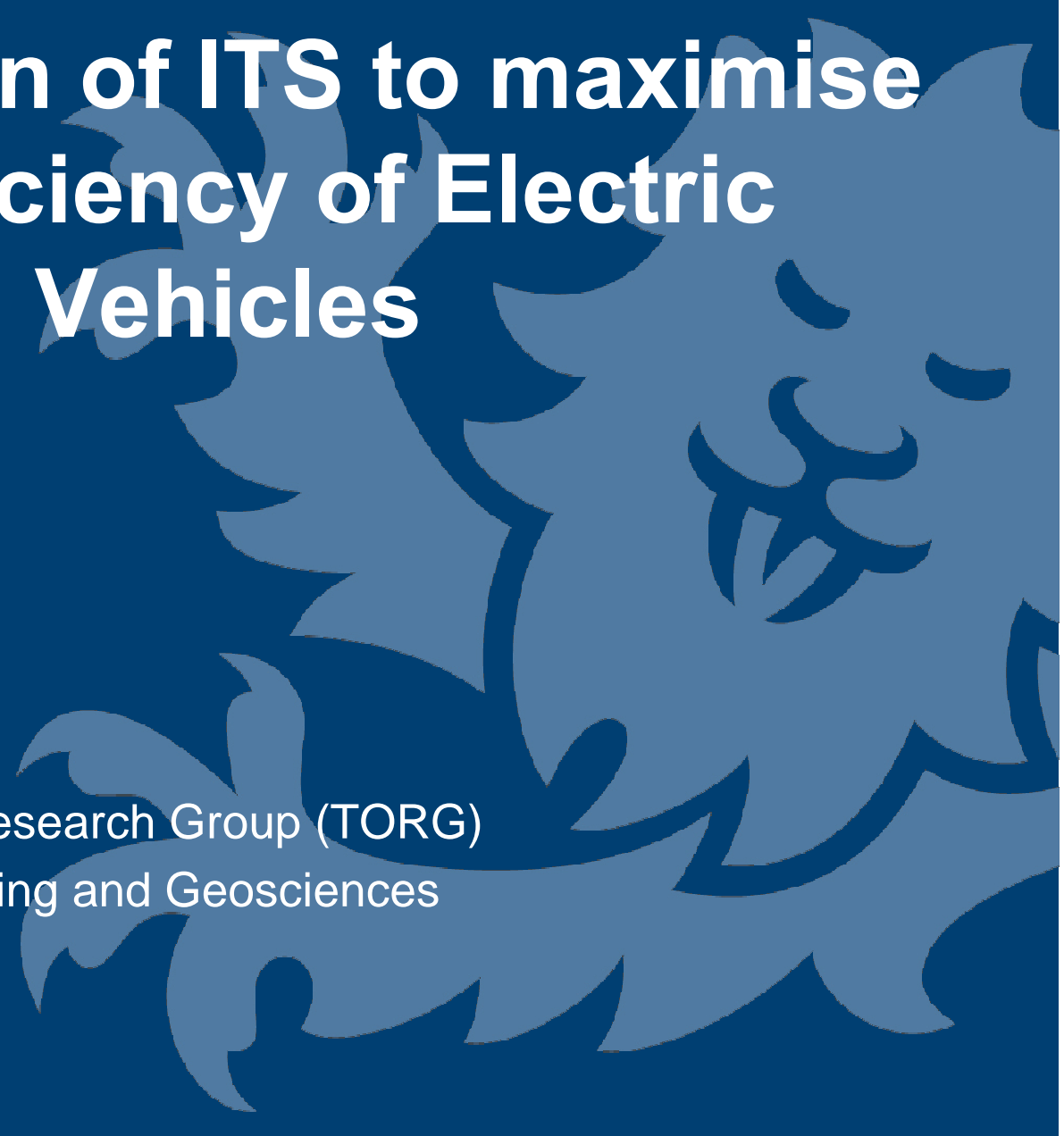


# Application of ITS to maximise the efficiency of Electric Vehicles



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# Presentation Outline

## **Impact of traffic flows on electric vehicle energy use:**

- **Research context**
- **Previous knowledge**
- **Overview and aim of this study**
- **Data processing and analysis**
- **Conclusions**

