A study funded by eit Climate-KIC
Context

Birmingham Green Commission is targeting 60% CO$_2$ reduction from 1990 levels by 2027

• Plans to make Birmingham a **leading green city**
• Air quality improvement is also a priority for the city

**Road transport** is a major contributor to greenhouse gas emissions and air pollution.

• Lack of **infrastructure** is a key barrier to deployment of alternative vehicles which can achieve emissions savings and air quality improvements.
• Blueprint strategy could support savings of over 260,000 tonnes of CO$_2$ by 2035
Agenda

- Blueprint aims and approach
- Fuels and vehicle types
- Strategies and recommendations
- Potential uptake and emissions savings
- Current actions and next steps
Birmingham Blueprint sets out a refuelling infrastructure strategy

- Demand for low carbon vehicles
- Existing infrastructure
- Supply of low carbon fuels

Strategy for infrastructure

- Opportunities for infrastructure development
- Immediate actions
- Long term recommendations
## Contributing stakeholders

<table>
<thead>
<tr>
<th>Light vehicle fleets</th>
<th>Heavy vehicle fleets</th>
<th>Other stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2Z</td>
<td>Arriva</td>
<td>BCC – Planning and Regeneration</td>
</tr>
<tr>
<td>AMEY</td>
<td>Asda</td>
<td>BRC (GB) Limited</td>
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<tr>
<td>Birmingham and Solihull Taxi Alliance</td>
<td>BCC – Fleet &amp; Waste</td>
<td>Cenex</td>
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<td>BCC – Adults and Communities</td>
<td>BRIT European</td>
<td>Dearman Engine Company</td>
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<td>British Gas / Centrica</td>
<td>Centro</td>
<td>EBRI – Aston University Business School</td>
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<td>Carillion</td>
<td>Coca Cola</td>
<td>Gas Bus Alliance</td>
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<tr>
<td>Commercial Group</td>
<td>Freight Transport Association</td>
<td>Gasrec</td>
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<tr>
<td>Heart of England NHS Foundation Trust</td>
<td>Howard Tenens</td>
<td>Severn Trent</td>
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<tr>
<td>Network Rail</td>
<td>John Lewis Partnership</td>
<td>Transport for London</td>
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<td>nPower</td>
<td>Marks and Spencer</td>
<td>Western Power Distribution</td>
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<td>Royal Mail</td>
<td>National Express</td>
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<td>Star Cabs</td>
<td>Sainsbury’s</td>
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<tr>
<td>University of Birmingham</td>
<td>UPS</td>
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<td>West Midlands Police</td>
<td>Veolia</td>
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Fuels and vehicle types in the scope of the Blueprint

Market availability for **plug-in electric** and **hydrogen vehicles**

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
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<th>2025</th>
<th>2030/35</th>
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<tr>
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<td></td>
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<td></td>
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<tr>
<td><strong>Buses</strong></td>
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</table>

Recommendations for charging infrastructure and hydrogen refuelling focus on the needs of **light vehicles** and **buses**

HGV – Heavy goods vehicle; RCV – Refuse collection vehicle
Fuels and vehicle types in the scope of the Blueprint

Market availability for natural gas vehicles

<table>
<thead>
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<th>Year</th>
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Recommendations for gas refuelling focus mainly on infrastructure for trucks and buses.

Market availability for other technologies:

- Liquid air is another fuel considered in the report, with the first applications involving refrigeration for heavy goods vehicles.
- For LPG, recommendations focus on the needs of light vehicles.

HGV – Heavy goods vehicle; RCV – Refuse collection vehicle.
Refuelling for depot-based vehicles

• Heavy vehicles such as buses and trucks (and some light vehicle fleets) typically refuel in dedicated, in-depot refuelling facilities.

• In the absence of in-depot infrastructure, strategically placed public or shared facilities in Birmingham could support fleet uptake.

For depot based **electric vehicles** (buses and light vehicles) in-depot charging facilities are a definitive requirement.

