

# **Mayor of London / Gnewt Cargo Electric Vehicle Trial**

Q5 Environmental Update Report

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**[www.london.gov.uk](http://www.london.gov.uk)**

enquiries 020 7983 4100

minicom 020 7983 4458

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# CONTENTS

<b>Executive Summary</b>	<b>1</b>
<b>Introduction</b>	<b>3</b>
<b>Background</b>	<b>5</b>
<b>Pollutant Saving</b>	<b>7</b>
<b>Overview</b>	<b>8</b>
<b>Emissions Assessment Methodology</b>	<b>8</b>
<b>NO<sub>x</sub> and PM<sub>10</sub> Exhaust Emissions Saved</b>	<b>10</b>
<b>CO<sub>2</sub> Exhaust Emissions Saved</b>	<b>12</b>
<b>Savings During the Trial</b>	<b>14</b>
<b>Conclusion</b>	<b>15</b>

# Executive Summary

The Mayor of London / Gnewt Cargo project, which ran from July 2017 to December 2019, examined the logistical, environmental and economic performance impact of modified, larger electric vehicles (EVs) for delivery and logistics purposes in London.

This report should be read as a supplement to the Baseline Data Report.

Each report focuses on air pollutant savings which are presented in terms of vehicle exhaust emissions of oxides of nitrogen, particulate matter and carbon dioxide.

The project is divided up into the following reports:

- Baseline Report
- Operational Costs and Environmental Benefits
- Key Barriers Report
- Charging Infrastructure Grid Report
- Q1 Environmental Update Report
- Q2 Environmental Update Report
- Q3 Environmental Update Report
- Q4 Environmental Update Report
- **Q5 Environmental Update Report**
- Q6 Environmental Update Report
- Q7 Environmental Update Report
- Operational Costs and Environmental Benefits refresh
- Charging Infrastructure Grid Report refresh
- Final Data Analysis Report
- Final Report

This is the fifth quarterly environmental report and some early observations around the positive impact of using the trial electric vehicles over Euro 6 diesel equivalents. The exhaust emission savings have been calculated following the methods set out in the Baseline Data Report.

This report covers the fifth quarter from November 2018 to January 2019. Based on replacing Euro 6 diesel vehicles the savings in this quarter are:

Emission type	ALL Gnewt fleet including trial vehicles (49 vehicles)	Trial EV's only (19 vehicles)
Quarter 5 (PM <sub>10</sub> g)	320.9	141.7
Quarter 5 (NO <sub>x</sub> kg)	135.9	60.0
Quarter 5 (CO <sub>2</sub> t)	20.8	9.9

# Introduction

This report provides an update on the environmental savings achieved between November 2018 and January 2019, through the use of electric vehicles (EVs) for the Mayor of London/Gnewt Cargo EV trial project to date (see the next section for project background).

In order to demonstrate the air pollutant savings which result from using EVs rather than diesel vehicles, an assessment was undertaken quarterly, comparing the data collected from the EVs directly to the diesel equivalents as trialled through the baseline data collection period.

Emissions: The assessment has considered vehicle exhaust emissions of;

1. Oxides of nitrogen (NO<sub>x</sub>);
2. Particulate matter (PM<sub>10</sub>); and
3. Carbon dioxide (CO<sub>2</sub>).

The emissions that would result from a diesel vehicle are then compared to those from an electric vehicle (i.e. zero emissions at the exhaust).

This report is the fifth quarterly report and covers the 13-week period between November 2018 and January 2019. The quarterly report also presents the cumulative data in order to present a true picture of the impact of the trial rather than just the data for each quarter.

All reports and the environmental impact are based on the data obtained from Gnewt Cargo's systems and are subjected to fluctuations in operational activity and use of the trial vehicles which may vary according to business factors.

Gnewt's fleet of 49 EVs were monitored and reported on. When this report was originally written in February 2019 this fleet comprised 15 Nissan Voltia and four BD Auto eDucato (larger trial vehicles) and 30 smaller EVs (four Nissan eNV200 & 26 of the 44<sup>1</sup> Renault Kangoo). The larger trial vehicles made up 39% of the overall EV fleet. This changed as more trial vehicles were added throughout the trial.

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<sup>1</sup> A total of 26 Renault Kangoo vehicles recorded data over this period. In total 44 Renault Kangoos were used in at least one quarter throughout the trial period.

# Background



The Mayor of London / Gnewt Cargo project, which ran from July 2017 to December 2019, examined the logistical, environmental and economic performance impact of modified, larger electric vehicles (EVs) for delivery and logistics purposes in London. Gnewt Cargo specialises in delivery of goods using electric and low emission vehicles.

