

# Jemena Dynamic Electric Vehicle Charging Trial Project

## LESSONS LEARNT REPORT #1, May 2021

|                             |  |
|-----------------------------|--|
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# Executive Summary

The purpose of this Project is to undertake a residential Electric Vehicle (EV) managed charging trial involving 176 EVs across ACT, Victoria and Tasmania, with the trial ending November 2022.

Jemena is leading a consortium of 5 Distribution Network Service Providers (DNSP's) 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. It is expected that as a result, DNSP's can materially advance their preparedness for the impacts of EVs on the electricity system.

This pilot program has been established to gain insights in ways to accommodate home EV charging while minimising network charges to all customers, with the key objectives of:

- *Monitoring network capacity* in real time and providing technologies that can automatically control charging including time delay and throttling. i.e. initiating, delaying and/or varying EV charging rates.
- *Understanding customer behaviors* during the recruitment process and through customer surveys during and after demand response events.
- *Building capabilities* to forecast the real household EV charging load associated with managed charging.

## **Lessons Learnt Summary**

The Project was announced in February 2021 and we are now nearing the completion of the recruitment and development phase of the project. During this phase we learned the following:

- The interest in the trial exceed expectations with over 500 eligible registrations of interest being recorded for the 176 places for customer participant places.
- Direct marketing via email to JET Charge's existing EV customer list was the most effective channel for participant recruitment, followed by Facebook and friend referrals.
- Tasmania recorded the highest registered interest, this may be attributed to the local media picking up the story with interest from the local government including the Tasmanian State Premier.
- Despite having a relatively long list of questions (23 in total) for the online registration form, applicants were not deterred from registering which was an initial concern. The additional information then made it easier to screen registrants for eligibility.
- With a consortium of partners with different experiences, capabilities and technologies, interpretation of technical standards varied. A great deal of time and effort was required to agree on the application of IEEE2030.5 as a communications protocol for the Application Programming Interface (API) for the development of the aggregator platform.

# Lessons Learnt

## #1: Establishment and commencement of customer recruitment approach for the trial

**Category:** Customer

**Objective:**

To create a brand, with a new dedicated website and supporting marketing material, to promote the Dynamic Electric Vehicle Charging Trial project to recruit 176 eligible customers across three states (VIC, ACT, TAS) to participate in the trial.

**The brand:**

We chose the name “EV Grid” because it was short but descriptive enough to attract EV owners, whilst providing some context that it was being led by a group of electricity distributors, who manage the electricity grid. The .com.au Australian domain was also available, without any trademarks.



**The website:**

We created the brochure website [www.evgrid.com.au](http://www.evgrid.com.au) (screenshot below), to explain the intended purpose of the trial and promote the key Customer Value Proposition (CVP) – the free smart charger.

The website also included information about who the trial is for, the participating electricity distributors, some FAQs, and the Call To Action (CTA) – to “Register your interest”.

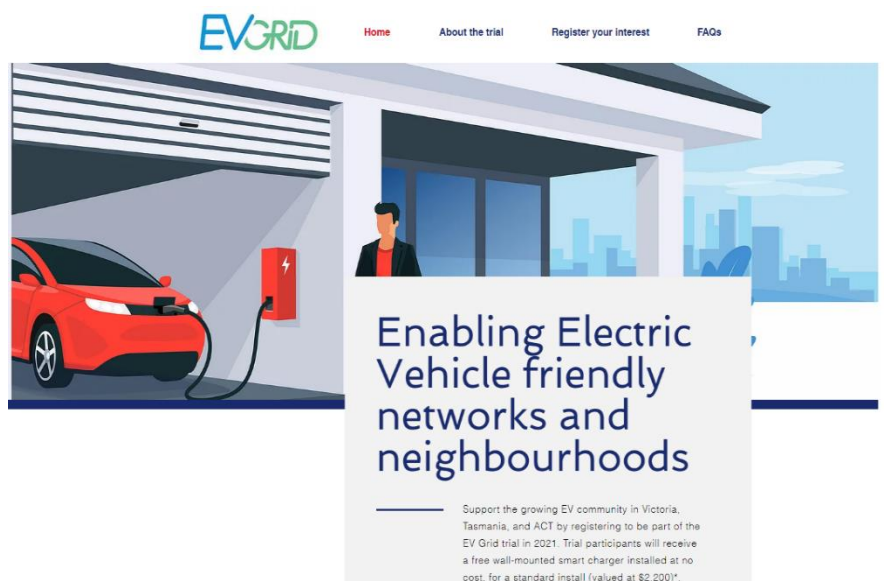


Figure 1.1. [www.evgrid.com.au](http://www.evgrid.com.au) landing Page

## Driving awareness:

To promote the trial and drive traffic to the website, we created a flyer that we used through various channels (including industry contacts, local councils, and EV groups). The CTA for the flyer was to visit the EV Grid website (screenshot of flyer figure 1.2).

