



A CITY BLUE PRINT FOR LOW CARBON FUEL REFUELLING INFRASTRUCTURE

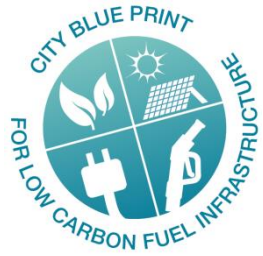
ELEC-
TRIC VE-
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DROGEN
FUEL CELL VEHI-
CLES GAS VEHI-
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ENERGY HYDROGEN
CHARGING POINTS HYDRO-
GEN REFUELLING STATIONS
GAS REFUELLING STATIONS
ELECTROLYSERS BIOMETH-
ANE GREEN ELECTRICITY
LPG TAXIS HEAVY DUTY
VEHICLES FLEET CARS
LIGHT COMMERCIAL VEHI-
CLES LIQUID AIR REFRIGERA-
TION UNITS LOW CARBON ELEC-
TRIC VEHICLES HYDROGEN FUEL
CELL VEHICLES GAS VEHICLES RE-
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CHARGING POINTS HYDRO-
GEN REFUELLING STATIONS
GAS REFUELLING STATIONS
ELECTROLYSERS BIOMETH-
ANE GREEN ELECTRICITY
LPG TAXIS HEAVY
DUTY VEHI-
CLES

Councillor Lisa Trickett



*A study
funded by*





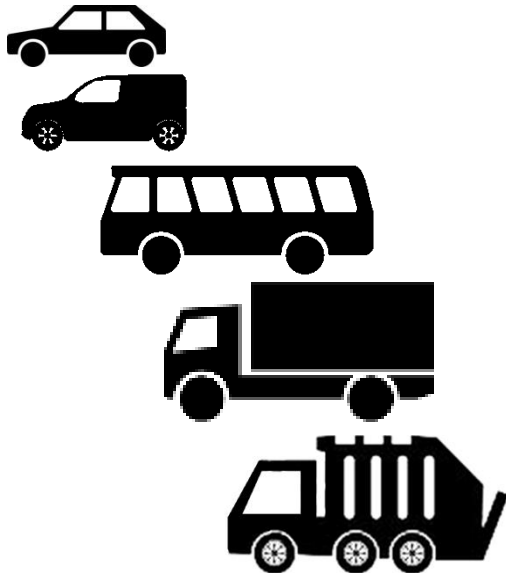
Context



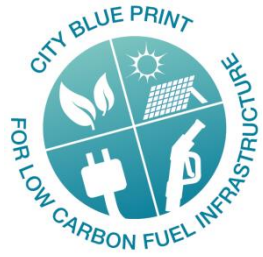
Birmingham Green Commission is targeting 60% CO₂ reduction from 1990 levels by 2027

- 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 CO₂ by 2035



Agenda



- Blueprint aims and approach
- Fuels and vehicle types
- Strategies and recommendations
- Potential uptake and emissions savings
- Current actions and next steps

