



Jemena Electricity Networks (Vic) Ltd

Response to the Annual Reporting Regulatory Information Notice issued 7 November 2019 and as varied on 8 September 2021 for the 2022-23 regulatory year

An extract of section 7 - Demand Management Incentive Allowance Mechanism



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Table of contents

Glossary	iv
7. Demand Management Innovation Allowance Mechanism	5

Glossary

AER	Australian Energy Regulator
ACS	Alternative Control Service
ARENA	Australian Renewable Energy Agency
CAM	Cost Allocation Methodology
DM	Demand Management
DMIA	Demand Management Innovation Allowance
DMIAM	Demand Management Innovation Allowance Mechanism
DMIS	Demand Management Incentive Scheme
DNSP	Distribution Network Service Provider
DR	Demand Response
EV	Electric Vehicle
FY	Financial Year
JEN	Jemena Electricity Networks (Vic) Ltd
MAIFI	Momentary Average Interruption Frequency Index
MED	Maximum Event Day
NEL	National Electricity (Victoria) Law
PTRM	Post Tax Revenue Model
RIN	Regulatory Information Notice
RIT	Regulatory Information Test
SCS	Standard Control Service
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
STPIS	Service Target Performance Incentive Scheme

7. Demand Management Innovation Allowance Mechanism

Paragraph 7.1 of Schedule 1 of the Notice requires JEN to identify each demand management eligible project for which JEN seeks approval. JEN seeks approval for one project for the relevant regulatory year, which is outlined below. Section 2.3(3)(f) of the demand management innovation allowance mechanism (**DMIAM**)¹ requires a statutory declaration signed by an officer of JEN. This is provided in Attachment A7.

7.1 Dynamic electric vehicle (EV) charging trial (project establishment)

This project was included in our DMIAM submission for FY2021 and FY2022. The DMIAM funding request for FY2023 is an extension of this project and there is no funding duplication across these three regulatory years.

7.1.1 Project Criteria

Paragraph 7.2(a) of Schedule 1 of the Notice requires JEN to explain how JEN's initiative complies with the project criteria detailed in Section 2.2.1 of the DMIAM. JEN's eligibility is outlined below.

JEN led an Australian Renewable Energy Agency (**ARENA**) partially funded collaboration between five DNSPs (comprising JEN, AusNet Services, United Energy, TasNetworks and EvoEnergy) and a leading EV charging installer (JET Charge) to understand the impacts of EVs on the electricity system, consumer willingness for third party control and to demonstrate how DNSPs can play a direct role in EV charge management.

The trial proved the concept of dynamically managing EV charging load by sending a dynamic operating envelope (**DOE**) to the charging infrastructure, with a real-time assessment of available network capacity, to accommodate more EVs without network augmentation. A small number of EVs per DNSP participated in the trial. Incentives were offered to customers to install smart EV chargers and to participate in EV charge management events referred to as solar soak and demand response events.

JEN considers that works undertaken in the relevant regulatory year comply with the DMIAM criteria in the following ways:

- This trial demonstrated demand management capability using residential EV chargers managed by the DNSP via the use of dynamic operating envelopes to manage the charging within the network limits. Two demand management scenarios were investigated (solar soak and demand response events). Solar soak events encouraged customers to charge and manage within the system limits to soak up excess solar during minimum demand periods. Demand response events actively managed the EV charger (curtailing charging if required) during peak demand periods to ensure the demand did not exceed the network limits.
- The trial was innovative and monitored the network in near real-time, (using network sensors, AMI data and EV Charging infrastructure data), to calculate the non-EV load and allocate the remaining capacity to the EVs via a dynamic operating envelope, sent and updated every 5 minutes to provide a dynamic solution based on the current network conditions.
- The trial was a *non-tariff-based* project and the claimed costs are not recovered under any other incentive scheme.
- Costs recovered under the DMIAM are not recoverable under any other jurisdictional incentive scheme.

7.1.2 Project Compliance Reporting

Paragraph 7.2(b) of Schedule 1 of the Notice requires JEN to submit a compliance report in accordance with Section 2.3 of the demand management innovation allowance mechanism. JEN's compliance report is outlined below.

¹ AER, *Demand Management Innovation Allowance Mechanism, Electricity distribution network service providers*, December 2017.