## Driving awareness (continued):

We actively targeted EV owners groups on social media channels, like the [Tesla Owners Club of Australia \(TOCA\)](#), [Nissan LEAF Owners Australia](#), [Hyundai EV Enthusiasts Australia \(Ioniq & Kona\)](#), [Electric Vehicles for Australia](#), and members of the [Australian Electric Vehicle Association \(AEVA\)](#).

We also created state based Media Releases ([ACT](#), [VIC](#), [TAS](#)) that we actively promoted after the Minister and ARENA had announced the trial. This was particularly well received in Tasmania, where local media outlets picked up the story and promoted it, resulting in further interest from the local government, including the Tasmanian Premier.



The flyer features the EV GRID logo at the top. A blue box on the left lists four requirements with checkmarks: 'DO YOU OWN A PLUG-IN ELECTRIC VEHICLE (EV)?', 'LIVE IN VIC, TAS, OR ACT?', 'AND WANT A FREE 7.2kW SMART WALL CHARGER? [professionally installed, worth \$2,200\*]', and 'PLUS RECEIVE A \$300 BONUS? [for being a participant in the 12 month trial]'. To the right, text explains the smart charger's compatibility and the trial's purpose. A central illustration shows a red EV charging in a garage with solar panels. At the bottom, logos for participating electricity distributors (JET CHARGE, Jemena, AusNet, united energy, TassNetworks, evoenergy) are listed. The footer contains the slogan 'Enabling electric vehicle friendly networks and neighbourhoods' and the website 'www.evgrid.com.au'.

Figure 1.2 EV Grid recruitment flyer

Figure 1.3 below shows the traffic to the EV Grid website, since it went live in February 2021. We have had almost 3,000 Unique Visitors view the website over the past 3 months.

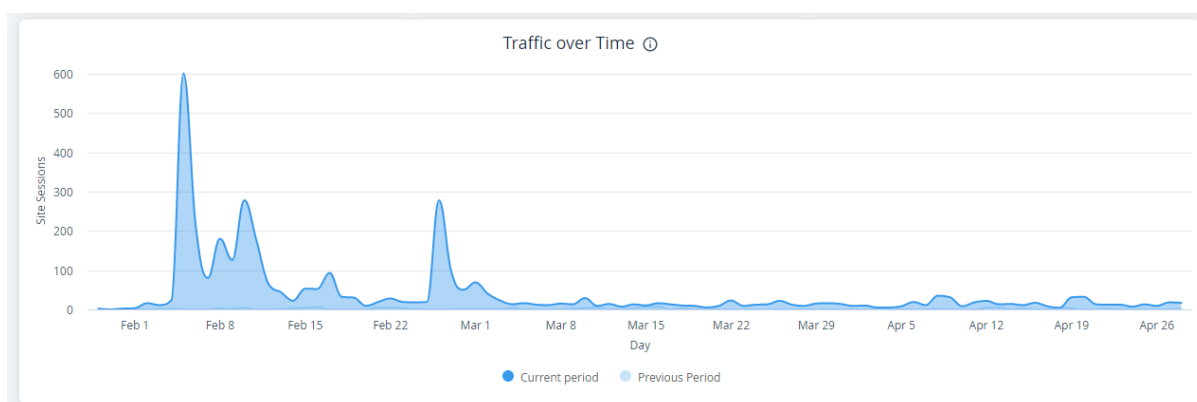


Figure 1.3 EV Grid website traffic flyer

Figure 1.3 shows a second spike in website traffic on Friday 26<sup>th</sup> February 2021. This was driven by JET Charge sending out a targeted email to about 2,000 of their existing customers in Victoria, Tasmania, and the ACT, resulting in about 400 incremental website visits (20% Click Through Rate), and 134 additional customer registrations (33% Conversion Rate).