elementenergy

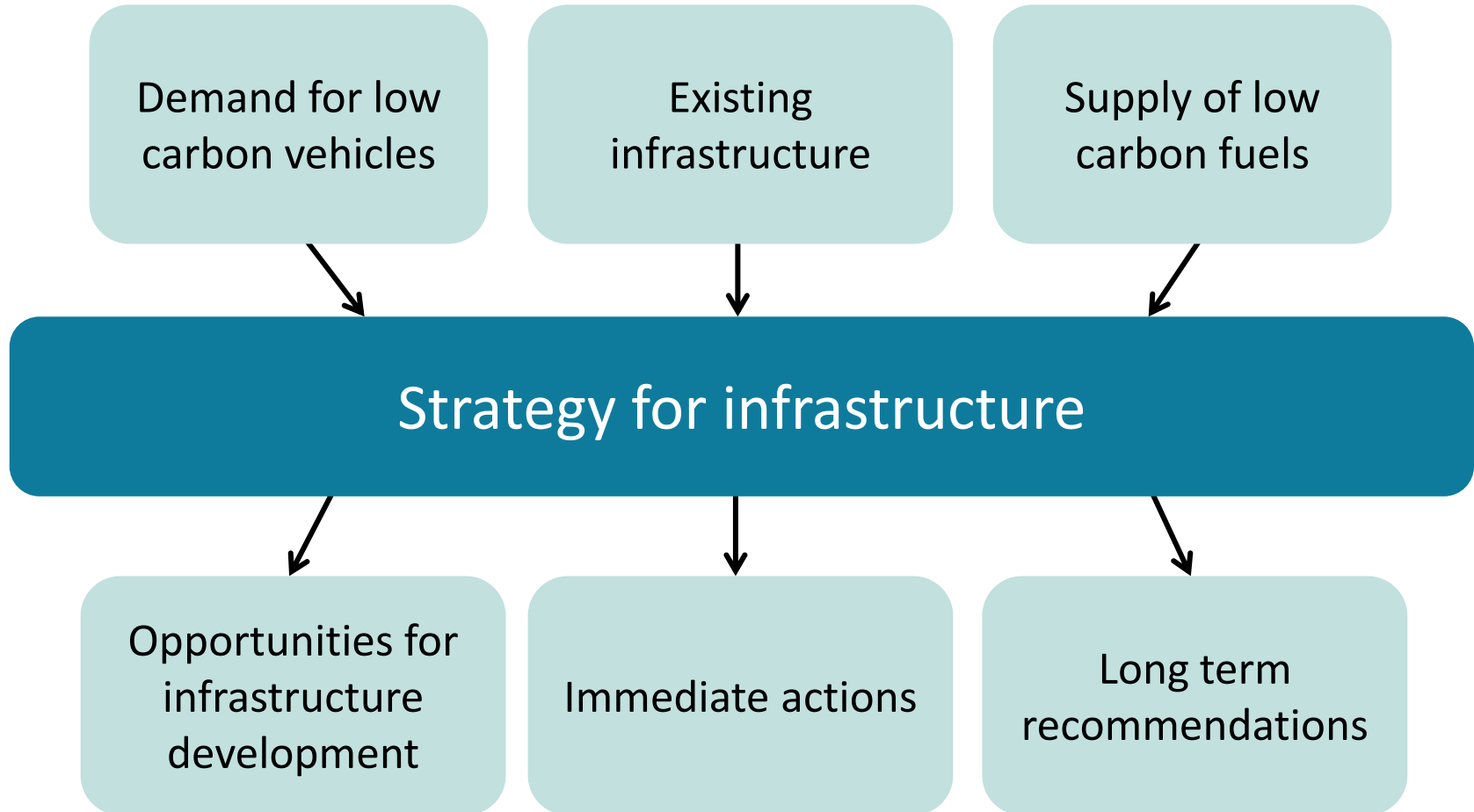
Celine Cluzel
Principal Consultant

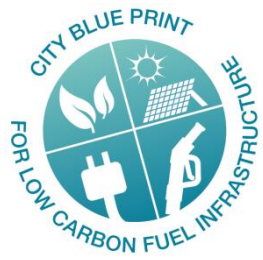


Sylvia Broadley
Green Fleet Change Manager



Birmingham Blueprint sets out a refuelling infrastructure strategy





Contributing stakeholders



Light vehicle fleets

A2Z

AMEY

Birmingham and Solihull Taxi Alliance

BCC – Adults and Communities

British Gas / Centrica

Carillion

Commercial Group

Heart of England NHS Foundation Trust

Network Rail

nPower

Royal Mail

Star Cabs

University of Birmingham

West Midlands Police

Heavy vehicle fleets

Arriva

Asda

BCC – Fleet & Waste

BRIT European

Centro

Coca Cola

Freight Transport Association