7.1.2.1 Nature and scope of the Dynamic EV charging trial

See section 7.1.1.

7.1.2.2 Aims and expectations of the Dynamic EV charging trial

The key objectives of this study are to prove the concept of managing EV charging load dynamically with a real-time assessment of available network capacity in order to accommodate more EVs without network augmentation.

The project delivered the following:

- monitored network capacity in real-time and provided technologies that automatically controlled charging, including time delay and throttling – initiating, delaying and/or varying EV charging rates
- obtained customer insights and preferences on multiple charge management initiatives and incentives
- obtained charging data for approximately 170 privately owned EVs with and without intervention
- demonstrated the successful use of control boxes to manage EV charging of Tesla cars, and smart chargers to manage other makes of EV
- demonstrated an aggregator as an intermediary between DNSPs and the charge points to orchestrate EV charging.

7.1.2.3 Dynamic EV charging trial compliance with the project criteria

The dynamic EV charging trial complies with the project criteria detailed in Section 2.2.1 of the demand management innovation allowance mechanism.

- This trial demonstrated demand management capability using residential EV chargers managed by the DNSP via the use of dynamic operating envelopes to manage the charging within the network limits. Two demand management scenarios were investigated (solar soak and demand response events). Solar soak events encouraged customers to charge and manage within the system limits to soak up excess solar during minimum demand periods. Demand response events actively managed the EV charger (curtailing charging if required) during peak demand periods to ensure the demand did not exceed the network limits.
- The trial is innovative and monitored the network in near real-time, (using network sensors, AMI data and EV Charging infrastructure data), to calculate the non-EV load and allocate the remaining capacity to the EVs via a dynamic operating envelope sent and updated every 5 minutes to provide a dynamic solution based on the current network conditions.
- The trial was a *non-tariff-based* project, and the claimed costs are not recovered under any other incentive scheme.
- Costs recovered under the DMIAM are not recoverable under any other jurisdictional incentive scheme.

7.1.2.4 Project implementation

The trial was delivered in various milestones:

1. hardware and software development and customer acquisition;
2. customer acquisition and installation of hardware (chargers and network sensors);
3. demand response events and customer surveys; and
4. project completion and final report.

At each milestone, a milestone report was submitted to ARENA to document knowledge sharing and provide evidence the following deliverables were met.

1. Hardware and software development and customer acquisition
 - a) Provision of evidence that demonstrated the website for marketing, customer recruitment and customer feedback was functional
 - b) Provision of evidence that demonstrated that a minimum of 40 EV owners were registered for the trial
 - c) Provision of evidence that demonstrated all DNSPs finalised the overall system architecture and design for the DNSP platform, which enabled the DNSPs to calculate the network limitation for EV charging (the operating envelope) and send the operating envelope to the aggregator for action
 - d) Provision of the control box specification, as well as test reports that demonstrated its capability to manage charging for Tesla EVs
 - e) Provision of evidence that demonstrated that the customer-facing (aggregator) platform was developed (by JET Charge).
 - f) Provision of evidence that showed a project manager was hired for the Project.
2. Customer acquisition and installation of hardware (chargers and network sensors)
 - a) Provision of evidence that demonstrated that a minimum of 170 EV owners were registered
 - b) Provision of evidence that demonstrated that a minimum of 140 registered EV owners had charging hardware installed and commissioned at their premises
 - c) Provision of evidence that demonstrated all DNSPs developed and tested their platforms for interface to the JET Charge platform
 - d) Provision of evidence that demonstrated that the network monitoring systems required at supply transformers were installed and commissioned for the above EV owners
 - e) Provision of evidence that demonstrated end-to-end testing was conducted from the DNSP network monitoring system to the customer premise control box
 - f) Provision of evidence to show that one customer survey was completed
3. Demand response events and customer surveys
 - a) Provision of evidence that demonstrated completion of customer acquisition, and charger and network monitoring system installation
 - b) Provision of evidence that demonstrated that a minimum of eight demand response events were scheduled and completed
 - c) Provision of evidence showing that two customer surveys were completed
4. Project completion and final report
 - a) Provision of evidence showing that two customer surveys were completed
 - b) Provision of a minimum of 12 months of operational data for each of the smart charging technologies

7.1.2.5 Project outcome measurement and evaluation approach

At each milestone, a milestone report was submitted to ARENA for approval to document knowledge sharing and evidence that the deliverables have been met.