At present, EV fleets tend to comprise purpose-built small cars and vans (max. 4.6 tonnes). There is a limited production and uptake of larger (7.5 tonne) electric vans and vehicles such as those comparable to the Mercedes Sprinter (capacity 8.5m<sup>3</sup>/ payload 1,035 kg). This project examined the benefits/disbenefits of the introduction of larger electric vehicles to London roadways.

The new electric cargo vehicles, which are the subject of this trial, are the Nissan Voltia eNV200 and BD Auto eDucato. The use of these vehicles in the project are summarised as follows:

- Since November 2017, 15 Nissan Voltias were live and deployed by Gnewt Cargo, each vehicle was assumed to operate five days per week.
- Since January 2018, four BD Auto eDucatos were live and deployed by Gnewt Cargo, each vehicle was assumed to operate five days per week; and
- Additional Nissan Vic-Young vehicles were added to the Gnewt Cargo fleet later in the trial and appear in subsequent issues of the report.

# Pollutant Saving

## Overview

In order to demonstrate the pollutant savings from the use of EVs as a replacement for diesel light goods vehicles (LGVs), an assessment has been undertaken to calculate the emissions which would have been generated by diesel LGVs based on the distance travelled and fuel used by the EVs during November 2018 to January 2019.

The assessment has considered vehicle exhaust emissions of oxides of nitrogen (NO<sub>x</sub>), particulate matter (PM<sub>10</sub>) and carbon dioxide (CO<sub>2</sub>).

## Emissions Assessment Methodology

To calculate the weekly diesel vehicle NO<sub>x</sub> and PM<sub>10</sub> exhaust emission savings in grams, the total kilometres travelled per week are multiplied by the relevant exhaust emission factors from COPERT 5<sup>2</sup>. COPERT is a European database of emissions factors for all vehicle types at different speeds. For this report, the Euro standard 6 exhaust emission factors are used, and it is assumed that all vehicles had an average speed of 8.4kph, which was estimated during the baseline testing conducted by LowCVP in September 2019.

The September 2019 baseline testing also provided CO<sub>2</sub> exhaust emissions for the Nissan NV200. The NV200 CO<sub>2</sub> emissions are scaled up to give corresponding emissions for the diesel equivalent of both the Nissan Voltia and the eDucato<sup>3</sup>. To calculate weekly diesel vehicle CO<sub>2</sub> exhaust emission savings in kilograms, the total kilometres travelled per week are multiplied by the relevant exhaust emission factors<sup>4</sup>.

Table 1 provides the exhaust emission factors used to calculate emissions for equivalent diesel LGVs. Further calculation details are provided in the Baseline Data Report.

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<sup>2</sup> COPERT 5, <https://copert.emisia.com/>

<sup>3</sup> The method of scaling up CO<sub>2</sub> emissions for the diesel equivalent of the Nissan Voltia and the eDucato is given in the Baseline Report.

<sup>4</sup> For this report the CO<sub>2</sub> exhaust emissions were calculated based on distance travelled. However, the accompanying Operational Costs and Environmental Benefits report adopts the DfT TAG methodology which reports the saved vehicle exhaust emissions as carbon dioxide equivalent and the saved emissions were calculated based on the gCO<sub>2e</sub> per litre of diesel and the energy use by the NV200 and Ducato.

Vehicle exhaust emission factors are dependent on vehicle type, engine fuel type, Euro standard and average speed. Factors such as vehicle age and maintenance also have an impact, however, these have not been considered in the calculations.

**Table 1 Exhaust emission factors for equivalent Euro 6 diesel LGVs**

EV type	Emission factor		
	NO <sub>x</sub> (g/km)	PM <sub>10</sub> (g/km)	CO <sub>2</sub> (g/km)
Nissan Voltia	1.4	0.003	225.3
Nissan eNV200			204.0
Renault Kangoo			204.0
BD Auto eDucato			265.2

### NO<sub>x</sub> and PM<sub>10</sub> Exhaust Emissions Saved

This section presents the pollutant savings achieved by the use of EVs in replacement of Euro 6 diesel LGVs for NO<sub>x</sub> and PM<sub>10</sub>. The calculated pollutant savings for NO<sub>x</sub> are presented in Table 2 and the pollutant savings for PM<sub>10</sub> are presented in Table 3.

Pollutant savings presented in Table 2 and Table 3 have been presented for the following scenarios based on the travelled distances for each EV type:

- Pollutant savings for an average week per vehicle<sup>5</sup>;
- Total pollutant savings for an average week for the EV fleet; and
- Total pollutant savings for the reporting period (November 2018 to January 2019).

The EVs operated for a period of 13 weeks during November 2018 to January 2019.

The switch to EVs saved a total of 320.9 g of PM<sub>10</sub> exhaust emissions and 135.9 kg of NO<sub>x</sub> exhaust emissions over the reporting period when compared to a diesel LGV.