Figure 1.4 below shows the main sources of the website traffic. Direct visits accounted for over 60% of traffic to the site with referrals from social media including Facebook and LinkedIn.

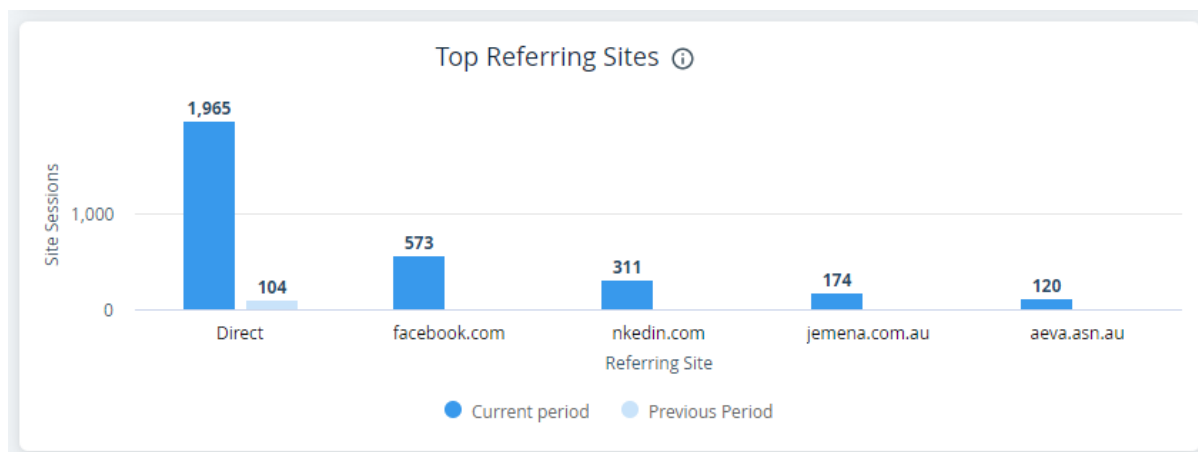


Figure 1.4 EV Grid website referring sites

### Customer Registrations:

From the 3,000 Unique Visitors who viewed the EV Grid website, we had 595 people register to participate in the trial, resulting in an overall conversion rate of about 20%.

About 20 of the registrations were people who registered twice, with one person registering 3 times.

A further 76 registrations were from people who lived within a non-participating electricity distribution network area (mostly Citipower and Powercor), but also 3 from SA, 2 from NSW, and 1 from QLD.

After initial screening, we had about 500 eligible registrations to choose from, to meet our target of 176 charger installs. TasNetworks had the highest number of registrations, receiving a total of 160 (against their install target of 22), mostly due to the local media attention and local AEVA interest.

Below is a chart that shows the top 10 reasons people gave when they answered the question “How did you find out about this trial?” during registration.

| RANK | AWARENESS SOURCE                               | #   | %   |
|------|--|-----|-----|
| 1    | JET Charge customer email                      | 134 | 24% |
| 2    | Facebook Group - TOCA                          | 77  | 14% |
| 3    | Referred via Friend                            | 71  | 12% |
| 4    | Australian Electric Vehicle Association (AEVA) | 57  | 10% |
| 5    | The Mercury Newspaper (Hobart)                 | 35  | 6%  |
| 6    | Facebook Group - Nissan                        | 32  | 6%  |
| 7    | Online - General                               | 35  | 6%  |
| 8    | LinkedIn                                       | 23  | 4%  |
| 9    | News - General                                 | 21  | 4%  |
| 10   | The Good Car Company                           | 13  | 2%  |

Figure 1.5 EV Grid Trial awareness source

Figure 1.6 shows the customer registrations, by DNSP, which shows that we successfully exceeded our recruitment targets to allow for dropout through the onboarding/installation process.

| <b>CUSTOMER REGISTRATIONS</b> | <b>ACTUAL</b> | <b>TARGET</b> | <i>buffer</i> |
|-------------------------------|---------------|---------------|---------------|
| <b>AusNet Services</b>        | <b>100</b>    | <b>33</b>     | 67            |
| <b>Evoenergy</b>              | <b>57</b>     | <b>25</b>     | 32            |
| <b>Jemena</b>                 | <b>49</b>     | <b>23</b>     | 26            |
| <b>TasNetworks</b>            | <b>160</b>    | <b>22</b>     | 138           |
| <b>United Energy</b>          | <b>128</b>    | <b>73</b>     | 55            |
| <b>TOTAL</b>                  | <b>494</b>    | <b>176</b>    |               |

Figure 1.6 EV Grid registrations by DNSP

### Key insights and implications for future projects:

During the customer recruitment phase of the trial, we learnt that current EV owners are generally highly engaged, and quite knowledgeable about EV technology.

