# Jemena Electricity Networks (Vic) Ltd

## ICT business case Post Implementation Report (PIR) template

Volt-Var Control Pilot Project

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# Abbreviations

| Abbreviation | Description |
|---|---|
| AA | Access Arrangement |
| AER | Australian Energy Regulator |
| AWS | Amazon Web Services |
| Capex | Capital expenditure |
| C4C | Cloud for Customer |
| CDC | Customer Data Cloud |
| CIAM | Customer Identity and Access Management |
| CSAT | Customer Satisfaction |
| CWIP | Capital Work in Progress |
| CX | Customer Experience |
| ECA | Energy Consumers Australia |
| EDP | Electricity Distribution Portal |
| EDPR | Electricity Distribution Price Review |
| ENA | Energy Networks Australia |
| GDP | Gas Distribution Portal |
| GIS | Geographic Information System |
| ICT | Information and Communications Technology |
| IFRS | International Financial Resourcing Standards |
| JAWS | Jemena AWS analytics platform |
| JEN | Jemena Electricity Networks (Vic) Ltd |
| JGN | Jemena Gas Networks Ltd |
| JN | Jemena Networks |
| MAT | (SAP) Maintenance Activity Type |
| Opex | Operational expenditure |
| SaaS | Software as a Service |
| SME | Subject Matter Expert |
| SGSPAA | State Grid Singapore Power (Australia) Assets Pty Ltd |
| VVC | Volt/VAR Control |

# 1. Executive summary

The Volt-Var Control (VVC) Pilot project was established to validate that the dynamic voltage management (DVM) capability could be utilised to monitor and control voltage on the electricity network to maintain acceptable quality of supply to our customers. Driven primarily by rooftop solar in Victoria, which is expected to double from 560,000 households (21%) in 2022 to about 1.13 million households (35%) by 2030, the VVC solution was assessed as the preferred option to manage impacts caused by potential reverse power and voltage rises caused by customer installations feeding into the electricity network.

The VVC solution was established in a small section of the electricity network to validate that the VVC solution would support the DVM capability, where near real-time Advanced Metering Infrastructure (AMI) data is used to feedback signals to dynamically adjust zone substation transformer voltage settings to ensure that network voltages are within regulated limits.

VVC is one of the Future Networks strategy initiatives identified by Jemena to deliver the 21-26 EDPR period. VVC was assessed as the only feasible solution that can support VEDC voltage compliance in the short term. Future solutions such as Distributed Energy Resources Management (DERMS) will become available in the medium term with additional penetration of Customer Energy Resources (CER) in the distribution network and regulatory changes advancing to support CER control. Prior to undertaking the significant investment required for a solution that is capable of controlling the entire electricity network, the VVC trial was established.

In August 2024 the trial successfully built and tested the VVC solution at two JEN zone substations with the following outcomes against the primary objectives:

- The VVC pilot successfully confirmed that the chosen solution was technically feasible and validated the costs and benefits of rolling out a full VVC solution across the wider network;
- Successfully validated the foundational component of Jemena's Network Analytic Architecture that will enable other Future Network initiatives; and
- Successfully validated the investment required to deliver near real-time AMI data to support VVC and emerging Future Network initiatives such as Dynamic Operating Envelopes via the development of the VVC Rollout Phase 1 Business Case

The solution built, tested and validated as a part of the VVC Trial has been assessed as suitable for utilisation in the final full network solution, and activity to make all components production-ready will be incorporated into the VVC Rollout Stage 1 Business Case

**Reason for closing the project**

Reason: ☐ Cancellation ☐ Postpone or on hold ☒ Natural Completion

**Table 1–1: Executive summary**

| Key consideration | Details |
|---|---|
| Background | The Volt-Var Control (VVC) Pilot project was established to validate that the dynamic voltage management (DVM) capability could be utilised to monitor and control voltage on the electricity network to maintain acceptable quality of supply to our customers.<br><br>The VVC solution was established in a small section of the electricity network to validate that the VVC solution would support the DVM capability, where near real-time Advanced Metering Infrastructure (AMI) data is used to feedback signals to dynamically adjust zone substation transformer voltage settings to ensure that network voltages are within regulated limits.<br><br>The solution built, tested, and validated as part of the VVC Trial has been assessed as suitable for use in the final full network solution, and activity to make all components production-ready will be incorporated into the VVC Rollout Stage 1 Business Case. |
| Performance against regulatory allowance | The VVC Trial expenditure was to support regulatory obligations relating to the growth of CER. The capex is non-recurrent and primarily falls into the two following categories:<br>• maintaining existing services, functionalities, capabilities and/or market benefits<br>• new or expanded Information and Communications Technology (ICT) capability, functions and services |
| Performance against schedule | The Project was completed by August 2024 (actual) as opposed to December 2023 (expected, Business Case). |
| Performance against expected benefits | The pilot project was a risk mitigation benefit prior to significant investment in a full solution designed to evaluate the technical feasibility and validate the costs and benefits of an end-to-end VVC (Volt Var Control) solution. |

# 2. Project performance

The JEN VVC Pilot Project was initiated to evaluate the technical feasibility and validate the costs and benefits of an end-to-end VVC (Volt Var Control) solution.

- The VVC pilot successfully confirmed that the chosen solution was technically feasible and validated the costs and benefits of rolling out a full VVC solution across the wider network;
- Successfully validated the foundational component of Jemena's Network Analytic Architecture that will enable other Future Network initiatives; and
- Successfully validated the investment required to deliver near real-time AMI data to support VVC and emerging Future Network initiatives such as Dynamic Operating Envelopes via the development of the VVC Rollout Phase 1 Business Case.