There was extensive data gathering during the project to gain insights on the effectiveness of the EV charger response to the dynamic operating envelopes sent, monitoring the network in near real-time and the charging behaviour of the participants.

After each managed charging event, participants were encouraged to answer a survey to gain further insights into customer behaviour.

7.1.2.6 Project costs

The actual expenditure for this project in the relevant regulatory year is \$350,414 and reflects the following:

- Program management (36%)
- Digital solution implementation (6%)
- Data platform operation, hosting and support (5%)
- Customer rewards and survey costs (27%)
- External consultation support (26%)

We are not claiming this full amount because a portion of the expenditure will be recovered from ARENA funding. Therefore, the associated **\$165,408** costs we have claimed under DMIAM for the project this regulatory year have not been:

- recovered under any other jurisdictional incentive scheme;
- recovered under any other Commonwealth or State Government scheme or ARENA funding; and
- included in the forecast capital or operating expenditure approved in the 2021-26 distribution determination or recovered under any other incentive scheme in that determination.

ARENA has partially funded this trial project and the amount outlined above excludes the funds that will be recovered from ARENA funding (\$185,006).

7.1.2.7 Ongoing project activity

JEN and the consortium have completed all Milestones 1-4. A summary of the key activities completed is outlined below:

- creation of a functional website for marketing, customer recruitment and customer feedback
- registration of all EV owners for the trial
- development and finalisation of the overall system architecture design and the communication protocol for sending the DOE signals
- installation of all EV chargers
- procurement, design, installation and commissioning of all network sensors
- digital system upgrades, software and DOE algorithm development, creation of a data hosting platform
- full end-to-end testing demonstrated
- 10 demand response events completed
- 12 customer surveys completed (Onboarding survey, Solar Soak event 1-5 surveys, Demand Response event 1-5 surveys, End of trial survey)
- completed Knowledge Sharing deliverables and published the Lessons Learned Report for Milestones 1 and 2
- completed and published the Final Knowledge Sharing Report.

