Jemena Electricity Networks (Vic) Ltd.

IT Investment Brief – Dynamic Network Planning with Automation

Non-recurrent – New or Expanded ICT capability, functions and services

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Glossary

ADMS	Advanced Distribution Management System
AutoCAD	2D and 3D computer-aided design (CAD) software application developed by Autodesk
Capex	Capital Expenditure
CWIP	Current Work in Progress
Current Regulatory Period	The period covering 1 July 2021 to 30 June 2026
GIS	Geospatial Information System
ICT	Information and Communications Technology
Jemena	Refers to the parent company of Jemena Electricity Network
JEN	Jemena Electricity Network
JESA	Jemena Electricity Services Agreement
Next regulatory period	The period covering 1 July 2026 to 30 June 2031
NPV	Net Present Value
Opex	Operating Expenditure
OSI	Aspen Technology product name for ADMS
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
Totex	Total Expenditure

Dynamic Network Planning with Automation

Objective	This initiative aims to digitise the process of managing network drawings by removing the manual keying of as-designed and as-built paper and electronic drawings into the Jemena Electricity Network Vic Ltd. (JEN) Geospatial Information System (GIS).		
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	**AutoCAD drawings are manually transcribed and transformed into the GIS** Fundamental changes in energy needs and customer expectations requires accurate and timely data throughout the network design, build and commissioning phase. JEN collaborates with third-party companies under the Jemena Electricity Services Agreement (JESA) to manage the creation of design and as-built drawings for construction and drafting activities. This involves both insourced and outsourced draftspersons who produce engineering drawings related to construction projects. Planned work on the network that could potentially alter the existing network model are submitted in AutoCAD format, as proposed design drawings, and upon completion of underground works, JEN receives AutoCAD as-built drawings. JEN's GIS Technicians are responsible for interpreting the information provided for both the proposed design and as-built drawings. Using symbology and notes on the drawings, the technicians determine the assets that need to be created, altered or removed from the GIS. This process involves manually transcribing the drawing information into GIS objects and topology and as a result, duplicates effort to transcribe, upload and transform AutoCAD data into the GIS model following the initial effort to create this same data in AutoCAD. the Manual transcription of data from one digital format to another increases the likelihood of errors occurring within the GIS system. This increased level of risk requires a greater effort by the GIS Technician to review and correct data and topology manually transcribed to prevent errors from occurring in the GIS system. **Network Program of Work is increasing** JEN's network program has increased in the 2021-2026 regulatory period by an average of 16% per annum[1] and as a result, we have seen the volume of work increase 20% which has been driven by increased data model complexity, an increase in new object types, new and refined business rules and more mandatory fields); this has been absorbed by our existing GIS technicians. JEN's network program is forecast to continue to increase by 56%[2] over the forthcoming regulatory period. As a result, we expect there will be a requirement for increased planning and updates to the network model and drawings in AutoCAD and GIS. It is expected that without additional digital support (e.g. the digital solution proposed by this brief), additional FTEs will be required to support the program's growth. The duplication of effort in capturing the data manually in both AutoCAD and GIS will continue to create a challenge, increasing proportionally with the volume of drawings processed. The need to manage, store and file more and more drawings will also increase and require additional support.		
Customer Importance	The Dynamic Network Planning with Automation solution will automatically integrate data into the GIS system, removing the need for manual input. This will enable timely access to proposed asset data, improving situational awareness for planners and network operators. Consequently, the project will deliver key benefits for JEN customers, including: • Maintain frequency and impact of planned outage interruptions despite increasing program of network activities by improving scheduling and response times. • Maintain risk of momentary interruptions and faults, which can cause brief but disruptive losses of service for customers.		

[1] Historical and forecast gross capex expenditure per JEN Draft Plan.

[2] Historical and forecast gross capex expenditure per JEN Draft Plan.