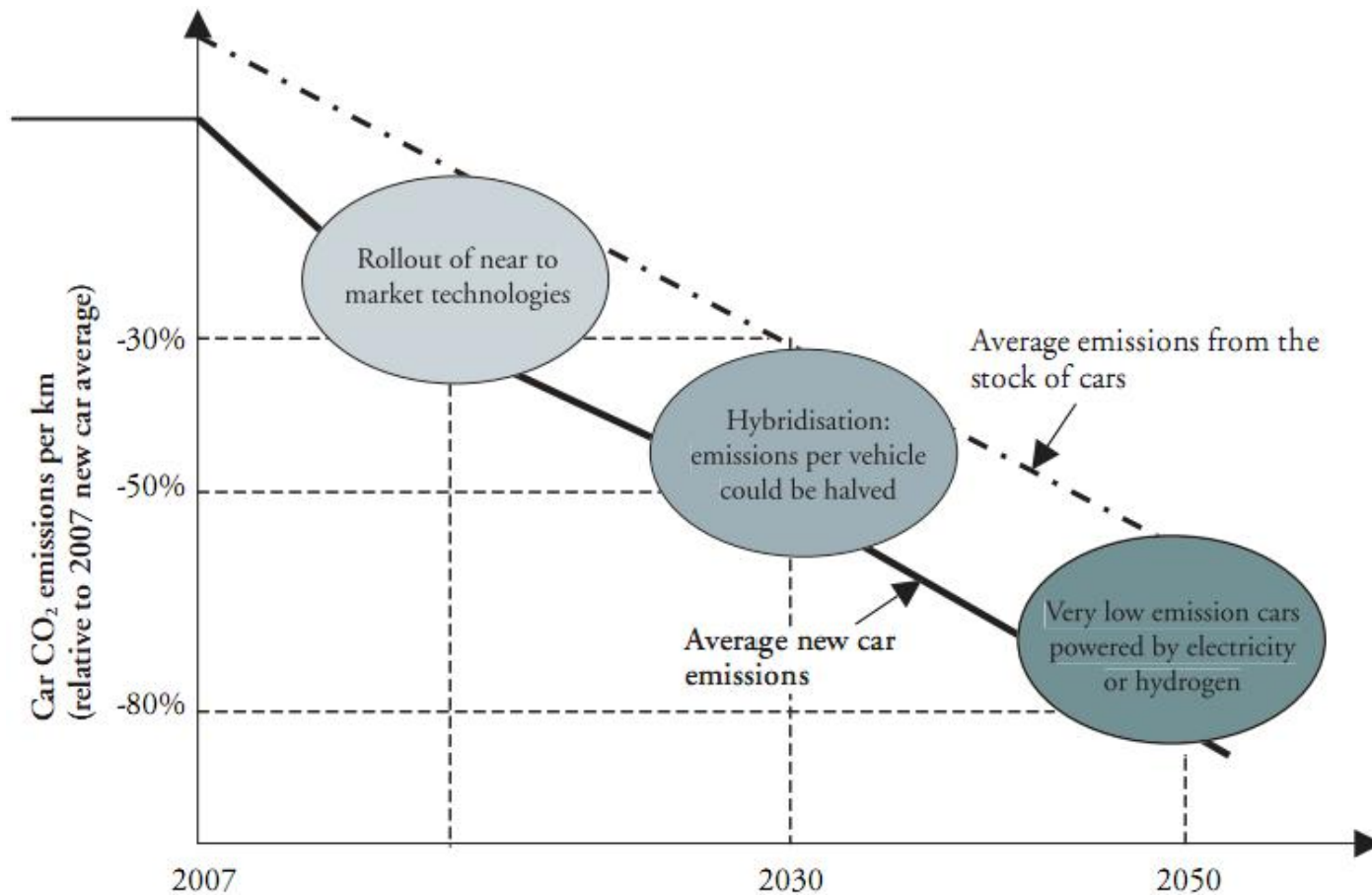
## **North East England EV trials:**

- **Plugged in Places**
- **Switch EV trials**
- **ITS applications**

# Research Context

- **UK Climate Change Act 2008 – 80% emission reduction by 2050**
- **King Review (2008) of low carbon cars found that private vehicle sector must be electrified**

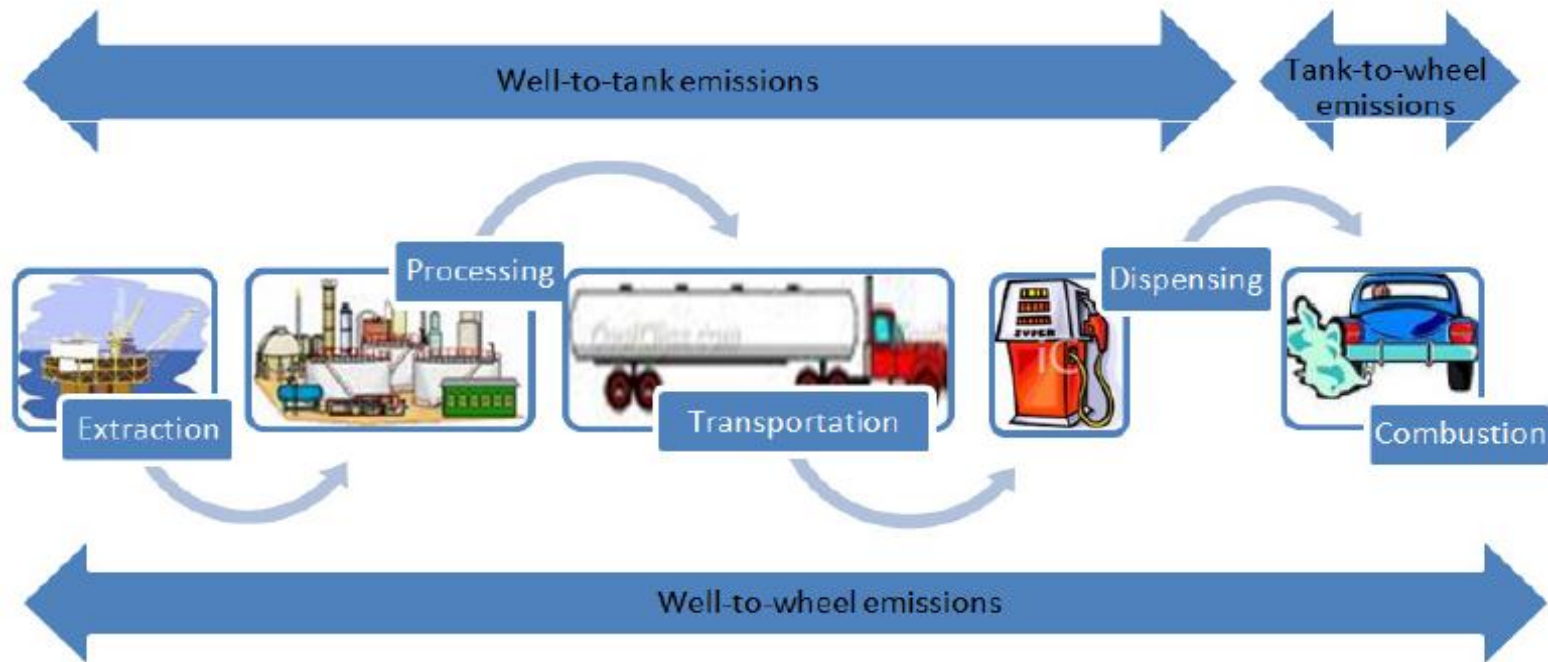
# Research Context



# Research Context



## Sources of well-to-wheel emissions



# Previous studies

- **Sheffield University/  
CENEX - ED Vehicle  
Deployment in the  
UK (2009)**
- **CENEX – EV  
performance by  
driver style and duty  
study (2010)**
- **CENEX Smart Move  
Phase 1 (2010)**