The Project delivered performance in excess of expectations by proving the technical solution feasibility of the end to end solution and determining that the pilot investment could capitalised as a viable component of the proposed final solution.

## 2.1 Performance against objectives

The following are the broad objectives of the VVC Solution as designed as listed in the background section of the business case including an assessment of performance of the trial in assessing the solution objectives:

| # | Broad VVC Solution Objectives | Assessment from VVC Trial on solution ability to meet these broad objectives[1] |
|---|---|---|
| 1 | Enable JEN to meet and improve voltage due to expected CER growth. | The trial confirmed that voltage regulation by VVC was able to be better regulated within the Victorian Electricity Distribution Code of Practice (EDCOP) limits compared to the status quo. This capability facilitates JEN in realising its voltage compliance strategic objectives. |
| 2 | Provide demand management to support the electricity network during peak demand and minimum demand periods. | The trial confirmed that voltage reduction by VVC was able to reduce demand on the network. This capability facilitates JEN in realising its demand management strategic objectives. |
| 3 | Defer solar-related capex and avoid future opex growth. | The trial confirmed that VVC was able to operate the network voltages at lower levels compared to the status quo, effectively increasing the solar hosting capacity of the network by avoiding solar curtailment. This capability is able to help JEN minimise its capital and operating expenditure strategic objectives for CER enablement. |
| 4 | Reduce carbon emissions due to reduced energy usage from lowered network voltages. | The trial confirmed that VVC was able to operate the network voltages at lower levels compared to the status quo, effectively reducing customer energy consumption, solar PV curtailment, and the need for export limiting. This capability facilitates minimising carbon emissions through reduced customer energy consumption and increased solar PV generation. |
| 5 | Deliver customer energy cost savings and lower emissions by enabling greater CER export capacity. | The trial confirmed that VCC was able to deliver all of items 1, 2, 3 and 4 concurrently, allowing for VVC to deliver customer energy cost savings and lower emissions by |

[1] Refer to the VVC Trial Business Report for details on the testing result analysis, outcomes and conclusions. Refer to JEN's VVC Strategy (Document No. ELE-999-PA-IN-004) for its strategic objectives.

| # | Broad VVC Solution Objectives | Assessment from VVC Trial on solution ability to meet these broad objectives[1] |
|---|---|---|
| | | enabling greater CER export capacity and reduced energy consumption. |

The specific objectives of the VVC Pilot Project have been performance assessed as follows:

| # | VVC Pilot Project Objectives | Assessment of Project Performance on meeting objective |
|---|---|---|
| 1 | Evaluate the technical feasibility of the trial VVC solution and validate the costs and benefits of rolling out a full VVC solution across the wider network. | The trial confirmed that the implementation and configuration of VVC deployed at AW and CS could be extrapolated to a full VVC solution across the wider network, consistent with that contemplated in JEN's VVC strategy. |
| 2 | Validate a foundational component of Jemena's Network Analytic Architecture that will enable other Future Network initiatives. | The trial confirmed that AMI voltage data can be utilised to expand JEN's network analytics applications in support of JEN's Future Network initiatives. |
| 3 | Validate the investment required to deliver near real-time AMI data to support VVC and emerging Future Network initiatives such as Dynamic Operating Envelopes. | The trial confirmed that AMI data can be utilised in near-real time in JEN's operational technology real-time systems to improve the operational control of network management in support of JEN's Future Network initiatives. |

The trial assessment also confirmed that the pilot solution that was built for the two zone substations can be used in the full production final solution and will remain in service whilst the full enterprise grade infrastructure is built.

### 2.1.1 Actual expenditure performance

The VVC trial was a proof of concept stage supporting the larger Future Grid initiatives in Jemena's 21-26 EDPR determination.

**Table 2–1: Actual expenditure performance**

| Expenditure | Budget | Actual expenditure | Comments |
|---|---|---|---|
| Capex | $30,400,000 *(VVC was only a part of this allowance)* | $3,209,554 | VVC Trial was the first stage of a larger program of works approved in the EDPR 21-26 for Future Grid |
| Opex | | $1,242,091 | |
| **Total** | **$30,000,000** | **$4,451,645** | |

### 2.1.2 Performance against schedule

The schedule provided in the JEN VVC Pilot Business Case had the project commencing in December 2022 and work concluding by December 2023. Evidence shows the VVC Pilot completed in August 2024 with financial close out completing in September 2024 with the capitalisation of the VVC Pilot Solution.

**Table 2–2: Schedule performance**

| ID | Milestone | Date delivered | Comments |
|---|---|---|---|
| 1 | VVC Trial Complete | 31/08/2024 | Pilot solution originally expected to be retired was assessed as suitable for building upon for the final VVC solution and was capitalised in Sept 2024. |

### 2.1.3 Performance against expected benefits

The JEN VVC Pilot Project benefit was a risk mitigation benefit of proving the end to end solution VVC Control prior to undertaking significant future investment in a full electricity network VVC solution. The project successfully validated the solution as designed and assessed the pilot solution as suitable to be incorporated into the final solution for use in the live network monitoring and voltage adjustment.

#### 2.1.3.1 Compliance-driven projects

This project was compliance-driven and undertaken to ensure Jemena meet its EDCoP obligations with regard to customer voltage limits. Jemena was required to invest in this project to maintain compliance as required under its licence conditions.

In addition, the expected benefits of this project were not explicitly discussed or analysed in the business case. Rather, the business case adopted a least-cost approach to ensure Jemena complies with the obligations outlined above. Therefore, the realised economic benefits of this project have not been discussed in this PIR.