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<sup>5</sup> Average week data is based on the average distance driven per week during the quarter

**Table 2 Summary of PM<sub>10</sub> emissions savings**

EV type	No. of vehicles	Average weekly travel distance (km per vehicle)	Average weekly saving per vehicle (PM <sub>10</sub> g/week)	Total weekly saving (PM <sub>10</sub> g/week)	Total savings for report period (PM <sub>10</sub> g)
Nissan Voltia	15	176.9	0.6	8.9	115.1
Nissan eNV200	4	154.9	0.5	2.1	26.9
Renault Kangoo	26	135.0	0.5	11.7	152.3
BD Auto eDucato	4	153.5	0.5	2.0	26.6
<b>Total</b>	<b>49</b>	<b>155.1</b>	<b>0.5</b>	<b>24.7</b>	<b>320.9</b>

**Table 3 Summary of NO<sub>x</sub> emissions savings**

EV type	No. of vehicles	Average weekly travel distance (km per vehicle)	Average weekly saving per vehicle (NO <sub>x</sub> g/week)	Total weekly saving (NO <sub>x</sub> g/week)	Total savings for report period (NO <sub>x</sub> kg)
Nissan Voltia	15	176.9	249.9	3,747.8	48.7
Nissan eNV200	4	154.9	218.7	874.9	11.4
Renault Kangoo	26	135.0	190.8	4,959.9	64.5
BD Auto eDucato	4	153.5	216.8	867.2	11.3
<b>Total</b>	<b>49</b>	<b>155.1</b>	<b>219.0</b>	<b>10,449.8</b>	<b>135.9</b>

## **CO<sub>2</sub> Exhaust Emissions Saved**

This section presents the CO<sub>2</sub> emissions savings achieved by the use of EVs.

The calculated emissions savings for CO<sub>2</sub> are presented in Table 4. The switch to EVs saved 20.8 t of CO<sub>2</sub> exhaust emissions over the reporting period.

**Table 4 Summary of CO<sub>2</sub> emissions savings**

Vehicle type	No. of vehicles	Average weekly travel distance (km per vehicle)	Average weekly saving per vehicle (CO <sub>2</sub> kg/week)	Total weekly saving (CO <sub>2</sub> kg/week)	Total savings for report period (CO <sub>2</sub> t)
Nissan Voltia	15	176.9	39.9	597.8	7.8
Nissan eNV200	4	154.9	31.6	126.4	1.6
Renault Kangoo	26	135.0	27.5	716.3	9.3
BD Auto eDucato	4	153.5	40.7	162.8	2.1
<b>Total</b>	<b>49</b>	<b>155.1</b>	<b>34.9</b>	<b>1,603.3</b>	<b>20.8</b>



**Savings During the Trial**

The total savings during the trial November 2017 to January 2019 are presented in Table 6.

**Table 6 Savings during the trial period**

Vehicle type	Total savings for trial period (PM g)	Total savings for trial period (NO <sub>x</sub> kg)	Total savings for trial period (CO <sub>2</sub> t)
Nissan Voltia	479.0	202.9	32.4
Nissan eNV200	101.6	43.1	6.2
Renault Kangoo	742.0	314.2	45.4
BD Auto eDucato	74.7	31.6	5.9
<b>Total</b>	<b>1,397.3</b>	<b>591.8</b>	<b>89.9</b>

# Conclusion

This report shows that switching from diesel Light Goods Vehicles (LGVs) to Electric Vehicles (EVs) eliminates the exhaust emissions of carbon dioxide and air quality pollutants.

The savings in this quarter for the Gnewt fleet (all 49 operating vehicles including trial EVs) are:<sup>6</sup>

- PM<sub>10</sub> – 320.9 g
- NO<sub>x</sub> – 135.9 kg
- CO<sub>2</sub> – 20.8 t

The savings in this quarter for the trial EVs only (19 operating vehicles) are:

- PM<sub>10</sub> – 141.7 g
- NO<sub>x</sub> – 60.0 kg
- CO<sub>2</sub> – 9.9 t

Other quarterly reports include the Nissan Vic-Young vehicles fitted with an updated battery for performance comparison against the Nissan Voltia. The new Nissan Vic-Young trial vehicles were reported as a separate line in order to evaluate the performance against the other trial vehicles.

Total savings in the trial to date (all Gnewt EVs) are as follows:

- PM<sub>10</sub> – 1,397.3 g
- NO<sub>x</sub> – 591.8 kg
- CO<sub>2</sub> – 89.9 t

Total savings in the trial to date (trial EVs only) are as follows:

- PM<sub>10</sub> – 553.7 g
- NO<sub>x</sub> – 234.5 kg
- CO<sub>2</sub> – 38.3 t

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<sup>6</sup> All figures rounded to one decimal place

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