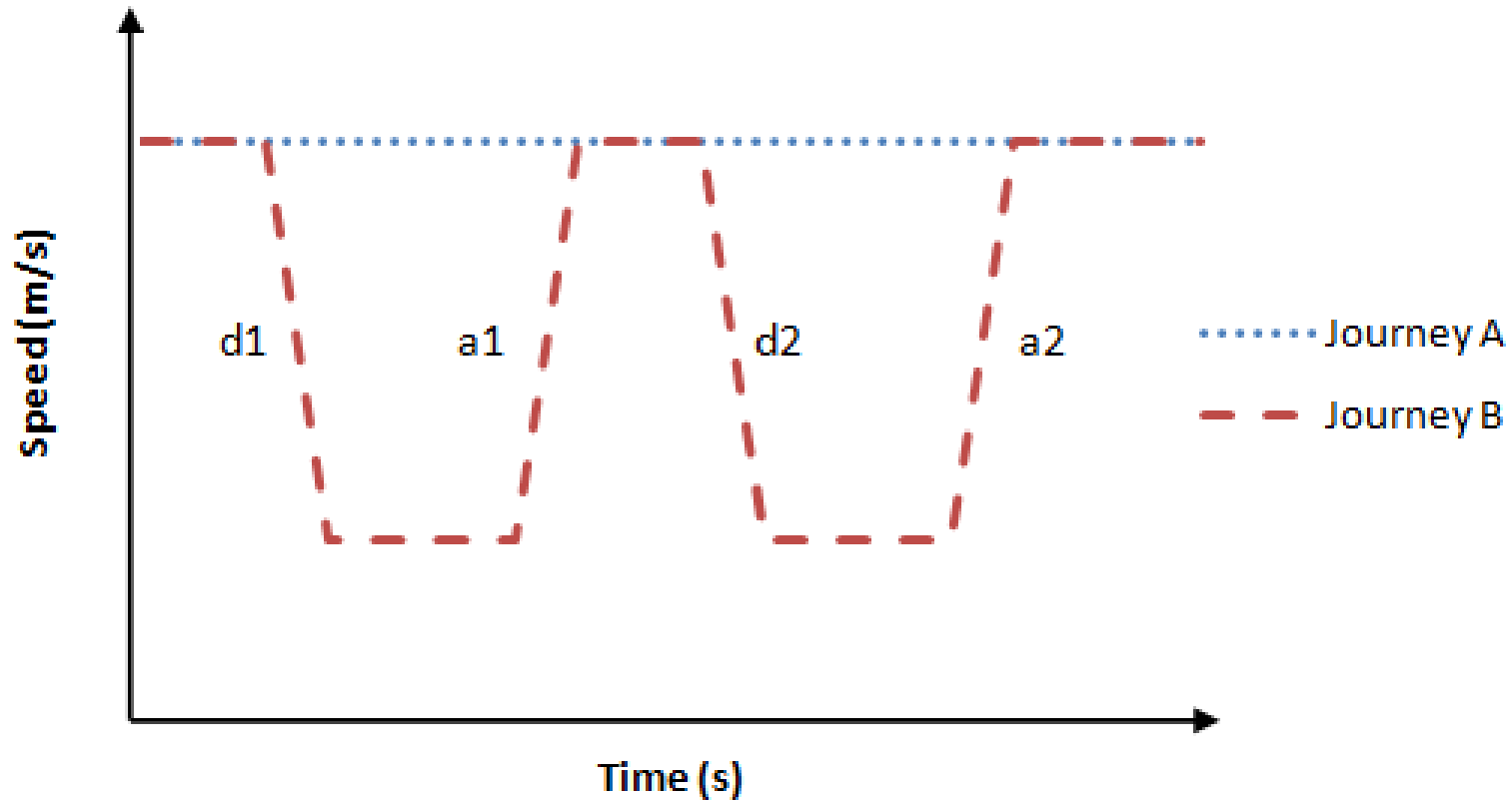


# Overview and aim of this study



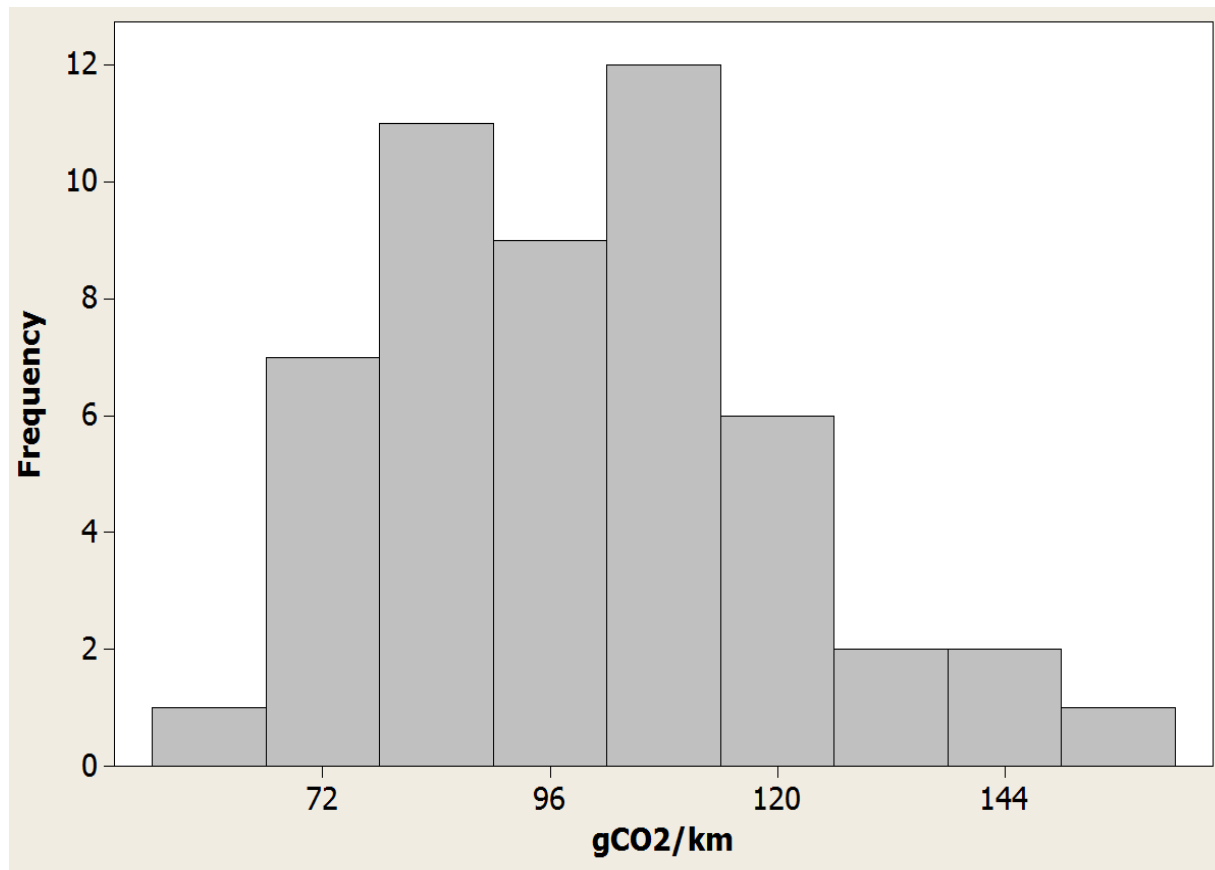
# Data Processing

Histogram showing the range of emissions in the trial



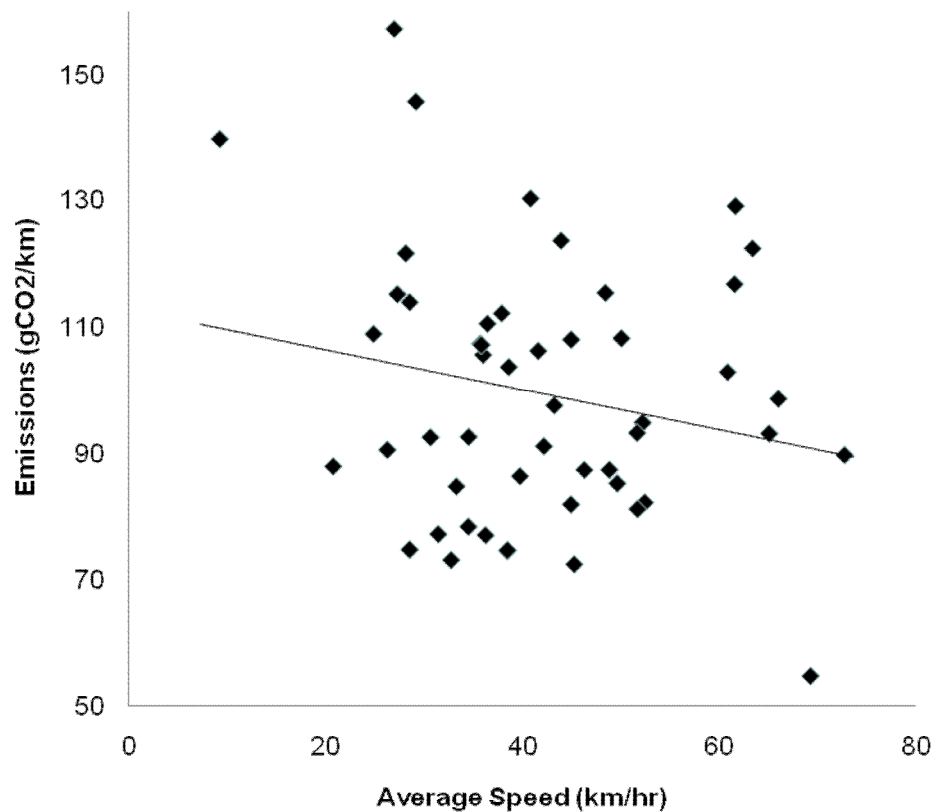
