digital Recurrent Step	-	$1.2	$1.2	$1.1	$1.5
	Asset Recurrent Step	$5.0	$5.0	$5.0	$5.0	$5.0
Total		**$7.4**	**$8.6**	**$6.2**	**$7.1**	**$7.5**

Option 2: Project-by-project Data Analytics

Description

JEN to justify and implement data and analytics requirements on a project-by-project basis.

Direct Escalated Costs

JEN's costs for this option is outlined in the table below.

$2024M		RY27	RY28	RY29	RY30	RY31
Capex	Digital	$4.6	$4.6	$2.2	$3.1	$3.1
	Asset	$2.4	$2.4	-	-	-
Opex	Digital Non-recurrent					
	Digital Recurrent Step	$0.5	$1.7	$1.7	$1.7	$2.1
	Asset Recurrent Step	-	-	-	-	-
Total		**$7.4**	**$8.6**	**$3.7**	**$4.7**	**$5.1**

Benefits

- Operational improvements: such as replacing on-site power quality investigations with remote power quality visualisation tools, meter tempering detection, network planning tools. The data also enables early detection of network issues (such as impending transformer overloads) and helps to prioritise remediation works or asset replacements. It could delay or bring forward remediation works.
- Regulatory compliance: ability to deliver evolving reporting requirements such as data development for the DEECA/AER Data Trial.
- Maintain service levels in the face of increasing climate risk: such as the prediction of impending power quality issues and asset failures by detecting near real-time trends in voltage, currents and other measurements.
- Network data improvements: applications to improve network data such as wrong GIS (Geospatial Information System) records detection and phase colour detection.
- Customer safety improvements: such as the detection of broken supply neutrals (high impedance detection).
- Customer satisfaction improvements: generate metrics that could impact customer satisfaction and help to prioritise network remediation works. For example, generate an index on solar export restrictions to prioritise LV remediation works. Additionally, by enabling the early detection of power quality issues JEN can resolve them before they cause significant customer impacts.
- DER enablement benefits of data and analytics (e.g. DER growth hosting capacity forecast tool)
- Allows us to meet our customer expectations (customer asked us to be informed with real time information and use new technologies to improve electricity system management)

Risks

- Inefficiencies - Higher cost, effort, and time because of the need to use separate data and analytics implementation for each initiative

- Will allow for less-efficient management of project implementation risks:

    - Electricity network risk – Risk to the electricity network if analytics use cases with operational impact that have errors. The mitigation will be to do comprehensive testing prior to release, monitor for errors, and have processes in place to safely recover from errors.

    - Electricity network risk – Risk to the electricity network if analytics use cases with operational impact encountered cyber-attacks. The mitigation will be to design the solution with appropriate cyber-security protections in place.

    - Delivery risks – Dependency on availability of key resources (SMEs and field resources) is a risk. The mitigation is to have appropriate resourcing contingency and skills development plan in place, and to ensure that the project schedule is aligned with realistic resources availability.

    - Delivery risks - Delays due to complexities of implementing new equipment (such as the new VRR (Voltage Regulating Relay)). The mitigation is to derisk new equipment with lab-based proof-of-concept testing early in the project life-cycle to allow time to fix issues and minimise their impact on the overall project delivery timing.

Option 3: SNAP, Near Real-Time Smart Meter Data, & Network Analytics Program (preferred)

Description

Jemena to invest in a SNAP, near real-time smart meter data, and an analytics program of work. This option recognised the on-going need for data and analytics and proposes a strategic platform (SNAP) that is built once and then used to service a number of Future Network Strategy initiatives; near complete coverage of near real-time data (beyond DVM requirements); and a network analytics program that can deliver analytics applications (for regulatory compliance, operational and safety improvements, and DER enablement) over the next regulatory period.

This strategy recommends developing:

- A SNAP that is a foundation capability for delivering data and analytics;

- The extension of JEN's near real-time (5 min) smart meter power quality delivery from almost 80% meter population coverage to over 90%, via the installation of additional AMI telecommunications Access Points to enable emerging near real-time network analytics applications; and

- A network analytics program of works that leverages SNAP, near real-time smart meter power quality data and developing new analytics applications (tools and processes) to deliver the following benefits:

    – evolving regulatory compliance,
    – operational and safety improvements; and
    – CER enablement.

Direct Escalated Costs

JEN's costs for this option is outlined in the table below.

$2024M		RY27	RY28	RY29	RY30	RY31
Capex	Digital	$3.1	$1.7	$1.7	$1.7	$1.8
	Asset	$2.4	$2.4			
Opex	Digital Nonrecurrent	$0.4	$0.1	$0.1	$0.1	$0.1
	Digital Recurrent Step		$0.3	$0.3	$0.3	$0.3
	Asset Recurrent Step		$0.4	$0.4	$0.4	$0.4
Total		**$5.8**	**$4.9**	**$2.5**	**$2.5**	**$2.5**

Period total $18.3

Benefits

- This option provides the same benefits as option 2, but allows JEN to do this in a more efficient manner
- This option is the lowest cost

