

**ZENOBE**



# Lessons Learnt Report No. 1

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Next Generation Electric Bus Depot

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## **Disclaimer and Acknowledgement of support:**

*The views expressed herein are not necessarily the views of the Australian Government. The Australian Government does not accept responsibility for any information or advice contained within this document.*

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## Document Control

Revision	Description	Author	Reviewer	Approver	Date
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# 1. Project Overview

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## 1.1 Executive Summary

This report contains key lessons learned during the development and initial construction phase of the Next Generation Electric Bus Depot at Leichhardt, Sydney. The project comprises the deployment of 40 battery electric buses and associated on-site charging infrastructure (electric chargers, solar PV, energy storage system, grid works).

This report focussed on the project development and initial construction phase and includes commercial, technical, regulatory and logistical lessons learned by members of Zenobē's project team directly involved with the development and delivery of the project.

## 1.2 Project Objectives

### Objective 1

Reduce barriers to electrification of bus fleets.

### Objective 2

Provide electric bus operators with a possible financing model that allows the amortisation of the charging infrastructure costs (solar, batteries, chargers) across enough buses to improve and test economics.

### Objective 3

Promote use of renewable energy in the transport sector.

### Objective 4

Maximise the value of a scalable model and demonstration of an electric bus fleet that can be applied to Australia's largest bus depots.

## 1.3 Current Project Status

Construction works at the Leichhardt Bus Depot for Stage 2 are well underway. Our primary subcontractor Tobco as well as our solar subcontractor Smart Commercial Solar have deployed all necessary equipment and tools to site to be able carry out the planned civil, electrical and solar works. During the reporting period of this Lessons Learnt Report the following key works have been completed:

- A new Substation with a power capacity of 1.5 MVA has been installed (waiting for Ausgrid commissioning)
- 5 DC fast chargers have been installed and commissioned (meaning that all 36 chargers for the project have been powered up)
- All the relevant civil works to install the above-mentioned electrical equipment have been undertaken including trenching across the depot yard, installation of conduits and electric cables, etc.
- Solar Panels with a total power capacity of 388 kW have been lifted and installed on the depot's roof.
- Preparations for the installation of the future Battery Energy Storage System (BESS) have been undertaken.
- Permanent restoration of the depot yard has been finished.

## 2. Lesson learnt no. 1: Be prepared for brownfield site challenges (Technical/Risk)

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### Objective: 1

#### Detail:

Service scanning shouldn't be limited to underground services especially for old brownfield sites; it should be comprehensive, consider the high-level design and include:

- building services
- lights
- consider zones of influence.

Some services can't be detected such as irrigation plastic pipes, sewer, these need inspections after the high-level designs. Drawings and knowledge of underground services are not always available as current depots are usually old.

#### Implications for future projects:

- comprehensive scanning should be included in the contracting process from the beginning – scanning is optimised if done by contractor who is responsible end-to-end (EPC/D&C) and this minimises “surprises” in the future
- allow for contingency (time and money) for “surprises” such as underground services which were not picked up by scanning or unable to be picked up by scanning due to being plastic.
- more engagement on planning requirements and processes from the contractor as well as Public Transport Authorities to mitigate issues

#### Conclusion:

Early and comprehensive service scanning at brownfield depots will be fundamental to achieving timely and cost-effective project outcomes. This should feed into the design process and designs continually reviewed to make sure latest information from service scanning is incorporated.

## 3. Lesson learnt no. 2: Consider weather risks/events in contracting (Risk)

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### Objective: 1

#### Detail:

Severe wet weather has been a constant issue due during the build of the project. Many of the build items are electrical and are outside in the elements. Wet weather at these exposed sites can severely limit the ability to install and commission electrical equipment which has led to delays.

#### Implications for future projects:

When building on an exposed depot, which is most of the depots in Australia, severe weather such as floods, thunderstorms and prolonged wet spells should be provisioned in the contracts to allow extension of time for the project programme.

#### Conclusion:

Add into contracts provision for wet weather delays when installing electrical equipment outdoors. Provisioning for this can reduce construction & commissioning delays significantly.

## 4. Lesson learnt no. 3: Agree risk allocation early in the project development (Commercial/Risk)

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### Objective: 2

#### Detail:

Contract finalisation was materially longer than expected due to a number of factors but primarily was influenced by negotiating the risk allocation between the key parties including the recipients, operator and transport authority. In particular risks such as grid outages and supply chain constraints caused by external factors such as weather, pandemic or conflict.

#### Implications for future projects:

While the project structure can be easily replicated, introducing new operators and different jurisdictions (and their nuances around contracting, services and Government participation) will require time for a thorough explanation of the roles and responsibilities of all parties to meet expectations and ensure risk is allocated appropriately. While the risks are universal, different authorities may have different levels of comfort or appetite for bearing particular risks.

#### Conclusion:

Public tenders need to clearly specify risk allocation between stakeholders. There should be greater time given to the Term Sheet phase to agree the risk allocation before proceeding to formal documentation.

## 5. Lesson learnt no. 4: Improved driver training (Risk)

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### Objective: 1

#### Detail:

Most downtime issues with electric buses in our experience and in relation to this project are caused by user error and insufficient driver training. Issues can be caused by a number of factors the chief amongst are collisions and improper stowage of charging cables after use, leading to charging guns being run over and damaged. Driver training is conducted by the operators and training for the operation and plugging in of electric buses to chargers is conducted by the bus manufacturers however a gap was identified with the stowage of cables.

#### Implications for future projects:

Reducing the occurrence of these issues could have a profound impact on the delivery schedule and overall experience of the drivers with electric buses. Install signage to remind drivers to stow charging guns properly after use and work with bus operators to provide training on proper stowage. A solution was also included by placing cable hooks on the back of chargers.

#### Conclusion:

Driver training is an integral part of the service delivery and minor improvements to the current training regime can be made to mitigate the gap identified in cable stowage. For depot design there needs to be signage and dedicated cable management included at the initial design and procurement stage.

## 6. Lesson learnt no. 5: Education of Bus Industry (Commercial/Technical)

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### **Objective: 1**

#### **Detail:**

Government, Operators & technology suppliers need to work collaboratively to:

- Mitigate interoperability challenges
- Mitigate production and installation delays
- Understand the differences from an operational, planning & environmental perspective of EV depot vs a normal depot

#### **Implications for future projects:**

Market is evolving from a very low level of understanding. Challenges found on this project will be mitigated through the learnings provided by this project and via items such as this report and a planned Government Knowledge Sharing Workshop.

#### **Conclusion:**

Education of the industry will lead to better outcomes and speed up the transition process going forward.