# Results

Histogram showing the range of emissions in the trial



# Results

Graph showing average journey emissions vs average journey speed



Regression equation:

$$e = 112.7 - 1.14v$$

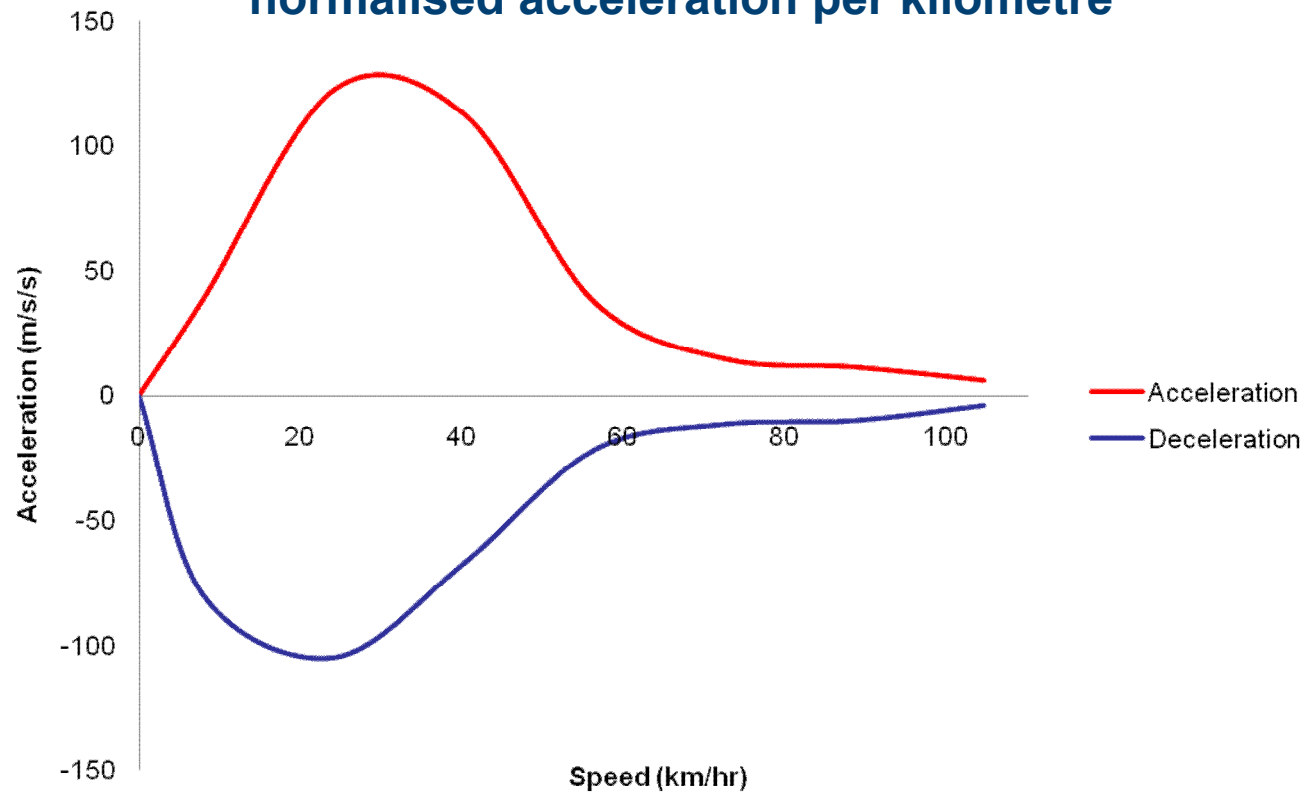
Where:

$e$  = average emissions (gCO<sub>2</sub>/km)

$v$  = average speed (m/s)

# Results

Graph showing average speed vs average normalised acceleration per kilometre



# Conclusions

- **Carbon emissions were not higher when travelling at higher average speeds**
- **Higher than expected carbon emissions at lower speeds match up with more acceleration/ deceleration events at these speeds**
- **Urban environment presents greatest energy efficiency challenge for EVs**

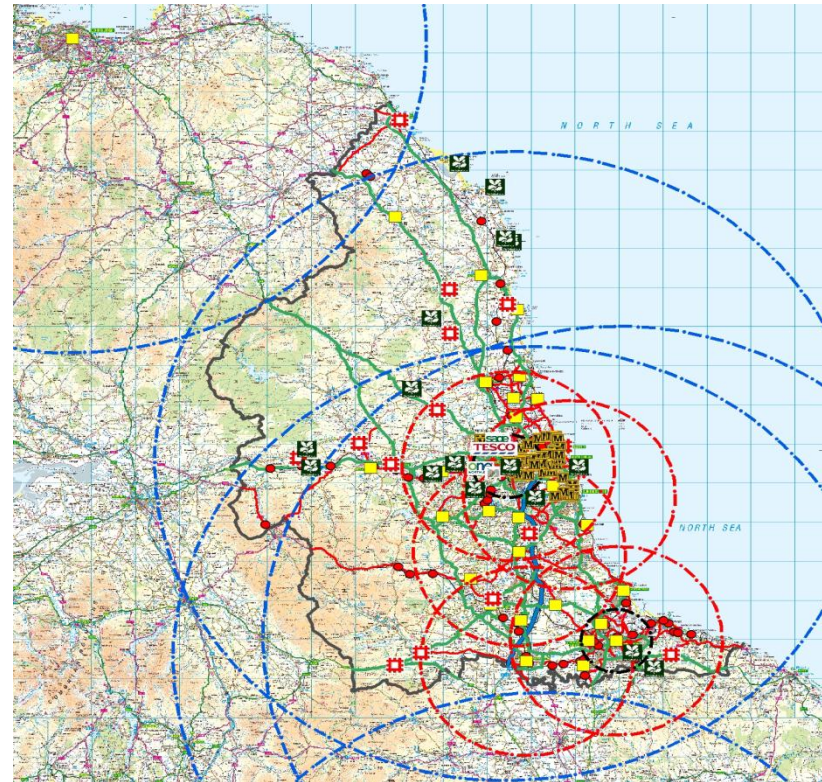
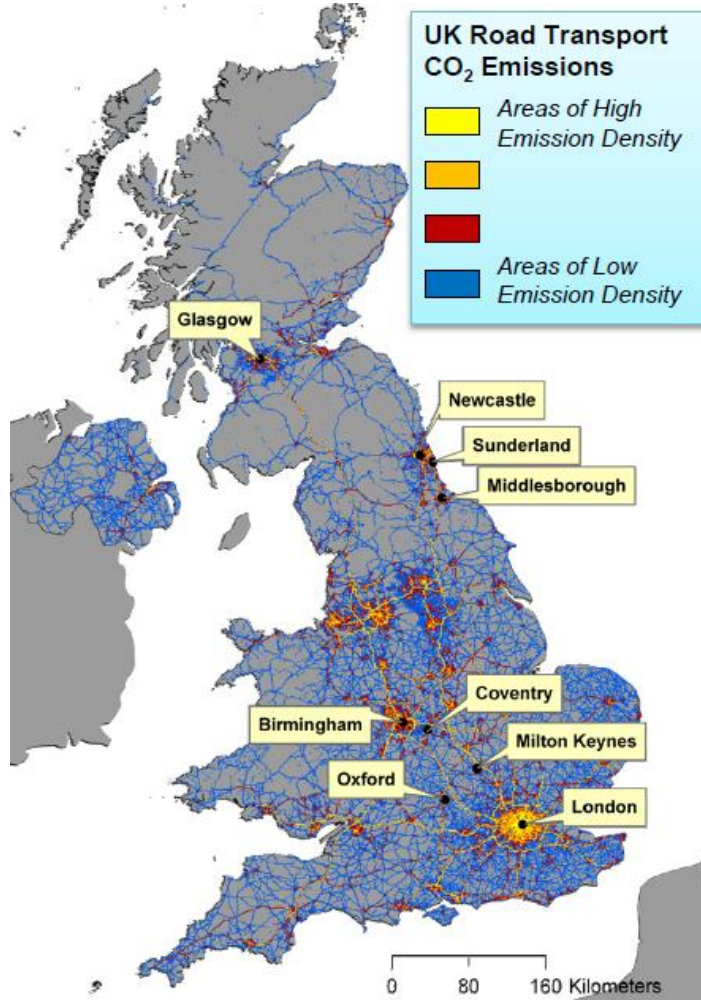
# Future Work