	• Reduced likelihood of switching incidents, which occur when errors in network configuration result in unintended power loss or incorrect system routing, impacting service continuity. • Maintenance of operating expenditure by streamlining data handling and reducing the need for manual intervention.
Key Considerations	JEN's strategic approach to managing our asset-related data is to continue the optimisation and consolidation of asset-related applications, to leverage a common platform across JEN's network assets which minimises the overall whole-of-life capital and operating costs. The JEN GIS platform underpins a wide range of network functions, data and systems, with this initiative enabling and supporting the data and downstream information systems. Controlling the risk associated with data availability (timeliness) and quality of data being loaded into the GIS and systems downstream from GIS has a direct impact to reducing risk of planned outage breaches and outage management highlighted in the supporting Attachment "*JEN – IT Investment Brief - Digitising Network Switching".* **How costs were derived** The effort and costs for the implementation of our recommended option (option 2) have been estimated based on JEN's experience, [redacted] In 2020, JEN completed a pilot project [redacted] This project enabled JEN to understand the complexities of completing this project, as proposed in this investment brief, and was used as a basis to estimate forecast costs. This initiative assumes a blended team of internal and external resources, with external resources supplying specialised skills. [redacted] Opex costs relate to internal resources focused on change management as there are significant transformation and change management impacts on process, standards and procedures. Training will need to be undertaken with a significant number of internal staff across multiple work groups and JEN third-party organisations who prepare the AutoCAD drawings. [redacted]
Options	JEN has considered 3 alternatives to deliver the capability articulated above: (1) Do nothing – not recommended. (2) Implement automation using a COTS solution – recommended. (3) Implement automation using a bespoke internally built solution – not recommended. **Option 1: Do nothing** **Description** This option represents the option where no action is taken, and AutoCAD Drawings of network design and associated asset information continue to be manually transcribed. **Benefits** There are no benefits associated with this option. Doing nothing only avoids immediate expenditure outlined in options 2 and 3. **Risks**

The risks of doing nothing are:

- Difficultly ensuring quality control leads to inaccuracies in GIS data
    - Manual keying of complex as-designed and as-built drawings from AutoCAD can be misinterpreted and different individuals may apply varying interpretations or standards when transposing drawings, leading to inconsistent GIS data quality
    - Data entry errors caused from manually transposing information from AutoCAD drawings (paper/PDF) into the GIS System also result in GIS data quality issues.
    - Without automated quality assurance tools, it is challenging to verify the accuracy and completeness of the transcribed data.
- Inefficiencies
    - Time consuming process which causes delays in availability of network design information and as-built construction drawings. This impacts downstream data availability, which can result in erroneous analysis of network data and associated decisions (e.g., planning of outages, network operational instruction errors).
- Increased operational costs
    - The number of employees engaged in managing the AutoCAD drawings, loading the data into core systems (such as GIS) and fixing errors, will continue to grow to keep pace with the growing volume of augmentation projects. It is expected that without additional digital support (e.g. the digital solution proposed by this brief), there would be significant GIS technician uplift required to support the new program delivery.
- Integration challenges
    - AutoCAD and the GIS have different data structures and file formats, increasing the chance of data loss or misalignment.

Summary

This option is not recommended as it does not consider or reflect good industry practice given the risks outlined above. With JEN's network program forecast to increase by 56%[3] over the forthcoming regulatory period, we expect there will be a requirement for increased planning and updates to the network model and drawings in AutoCAD and GIS. As a result, additional resources would be required should we proceed with the status quo and as outlined in the risks above.

Option 2: Implement automation using a COTS solution

Description

This option will establish digital pathways to integrate as-designed and as-built AutoCAD drawings into the GIS System and establish the ability to manage this information in the GIS to provide accurate and up to date data for re-use in future designs.

A COTS solution would be implemented to connect, transform and exchange AutoCAD drawing data with JEN GIS.

This initiative is a fundamental change to processes, templates, symbology and drafting standards to support the digital integration of AutoCAD drawings into GIS.

Costs

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

$2024	RY27	RY28	RY29	RY30	RY31

[3] Historical and forecast gross capex expenditure per JEN Draft Plan.

Digital capex	[redacted]	[redacted]	[redacted]		
Non-recurrent opex		[redacted]	[redacted]	[redacted]	[redacted]
Recurrent-step opex		[redacted]	[redacted]	[redacted]	[redacted]
Total opex		[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]		

[redacted]

Benefits

The benefits associated with the COTS solution include access to the extensive library of pre-built data transformers and connectors that have been designed and built over time with other industries and organisations. This means JEN will benefit from this investment thereby shortening implementation and realisation of benefits related to the availability of network design and as built information in the JEN GIS in a timely manner and with increasing accuracy.

We estimate that the implementation of a COTS automation solution will provide $10.7M[4] in benefits through cost avoidance as outlined below:

- With JEN's program of work forecast to increase 56%[5] over the next period, GIS technicians would have to dedicate significantly more of their time to this activity as the volume and complexity of network projects requiring network updates increases (noted in background section above). By automating, JEN will be able to maintain current staffing levels to complete this increasing volume of more complex work and focus on higher value tasks to ensure the integrity of drawings. To calculate the benefit, we have assumed similar FTE growth rates as experienced this period to forecast for next period. By FY27 we have assumed 3 additional FTE[6], increasing to 4 FTE by FY31.
- Over the current period we have seen an increase in the number of instances where we have had to "re-do" the digitisation of drawings due to increased complexity of network design (e.g. with additional monitoring devices on the network). We expect this trend to continue and so have assumed 1 additional FTE would be required to ensure quality, i.e. 're-do' and another 1 FTE to manage the increased volume of drawings.