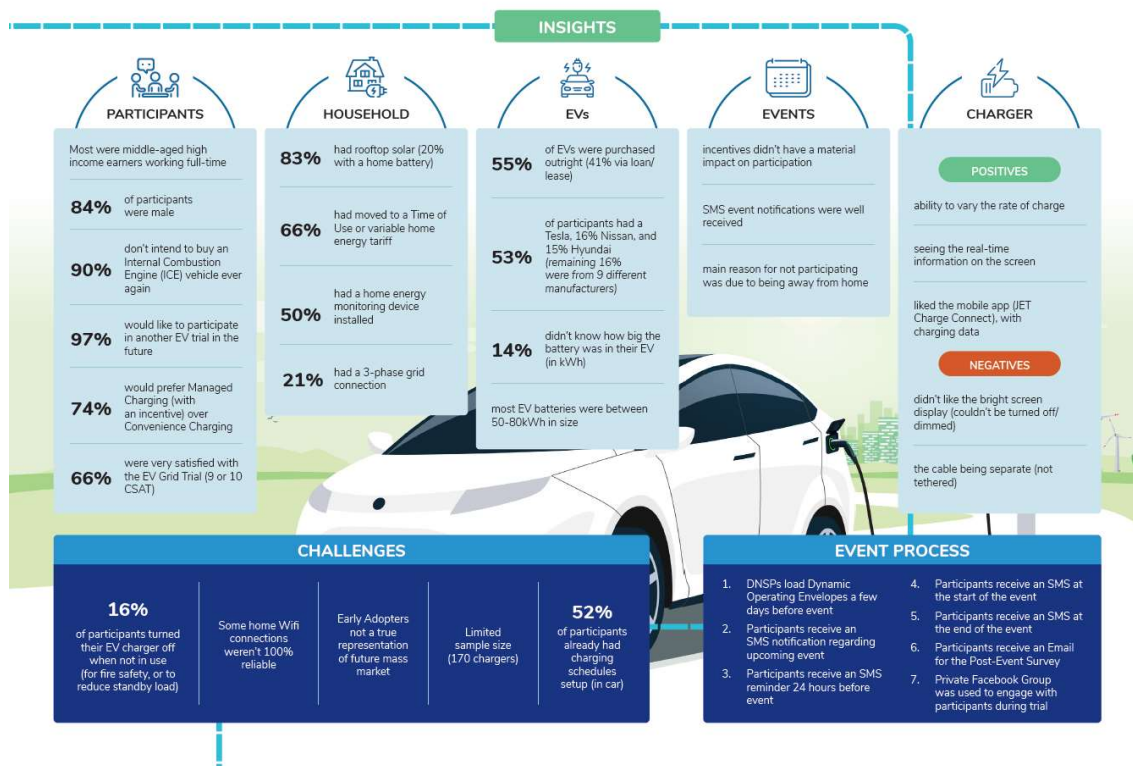
7.1.2.8 Results of the project

The trial project ended at the end of February 2023. Below is the trial infographic with the project summary and key insights.

Figure 7-1: EV grid trial project summary infographic



Figure 7-2: EV grid trial key insights infographic



Overall, the implementation of the trial was successful in developing, testing and implementing the capability to understand the charging behaviour of existing EV owners and the extent networks can manage their load to shift energy to periods of high renewable energy supply, reduce demand during periods of peak demand or low renewable energy supply and support network and wholesale constraints.

Despite capability being developed for the trial, the platforms and capability built by DNSPs and JET Charge were designed to allow use and continued improvement to EV owners and applications outside of the trial and the trial proponents, including for other networks from JET Charge's perspective, and other aggregators and technologies from the DNSPs' perspectives.

Participants in the trial were mostly satisfied with the delivery of the events and the trial overall and were mostly happy to continue participating in the trial, having their EV charging managed by another party and purchasing a smart EV charging themselves, if they didn't already have one. Various key insights relating to the behavioural and technical aspects of the trial were identified, including:

- Most participants were driven by receiving a free charger as well as supporting grid management and EV integration and adoption
- The option and ease of participating and not participating, clear communication, incentives and contribution to the grid were important factors that drove participant satisfaction
- Participants would have liked to see additional reminders and notifications of events
- More information and clarity on what the events mean, the purpose of the events and how they will impact the participants' charging would be beneficial to participants and increase their understanding of their role in the event and potentially their participation
- Around half of the participants are either on TOU or peak/off-peak tariffs and mostly consider their tariff and other connected systems, such as their solar PV system, when scheduling their EV charging

- Almost half of the cohort schedules their EV charging which was done through a variety of different options, including via an app or the EV itself
- On average, charging mostly occurs during the middle of the day or overnight periods across most networks given most participants have rooftop solar and were on a TOU-based tariff with a lower off-peak rate
- Participants charge sparingly which on an aggregated basis leads to a relatively small peak demand given the individual maximum demands do not significantly coincide, albeit only a small cohort of 170 participants
- The magnitude of charge varies and reflects the charging frequency and driving range of the EV owner
- Networks that experienced difficulty and challenges in installing network sensors and gaining great coverage of the participants suggested a focus on using AMI data instead if time and resources permitted
- The DOEs communicated to JET Charge and the EV charger were successful in limiting the rate of charge during DR events however any charging that is already previously scheduled by the participant through another device or the EV itself will ignore the DOE
- The charging behaviour of event participants was shown to charge slightly earlier than the event and continued charging after the event had finished
- There was around 60% participation across all events in the cohort with higher rates of participation occurring in the first two events and DR events
- Participation in the events was impacted by participants turning off their chargers when not in use, Wi-Fi-connectivity issues, the inconvenient timing of events

There was no direct correlation between event incentives and event participation despite incentives being a driver for event satisfaction.

7.1.3 Project Developments and Results

Paragraph 7.3 of Schedule 1 of the Notice requires JEN to provide an overview of developments in relation to the project and of any results to date. The project developments and results to date are outlined in Section 7.1.2.8.

7.1.4 Total amount of DMIAM spent

Paragraph 7.4 of Schedule 1 of the Notice requires JEN to provide any other information as specified by the demand management innovation allowance mechanism. Section 2.3(3)(a) of the demand management innovation allowance mechanism requires JEN to state the total amount of DMIAM spent in the relevant regulatory period. The total amount of DMIAM spent in this regulatory year is **\$165,408** and excludes any funds that will be recovered from ARENA.