- **More in depth analysis of electric vehicle behaviour**
- **Use data from real world trials taking place in the North East**

# Update on activities in the North East

- **Plugged in Places**
- **Switch EV**

# Plugged in Places



# Plugged in Places

- 3 year, £7.8 million project
- 1300 charging points by 2013
- 172 charging posts in place so far:
  - 33 - public on street
  - 40 - public places
  - 49 - commercial places
  - 50 – work places
- 1 quick charger
- 29 domestic chargers



# Plugged in Places

The screenshot shows the Charge Your Car website. At the top, there's a navigation bar with links for Home, Search a Charge Point, All You need to Know, Buying an Electric Vehicle, Recharging The Facts, Becoming a Member, Useful Links, and FAQs. There are also buttons for Member Sign Up and Fleet Owner Sign Up, and a Contact Us link. The main content area features a large banner with a blue car and wind turbines. Below the banner, there's a purple box with a white plus sign and text: "Charge your Car is North East England's project to provide a comprehensive Electric Vehicle charging infrastructure across the region." This is followed by three paragraphs of text. To the right, there's a login form with fields for Username and Password, and a Login button. Below the login form, there's a search bar for a Charge Point, a map of Newcastle showing charging points, and a list of menu items: EV: All You Need to Know, Buying an Electric Vehicle, and Recharging The Facts.

**CHARGE YOUR CAR**  
PARK + PLUG + RECHARGE

[Member Sign Up](#) [Fleet Owner Sign Up](#) [Contact Us](#)

[Home](#) [Search a Charge Point](#) [All You need to Know](#) [Buying an Electric Vehicle](#) [Recharging The Facts](#) [Becoming a Member](#) [Useful Links](#) [FAQS](#)

**+** Charge your Car is North East England's project to provide a comprehensive Electric Vehicle charging infrastructure across the region.

Between now and 2013, **over 1,300 charging points** will be put in place at key locations on streets, in car parks, at residential and commercial locations and at retail and leisure facilities across the North East.

Electric vehicle users can register to use any of these points for free by becoming a Charge your Car member. Becoming a member is easy – simply complete the **online registration form** and you'll be sent all the details you need to access the charging posts. Membership is subject to a **low cost fee of £10 per month** or £100 for an annual subscription.

The membership scheme is set up to trial the project with new electric vehicle users. Until March 2013 all electricity used to **charge your car will be free** and you'll be eligible for **free parking whilst you recharge**.

More charging points are being introduced all the time and their locations will be added here as the project progresses so keep checking back for more information.

The Charge your Car project cements North East England's position at the forefront of low carbon vehicle development, as the region continues to provide the UK with its blueprint for charging

