

# Lessons Learned

## Background

### About Chargefox

Chargefox is a business dedicated to accelerating the uptake of electric vehicles (EV) in Australia. We have built an EV charger management platform and freely accessible app, and have more than 500 plugs under management. We are also building Australia's first Ultra-Rapid charging network, which connects Brisbane, Sydney, Melbourne and Adelaide, and adds stations in Western Australia and Tasmania. We will deliver at least 22 sites before the end of 2019, using a mix of Ultra-Rapid 350kW DC chargers for future vehicles, and 50kW DC units for legacy EVs.

The first two sites are completed and open, another six will be open before the end of the financial year, and the remaining 14 opened in the last 6-months of 2019.

This report covers lessons learned in the previous 12 months, from April 2018 to March 2019.

### Delivery Team

Many of the lessons learned in this project have been realised in contrast to previous experiences with Tesla. Head of Charging, Evan Beaver, managed the Tesla Supercharger Program during 2014-2016 and based many of the assumptions about the Chargefox on that program. The differences between those experiences inform the next few lessons.

### Procurement is a big job

Tesla's Supercharger Network is built using Tesla charge posts and rectifiers, designed and built in the same factory as the cars. There is no engineering effort required to assess this equipment, because there are no choices.

For the Chargefox network at the start of the program we spent a lot of effort ensuring what we are building meets the car manufacturers' requirements. This work established our functional specifications for the charging equipment of CCS2 and CHAdeMO plugs, capable of delivering 150kW+ per parking space.

The chargers are a large part of our program budget, about \$5.5m of a program budget of \$15m. Their output, reliability and appearance will have a direct impact on the success of



our program as the key technology that drivers interact with. There is a lot of incentive to get this right.

The market for high-power chargers is maturing, so technical questions of deployment per region require serious engineering assessment. At the time of purchase there were only six chargers of this power deployed worldwide, so there was no experience to review in the assessment.

To make the decision for the initial purchases required deep engagement with manufacturers on the status of their products, timelines for delivery of new features and assessment of their service and support functions.

This procurement task took almost 3 months of full-time equivalent hours, and required engineering, planning, electricity network operator and legal input to complete the sale. Much longer than expected.

### New High-Voltage Connections are Still Tricky

We knew at the outset that managing the cost and timeline of new high-voltage connections would be difficult, but even then our first new connection brought unexpected failure modes.

The critical path for the site timeline is through transformer procurement. In a 6-month project, the key is to race to a high-voltage draft design with enough certainty to order the transformer. This draft design has to be approved by the electricity network operator (DNSP) and DNSPs will only receive designs from accredited designers.

The first designer we engaged didn't understand that they didn't hold these qualifications. We created a design and submitted it, which was rejected out of hand by the DNSP. Sadly the lesson here was not to trust suppliers at their word and check their qualifications.

We engaged a new designer with the appropriate qualifications and deep connections in the HV sector in Victoria. They were able to get a draft transformer specification approved quickly to commence transformer procurement. This business then spent a full month trying to procure a single transformer that could be delivered in 16 weeks. These are items manufactured in Australia that still take 16 weeks to deliver. After one month of a dedicated team searching we were able to procure a single 1000kVA transformer. Twice the size that we required, but the only one available so we put a deposit on it. This was then delivered a month late.

The late transformer delivery then pushed out the network outage with Ausnet. Once the transformer is installed operators can book a date for the network to be de-energised so the new transformer can connect safely. Getting this date took two weeks, with a requirement that there is a month between booking and the outage date.

The waiting period is designed to notify local customers that there is an outage coming. Our new neighbours, a large petrol station complained about the loss of trade, so we



designed and installed a generator at their site, at our cost, to keep them operating. This was about \$6000 for the day. We were not required to do this but did it as a show of goodwill to the station operators.

Connecting during the outage is a big job, requiring co-ordination of about 20 electricians on site, four different service trucks and fair weather. All crews were in place for the cut-over at the right time with good weather and a generator running next door. At the appointed time we contacted Ausnet to confirm the outage, as part of normal operating procedure. At this point we were informed that Ausnet had a communications outage, which meant they could not operate their switches remotely. The cut-over could not proceed. All crews stood down and the generator ran the petrol station for the rest of the day, because it can't be disconnected during operation.

A new outage was set 18 days later. Again a local electricity user complained, and this time engaged lawyers and threatened disruption and legal disputes if we didn't pay for a generator again, which we are not obliged to do by law. To minimise disruption to the project we chose to provide assistance with the second generator.

The overarching lesson here is that there are many ways a new high-voltage connection can be delayed, many out of our control, with large timeline impacts. With this in mind, the appropriate response is to manage stakeholder expectations about the timeline and retain timeline slack to ensure delivery.