Many were keen to find out more information, particularly with regards to the technical specifications of the EV charger, which resulted in us updating the FAQs on the EV Grid website.

We also found that Facebook was a great channel for promoting the trial, as there were existing Australian EV owners groups that had highly engaged members, and the social media platform enabled people to easily share the trial with their friends and/or family who also owned an EV.

Lastly, with regards to the actual customer registration form, we initially thought there were too many questions (23 in total), which might deter people from signing up to the trial. However, given the response rate we received, it didn't seem to have an impact on people investing the time to fill out the form. On average, it took most people between 5-10 minutes to fill out the registration form. Also, because we asked quite a few questions in the initial registration form, we already had quite a lot of information that helped us to pre-screen for eligible participants.

Below is the full list of questions that were asked in the customer registration form:

1. *First Name*
2. *Surname*
3. *Mobile Phone Number*
4. *Email Address*
5. *Home Address (street number/name)*
6. *Suburb*
7. *Postcode*
8. *State*
9. *I live in a ...*
10. *Who is your Electricity Distributor?*
11. *Please enter your National Metering Identifier (NMI), if known*
12. *Does your home have Rooftop Solar PV?*
13. *Does your home have a battery installed?*
14. *Does your home have a Smart Meter installed?*
15. *Is anyone at your home a registered Life Support customer?*
16. *Do you have off-street parking?*
17. *EV Make*

18. *EV Model*
19. *Do you have an existing EV wall charger installed?*
20. *How many kms do you usually drive each year?*
21. *How did you find out about this trial?*
22. *Are you already involved in another EV trial, by an Electricity Distributor or Retailer?*
23. *Customer Consent Tick Box*

### **Future questionnaire considerations**

- Ensure that the customer registration experience is simple and intuitive.
- Keep questions succinct and answerable without registrants having to look for supporting information.
- Utilise Online portal/form to collate responses, and record how long it takes to complete the questions, to ensure a positive customer experience.
- Avoid asking too many questions. Ask just enough to assist with participant selection.
- Online registration allows tracking of time taken to complete the form, identifying if the registration process is taking too long and therefore registrants potentially losing interest.



## #2 Establishment of aggregation software platforms and testing

Category : Technical



### Objective:

To provide lessons learned during the development phase for the establishment of the aggregator software platform, "Illuminate" by JET Charge,

JET Charge is a consortium partner with experience in managing complete end-to-end customer solutions including EV charging hardware manufacturing and distribution, installation, maintenance and software. JET Charge will perform the role of the smart charger provider & installer as well as the EV charging aggregator working with the DNSPs and the EV customers enrolled in the program.

### Background

JET Charge is providing an aggregator platform for the trial, which is based on their existing energy management capabilities at the household level. JET Charge is utilising their existing platform (Illuminate) for the trial. By moving the JET Charge aggregation platform to the cloud, they are able to receive "operating envelopes<sup>1</sup>" from each DNSP via an open protocol API, which can be used by other aggregators for future commercialisation post the trial.

### Operating Envelope Development

While JET Charge's Illuminate platform was already developed, a key input into the establishment of the aggregator platform for this trial was the agreed protocol for receiving the operating envelope format from the DNSPs. This was a key component to finalise and test the algorithms for the platform. Jet Charge relied on agreement on the operating envelope structure and communications protocol. Given the different DNSP technologies, capabilities (e.g. access to smart meter data) and requirements, it was very challenging to get the desired agreed envelope in the time available to allow JET Charge to test and provide the operation of the aggregator platform. JET Charge were, however able to progress substantially without the final envelope structure in their development and testing. The proposed operating envelope (Fig 2.1 right) is currently being tested.



#### Dynamic EV Charging

#### Operating Envelope

This document is created to define the operating envelope (OE) to be sent to Jet Charge as part of the Dynamic EV Charging Project.