For depot-based **hydrogen** vehicles, in-depot refuelling is preferred in the long term; **shared refuelling in strategic locations** could be feasible in the short term.

Depot based **gas** vehicles (buses and trucks) could also use shared facilities in the short term.

All vehicles using **liquid air** for refrigeration are likely to be depot based – trials will involve in-depot refuelling.
Strategy for gas infrastructure

Opportunities for public gas stations on trunk routes near Birmingham

Preferred areas for gas stations to enable gas vehicle use on routes in and via Birmingham

Zones with gas network connection opportunities for CNG stations

Relevant vehicle types (public stations):

[Map showing recommended areas with gas network connection opportunities]
Strategy for public infrastructure – plug-in vehicles

Rapid charging near popular taxi ranks (city centre)

For taxis in short term

Shared by other users as network expands

Legend
- Motorway
- A-Road
- B-Road
- Train stations

Main taxi ranks
- 5-6 places
- 7-9 places
- 10-14 places
Fleet feedback indicates that at least 3 public stations will be needed for significant vehicle uptake in Birmingham.

Siting criteria:
- Strategic corridors
- Away from heavy congestion
- Link to private early adopter locations

Relevant vehicle types: taxis, fleets, private vehicle users

Early adopter zone based on Campbell et al., Identifying the early adopters of alternative fuel vehicles: A case study of Birmingham, United Kingdom, 2012
### Potential vehicle uptake and emissions savings by 2035

Realisation of these emissions savings will depend on the availability of low carbon electricity, hydrogen and gas.

<table>
<thead>
<tr>
<th>Potential fleet uptake (average across fleets)</th>
<th>WTW GHG savings (tonnes CO₂e/year)</th>
<th>Percentage WTW savings for Birmingham road transport emissions¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plug-in vehicles</strong></td>
<td>20% (Taxis, vans, private cars, buses and small trucks)</td>
<td>190,000 tonnes (based on 100% renewable electricity)</td>
</tr>
<tr>
<td><strong>Hydrogen vehicles</strong></td>
<td>3% (Taxis, vans, private cars and buses)</td>
<td>48,000 (based on carbon neutral electrolysis)</td>
</tr>
<tr>
<td><strong>Gas vehicles</strong></td>
<td>7% (Buses, heavy goods vehicles, Refuse collection vehicles)</td>
<td>26,000 tonnes (based on injected biomethane)</td>
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<tr>
<td><strong>Liquid air refrigerated vehicles</strong></td>
<td>45% (Refrigerated heavy goods vehicles)</td>
<td>Dependent on applications / duty cycles</td>
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¹ - Compared to a baseline case without low carbon vehicles
Wider recommendations for Birmingham City Council

- Encourage and contribute to uptake of low carbon vehicles
- Use planning guidance to deliver strategy recommendations for infrastructure
- Assist infrastructure providers in finding/assessing land for installation
- Streamline planning processes for renewable fuel production and infrastructure
- Include low carbon fuels for transport into the development of energy system strategies
- Work closely with private fleets on demonstration and deployment activities for low carbon vehicles
Strategic Actions required

• Launch Green fleet strategy for Council fleet & engage private sector fleets e.g. National Express

• Public/private sector and University collaboration to align energy system strategies – from waste strategies to bio-methane injected into the grid, hydrogen production and electricity for heat & power.

• Low/zero carbon re-fuelling infrastructure alignment with ‘Birmingham Connected’ – key focus on Green Travel Districts, enabling uptake of new modes & models of integrated green transport.

• Strategic focus on funding sources & getting right mix of capital & revenue - LEP, H2020, OLEV, Climate KIC.
Next step developments

- Specific projects in the pipeline:
  - Plug-in vehicles - OLEV Go Ultra Low City & Local Authority scheme
  - Hydrogen – 100 bus project
  - Gas - infrastructure development (LEP funding approved for 4 feasibility studies)
  - LPG – taxi conversions
  - Liquid Air – Sainsbury’s trial

- Working with the private sector will be key
- Blueprint will be used to inform projects
Closing remarks