By implementing this solution, we reduce the need for these additional resources. We will need to maintain current staff levels to manage exceptions.

Risks

JEN will be required to undertake a market analysis and product selection, as well as select a system integrator to support with the delivery of this project. There will need to be further refinement of costs through an RFP process as all costs are currently estimated. This includes:

- Cost of system integrator selected through RFP process may be higher once more detailed costs are provided by a third-party.

[4] Nominal 2024. Refer JEN - IT Investment Brief - Dynamic Network Planning with Automation - Cost Benefit Analysis Model.

[5] Historical and forecast gross capex expenditure per JEN Draft Plan.

[6] Salaries based on Hays Salary Guide FY24/25

- Licences are indicative and there are possible changes in licencing models/costs.

Project governance will be implemented throughout implementation to mitigate these risks.

Summary

This option is recommended as we consider it reflects good industry practice given the benefits outlined above. Our proposed solution increases the timeliness and quality of the network data, reduction of duplication of effort to manually transcribe the network drawings into GIS. Furthermore, it provides the lowest sustainable cost.

Option 3: Implement automation using a bespoke internally built solution

Description

This option will deliver the same outcome as option 2, however instead of procuring a vendor product it will look to implement a bespoke internally built solution.

This option would require development of a geospatial extract, transform and load platform and all the associated business and data logic and rules required to integrate with JEN GIS.

Risks

Key risks include:

- Custom development will require extensive design and coding efforts, which increase in both time and costs.
- There is a risk that additional complexities are identified during design and build activities which result in additional cost/effort for the project.
- Bespoke solutions have an increased risk of re-work and additional costs during development cycle due to limited knowledge available at the time of design/development. This can be partially mitigated by engaging a system integrator with experience in implementing similar solutions.
- Cost of system integrator selected through RFP process may be higher than the assumed cost (which is based on similar projects undertaken in the past).
- If a single developer or a small team builds the system, JEN might become overly reliant on a team or individuals for ongoing maintenance and support. There is a risk of diminishing knowledge on system support, especially as staff change roles/leave JEN.

Benefits

Benefits of this option will be the same as those of option 2 except that JEN would not benefit from years of vendor product development with ‘out of the box’ business rules and logic.

In addition, whilst there may be a small reduction in recurrent step opex from a licencing perspective, it will be negated by internal support costs required to maintain the solution.

Costs

JEN’s costs for this option is outlined in the table below. The capex and non-recurrent opex associated with the development of the bespoke solution are expected to be 10% more costly than option 2, based on similar historic projects previously implemented within JEN. The additional costs are predominantly associated with the additional requirement (compared to option 3) of designing and building business and data logic and rules.

$2024	RY27	RY28	RY29	RY30	RY31
Digital capex	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Non-recurrent opex		[redacted]	[redacted]	[redacted]	[redacted]

	Recurrent-step opex					
	Total opex		[redacted]	[redacted]	[redacted]	[redacted]
	Total	[redacted]	[redacted]	[redacted]		

[redacted]

Summary

This option is not recommended as we do not consider it reflects good industry practice given the risks outlined above. Furthermore, it does not provide the lowest sustainable cost.

Options Summary

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

$2024	Capex	Opex	Totex	NPV[7]	Residual Risk
Option 1	Not applicable	Not applicable	Not applicable	Not applicable	Significant
Option 2	[redacted]	[redacted]	[redacted]		Low
Option 3	[redacted]	[redacted]	[redacted]		Low

What We Are Recommending	JEN recommends option 2 as we consider that it best reflects good industry practice and provides the lowest sustainable cost.
Dependencies on other Investment Briefs	This solution is a dependency for the *JEN – RIN – Support - ICT Investment Brief - Digitising Network Switching* (see respective attachment) where availability of information on new planned devices (for example substations, switches) as an object in the ADMS model are critical to enable digital switching activities on restoration.
Relationship to ICT Capital Forecast	**JEN - IT Investment Brief - Dynamic Network Planning with Automation - Cost Benefit Analysis Model.**

[7] 15-year NPV to include 10 years post implementation