- The operating envelope (OE) will be sent every 5 minutes.
- The OE will be sent in XML format using principles of IEEE 2030.5.
- The OE will be sent at NMI level with a single device associated at the NMI.
- The OE will provide Watts and VArS at a specified start time of a certain duration. VArS will be zero for purpose of trial but are included as part of IEEE 2030.5 format.
- Where an OE start time overlaps the previous OE, the newest OE will take precedence.
- Where an OE is not sent or received by Jet Charge a Default 24 hour OE will apply for the duration until OE is successfully sent and received.
- Jet Charge will use a nominal voltage of 230 V to convert Watts (received in OE) to Amps (sent to the EV charger).

Format of OE to be sent to Jet Charge is below:

```
<ENDDevice>
<sFID>6306574856</sFID>
<DERControlList>
  <DERControl>
    <mRID>ABC123</mRID>
    <interval>
      <duration></duration>
      <start></start>
    </interval>
    <DERControlBase>
      <opModLoadLimW></opModLoadLimW>
    </DERControlBase>
  </DERControl>
  ...
</DERControlList>
</ENDDevice>
```

Figure 2.1 EV Grid Operating Envelope

<sup>1</sup> An operating envelope is the Distributed Energy Resources (DER) or connection point behaviour that can be accommodated before physical or operational limits of a distribution network are breached. A dynamic operating envelope is a principled allocation of the available hosting capacity to individual or aggregate DER or connection points within a segment of an electricity distribution network in each time interval. A dynamic operating envelope essentially provides upper and lower bounds on the import or export power in a given time interval for either individual DER assets or a connection point. (ARENA.gov.au/knowledge-bank/On the Calculation and Use of Dynamic Operating Envelopes)

## API Integration

During the project initiation stage the intent was to use API integration to send DNSP operating envelope directly to Illuminate and then receive charging data in return. It was anticipated that an adaptation of open standard IEEE2030.5 would be used for the communications protocol for this project. A simplified 'shutdown' version was envisioned to develop a fit for purpose protocol that would inform the operating envelope for this trial. Unfortunately given the multiple consortium partners with varying experiences and requirements, reaching a consensus on the interpretation of the application of IEEE2030.5 was challenging.

A Feasibility study (Fig 2.2) for using IEEE2030.5 determined that full application of the standard would not be feasible given the timing and scope of this trial.

Reaching an agreement on the use and application of IEEE2030.5, caused delays in the development of the operating envelopes and therefore placed JET Charge under pressure to complete the development and configuration of the aggregator platform to meet the tight timeframes.

For future trials of this nature, consideration should be given for either adopting a standard in full or not adopting all together. A simplified or cut down application of the standard is open to differing interpretation, resulting in confusion. Particularly in a trial of this nature where there are multiple partners with varying experiences and capabilities. If a simplified approach to adopting a standard is taken, then the Project should seek clear alignment as to the interpretation of what part(s) of the standard will be applied to avoid confusion.

## Platform Development Challenges

JET Charge experienced some challenges in the development of the aggregator platform, There were considerable delays between the establishment of original project concept and timelines and the final project approval and announcement. This led to shrinkage of several months in the time available for the development of the deliverables for JET Charge. While the program there was an additional month added to this timeframe, this did not offset the time lost to plan in detail, mobilise, undertake product development and test. For future projects, potential delays in project contract finalisation and announcement need to be better accommodated in the project timetable.

Furthermore for the benefit of the trial, It was agreed that the schedule was to be accelerated somewhat to facilitate data gathering in Tasmania by TasNetworks. This would enable the trial to gain valuable insights

### ARENA EV Charging Project - Interface/Interoperability Feasibility Study (IEEE 2030.5)

IEEE 2030.5 Standard for Smart Energy Profile Application Protocol was developed in 2013 to provide a standard means for communicating and controlling smart devices.

The full IEEE 2030.5:2018 standard is very large and complex and includes support for:

- Device registration
- Device configuration, including settings.
- Device control (direct, schedules, curves)
- Metering
- Alarming
- Billing
- Time synchronisation

The proposed scope for this project in the adoption of the standard is to have the operating envelope communicated to JET Charge to be in line with the IEEE2030.5 standard when constructing messages where possible such as data format, data rate etc. as a lite approach and will not be implementing the full protocol such as end-to-end cyber security requirements, device registration and discovery process, communication mechanism etc.