Risks

- Electricity network risk – Risk to the electricity network if analytics use cases with operational impact that have errors. The mitigation will be to do comprehensive testing prior to release, monitor for errors, and have processes in place to safely recover from errors.
- Electricity network risk – Risk to the electricity network if analytics use cases with operational impact encountered cyber-attacks. The mitigation will be to design the solution with appropriate cyber-security protections in place.
- Delivery risks – Dependency on availability of key resources (SMEs and field resources) is a risk. The mitigation is to have appropriate resourcing contingency and skills development plan in place, and to ensure that the project schedule is aligned with realistic resources availability.
- Delivery risks - Delays due to complexities of implementing new equipment (such as the new Eberle VRR (Voltage Regulating Relay)). The mitigation is to derisk new equipment with lab-based proof-of-concept testing early in the project life-cycle to allow time to fix issues and minimise their impact on the overall project delivery timing.

Quantitative Analysis

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

	Capex ($2024M)		Opex ($2024M)		Totex ($2024M)		NPV
	Asset	Digital	Asset	Digital	Asset	Digital	
Option 1	-	$6.8	$25.0	$5.0	$25.0	$11.8	-$29.8
Option 2	$4.8	$17.4	-	$7.7	$4.8	$25.1	$27.6
Option 3	$4.8	$10.0	$1.4	$2.1	$6.2	$12.2	$32.9

Options Summary	**Option 1** Option 1 involves Jemena investing no additional expenditure for in the next regulatory period. This option is not recommended as our current analytics program is reaching end-of-life and therefore is necessary to replace. **Option 2** Option two would involve the ad-hoc implementation of data and analytics requirements for each of our projects. This option is not recommended as it is inefficient to implement separate data and analytics systems for each initiative. **Option 3** Option 3 delivers maximum quantified benefits at least cost by building data analytics enablers (SNAP and near real-time smart meter data) and developing network analytics applications (network analytics program) to deliver emerging regulatory compliance, operational and customer improvements, and CER enablement benefits. SNAP provides a reusable and extensible data and analytics platform for supporting Future Network Strategy initiatives into the future.
What We Are Recommending	Option 3 – "SNAP, Near Real-time Smart Meter Data, Network Analytics Program" is prudent and efficient and is our preferred approach. It maximises the present value of net benefits for our customers over the long term and is therefore the recommended development path. It is also expected to enable us to efficiently meet our regulatory obligations, which we expect will be strengthened in the next regulatory period as the Victorian government trials are completed.
Risks of not undertaking the program in the 2026-31 regulatory period	The risks of not implementing the program are high as outlined in the 'Do nothing option' above. The current JEN analytics prototype platform is reaching end-of-life by the end of 2024. There is a risk that JEN will not be able to meet emerging regulatory compliance requirements, or our customers' service expectations, in a timely and cost-effective way without near real-time smart meter power quality data and network analytics application. Further, not replacing our existing analytics prototype platform is not consistent with what a prudent operator would do and will result in JEN incurring inefficient costs as discussed in the Do-nothing option above. Further, with SNAP being an enabler of JEN's other FNS initiatives, it is required in the next regulatory period for us to achieve cost and time inefficiencies in the other FN initiatives.
Cost Estimation	Costs associated with the Networks Analytics program comprise capex to cover the costs of data scientists, data engineers and business subject matter experts to implement network analytics applications and to cover lifecycle costs associated with the analytics ecosystem; and trailing opex to cover cloud computing and data for the applications. Costs associated with SNAP have been derived based on our understanding of what is required to complete the SNAP capability that has been commenced in the current EDPR period. For capex costs, we have a good understanding of the resourcing required to fully implement SNAP (internal staff supported by external consultants as required) and have estimated accordingly. The opex costs are for ongoing software licensing, cloud computing, and data for the platform.

Initiative	Expenditure type	FY2026/27	FY2027/28	FY2028/29	FY2029/30	FY2030/31
SNAP	Digital Capex	1.4	0	0	0	0
	Digital Opex	0.3	0.3	0.3	0.3	0.3

		Network Capex	0	0	0	0	0
		Network Opex	0	$0.4	$0.4	$0.4	$0.4
	Network Analytics	Digital Capex	1.7	1.7	1.7	1.7	1.8
		Digital Opex	0.1	0.1	0.1	0.1	0.1
		Network Capex	0	0	0	0	0
		Network Opex	0	0	0	0	0
	[5]Real Time AMI	Digital Capex	0	0	0	0	0
		Digital Opex	0	0	0	0	0
		Network Capex	2.4	2.4	0	0	0
		Network Opex	0	0	0	0	0
	Total	**Capex**	**5.5**	**4.1**	**1.7**	**1.7**	**1.7**
		Opex	**0.4**	**0.8**	**0.8**	**0.8**	**0.8**
		Capex and Opex	**5.9**	**4.9**	**2.5**	**2.5**	**2.5**

Dependencies on other Investment Briefs	None
Relationship to ICT Capital Forecast	For ICT capital forecast, refer to detailed “Data Visibility and Analytics Program” justification paper and “Data Visibility and Analytics Program - CBA Model.xlsb”.

[5] This is captured under the capital expenditure program for metering and is called ‘access points and relays’.