Username  
  
Password

Search for a Charge Point

EV: All You Need to Know

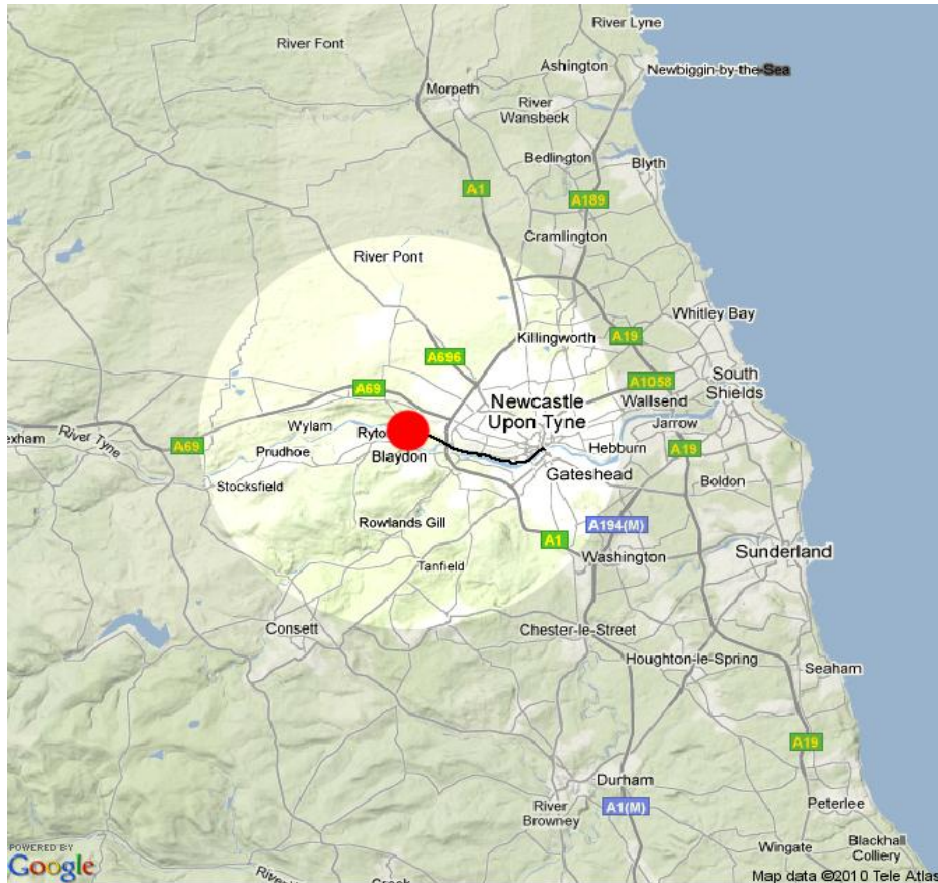
Buying an Electric Vehicle

Recharging The Facts

# Switch EV Trials

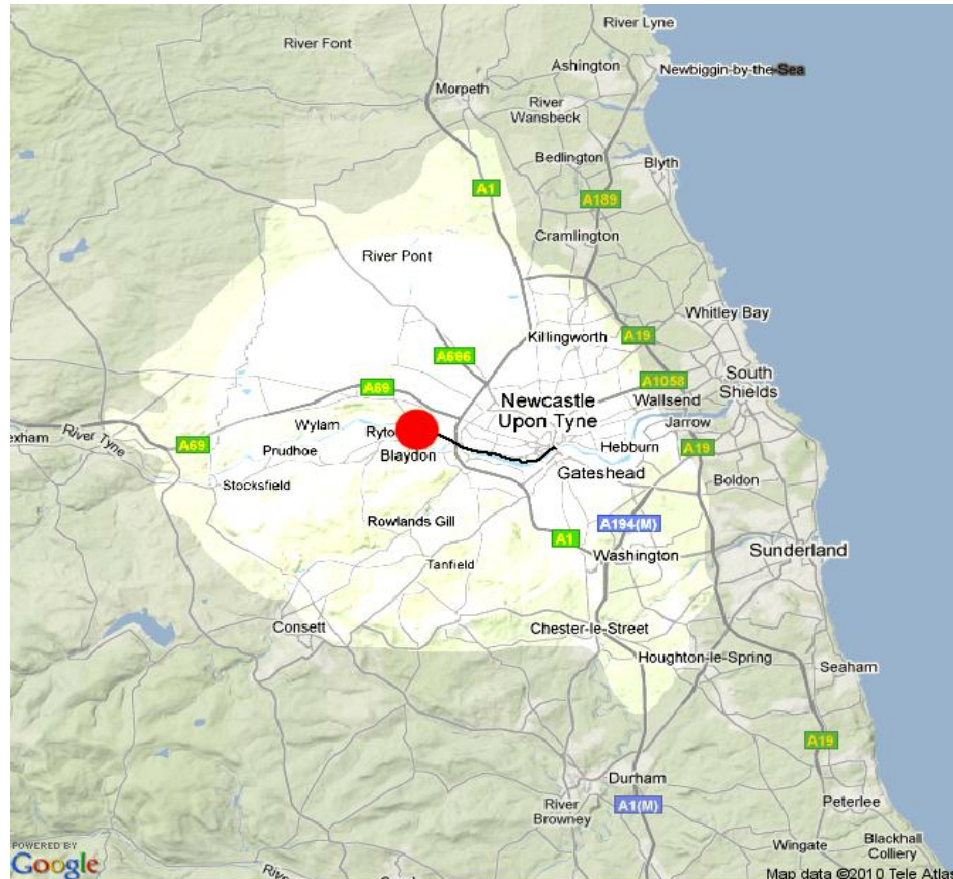


# I.T.S. Based outputs from Switch EV



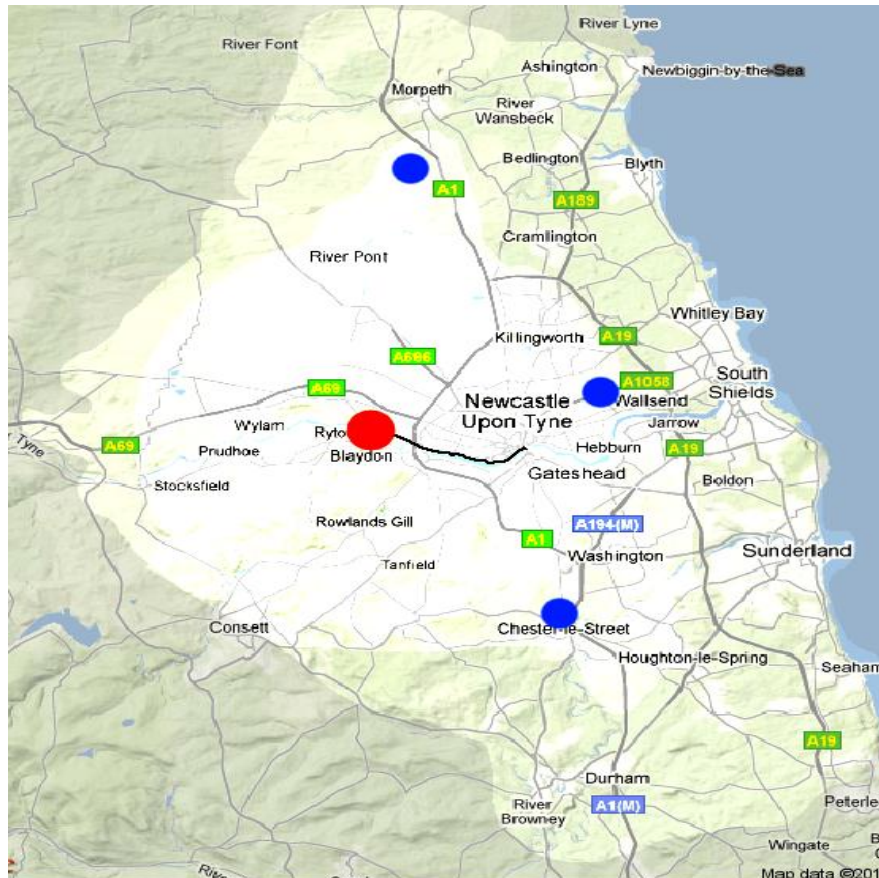
The electric vehicle has a theoretical range...