This section describes the recommended lite approach of IEEE2030.5 implementation based on the proposed scope. The OE instructions are generated by the DNSP systems and communicated to DERClient (JET Charge aggregator) through polled communications or subscription notification, depending on the JET Charge integration configuration. To enable real time emergency overrides control capability in response to a critical network event, the subscription notification integration approach is preferred over polled communications. In other words, DNSP will post OE instructions to JET Charge API. Subscription registration and discovery process, communication mechanism etc. is only applicable for the DERClient behind an OEM aggregator. (JET Charge to confirm if there is any DirectDER configuration in their fleet.)

According to the standard, an OE instruction message will typically consist of:

- Instruction type (Importing limit: `OpModImpLimW`)
- Start time (Epoch time)
- Duration (seconds)
- Instruction value (`boolean` or analogue)
- Randomised start time
- LFDI (Device ID)

The full IEEE 2030.5 standard covers an extensive list of the control modes supported by the DER, however, the import limit control mode required for this project is not currently defined in the standard. To include the import limit control mode, a substantial effort to extend the standard to include "OpModImpLimW" is required. Without extending the standard to include control for importing limits, there will be a minimum (if not zero) application in the future that will conform to this format.

A consultation about the adoption of IEEE 2030.5 lite with all project partners and other members of industry is required to assess if this is a fit-for-purpose approach. Should we leverage IEEE 2030.5 as the protocol for EV Charging project or alternative interface/interoperability should be considered? This is a key decision prior system integration design can begin.

The standard also covers the Meter Reading scope for device monitoring; however, it is not clear to us if this is in the original proposed scope to ARENA. This feasibility study has excluded any details on IEEE 2030.5 adoption regarding EV monitoring.

Figure 2.2: Feasibility Study (IEEE2030.5)



during the Tasmanian winter peak in 2021. The impact of this decision was that the Aggregator platform needed to be developed and tested in a much shorter timeframe than first anticipated.

JET Charge estimated resources and effort at the project initiation stage when the scope had not yet been determined in detail. JET Charge advised that they underestimated the effort and found that the product development took longer, however they were able to redirect other resources and utilise all remaining schedule float to ensure that they delivered the platform on time.

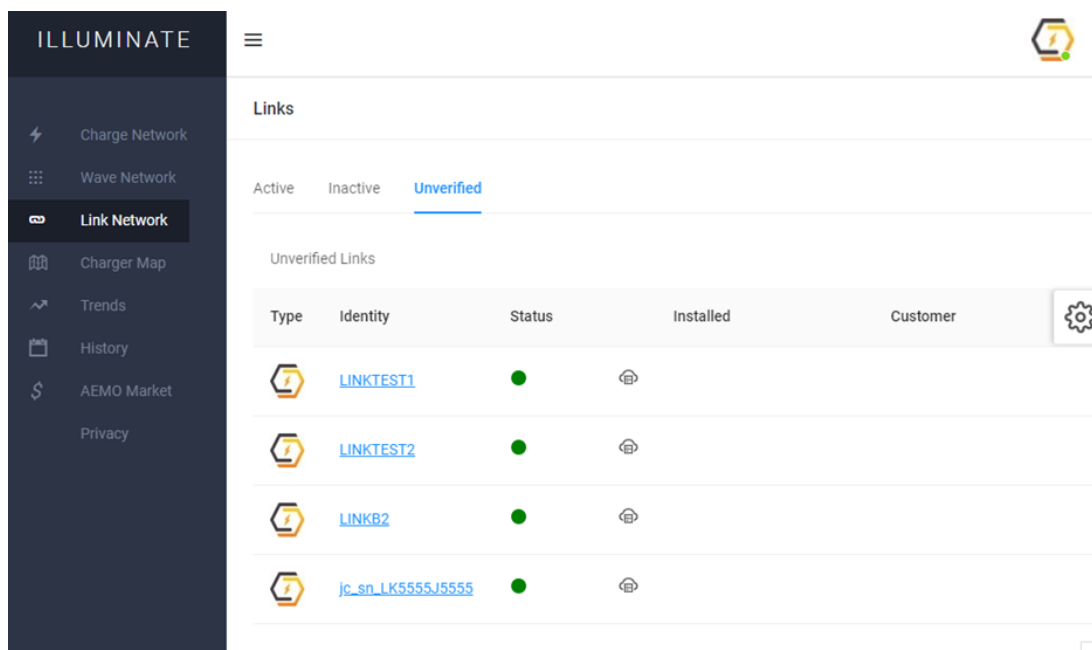


Figure 2.3: Illuminate screenshot