# I.T.S. Based outputs from Switch EV



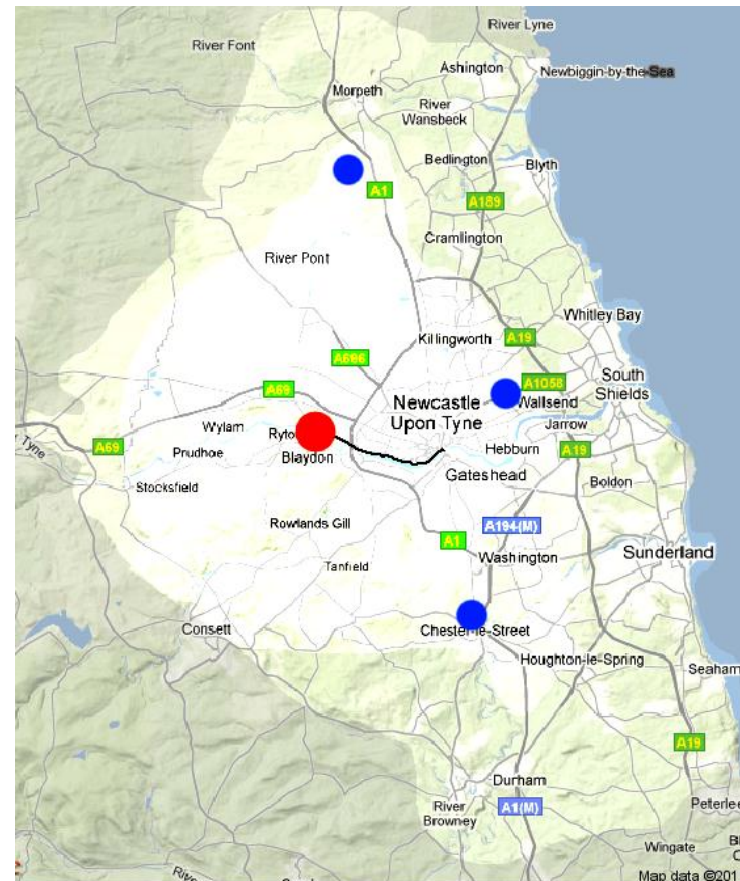
... which will change depending on driver behaviour and driving conditions.....

# I.T.S. Based outputs from Switch EV



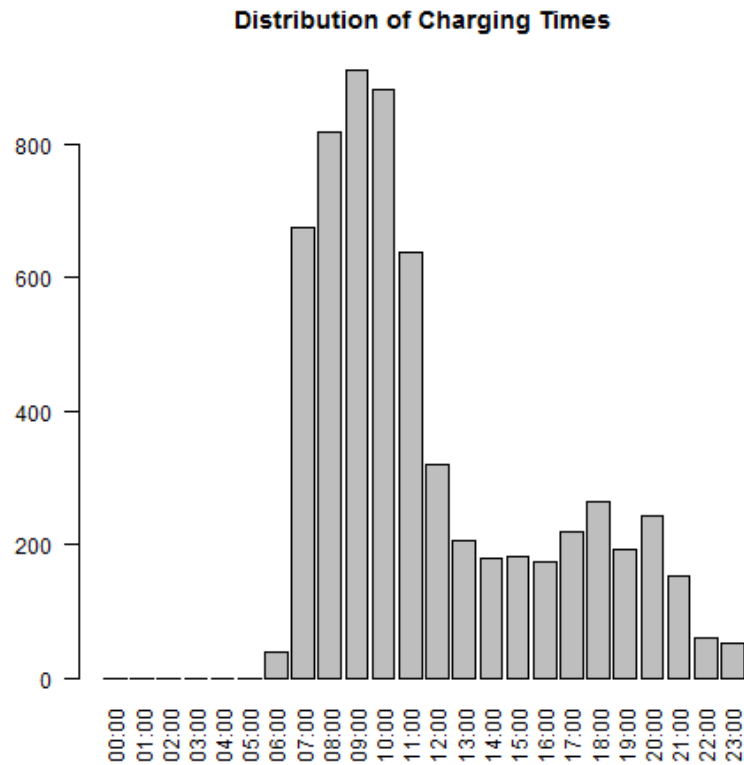
... and can be increased when locations of charging posts are known

# I.T.S. Based outputs from Switch EV

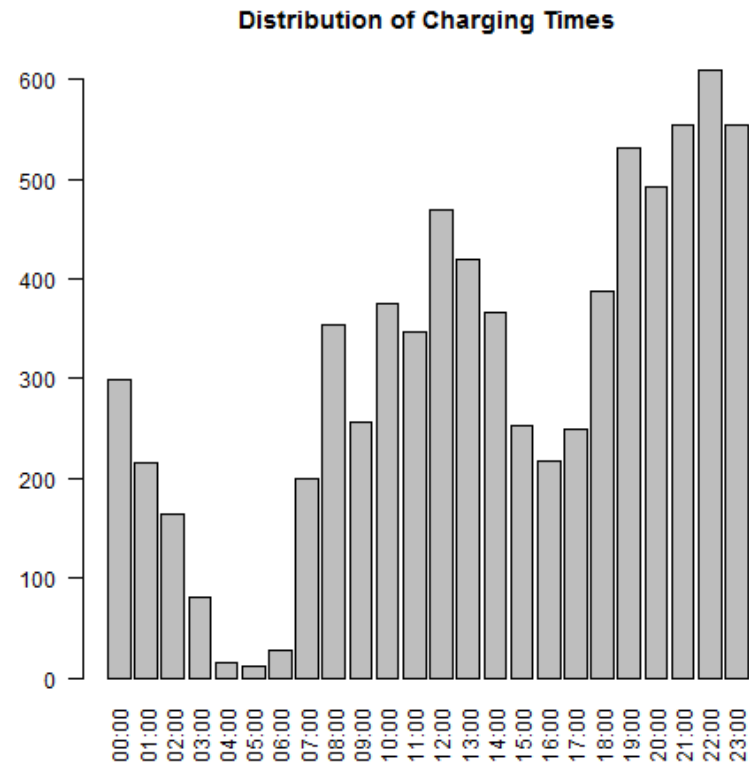


# I.T.S. Based outputs from Switch EV

## Work based charging



## Home charging



# Summary

- **Large number of vehicles in Switch EV**
- **Lots of charging posts in place at the beginning of trials – a UK first**
- **Fuse hard and soft data from these trials with data from PiP and other electric vehicle research in the region**
- **NE has world leading research into EVs and will continue to add to this body of knowledge**

# Acknowledgements

"ITS UK and ITS Sweden

"CENEX

"EPSRC/ School of Civil Engineering and Geosciences

"Switch EV partners

"Office for Low Emission Vehicles (OLEV)

"Technology Strategy Board (TSB)

# Any Questions?

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