Howard Tenens

John Lewis Partnership

Marks and Spencer

National Express

Sainsbury's

UPS

Veolia

Other stakeholders

BCC – Planning and Regeneration

BRC (GB) Limited

Cenex

Dearman Engine Company

EBRI – Aston University Business School

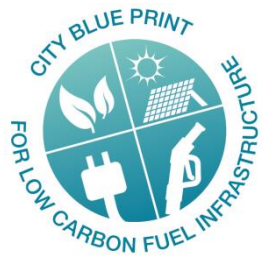
Gas Bus Alliance

Gasrec

Severn Trent

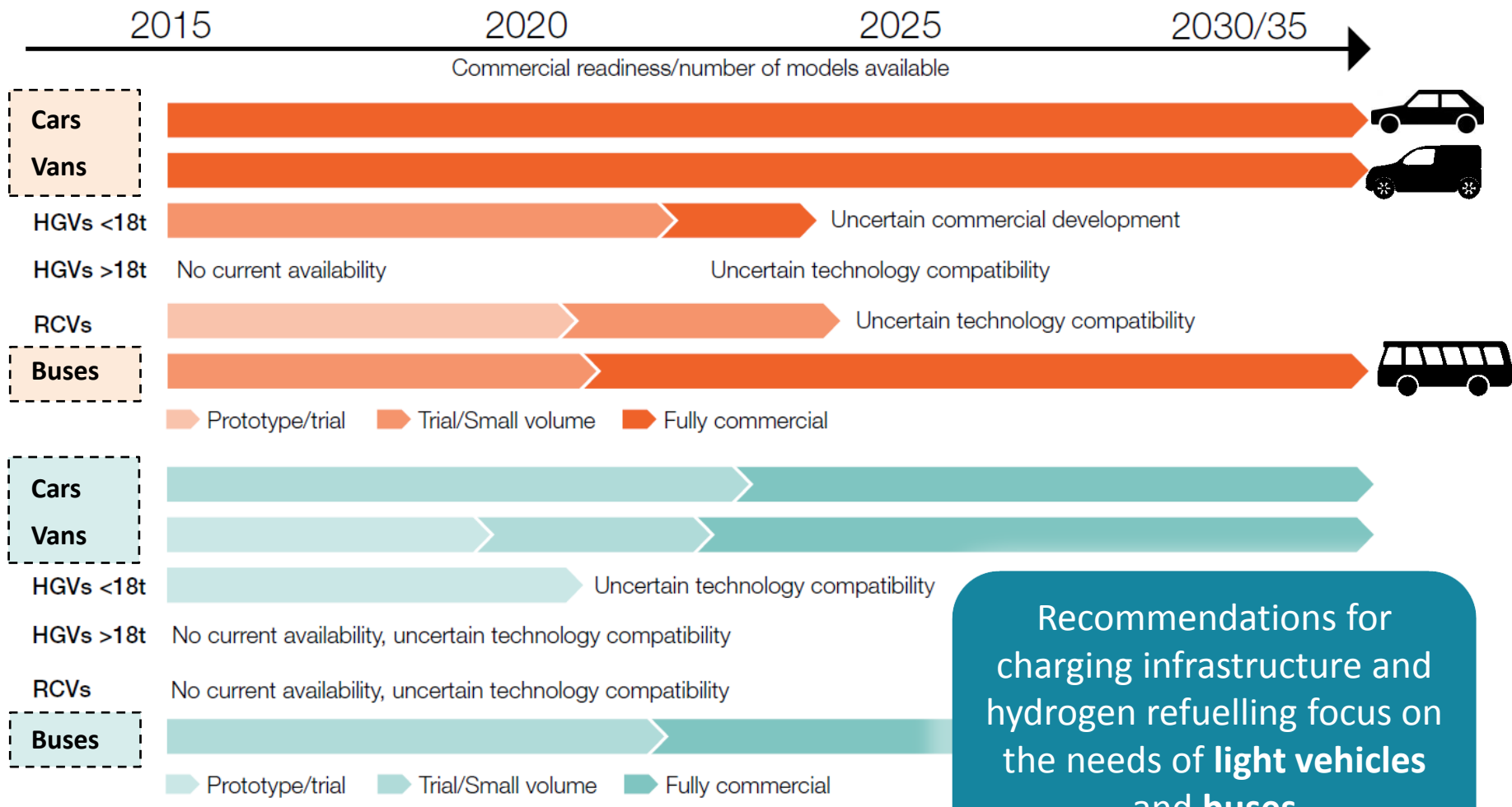
Transport for London

Western Power Distribution



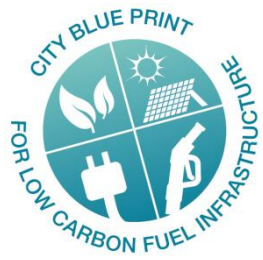
Fuels and vehicle types in the scope of the Blueprint

Market availability for plug-in electric and hydrogen vehicles



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

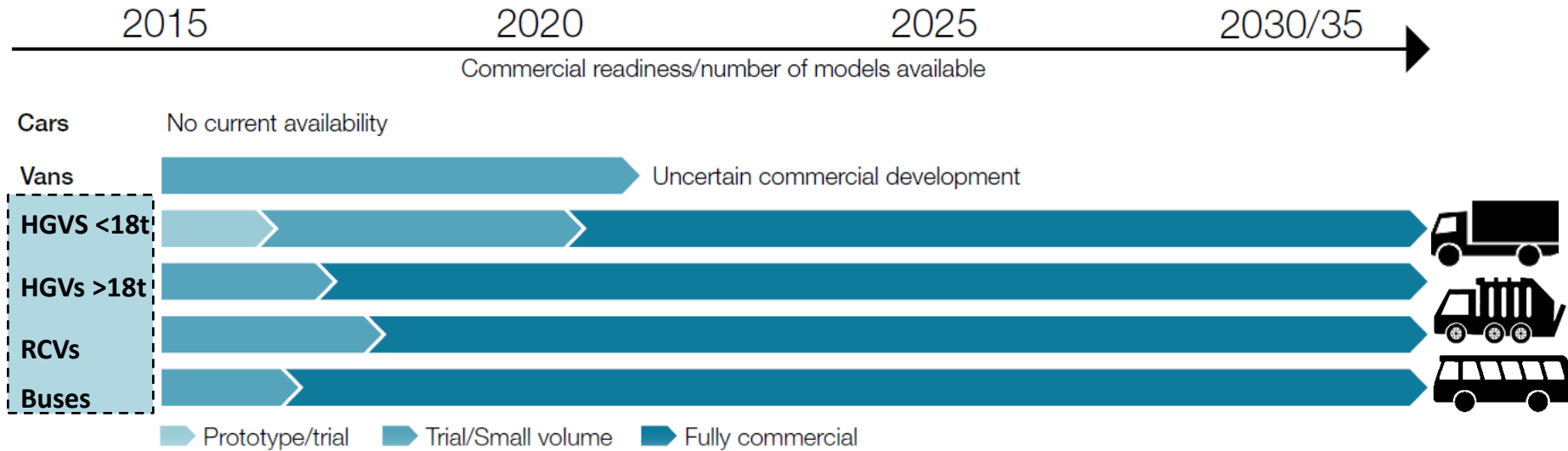
HGV – Heavy goods vehicle; RCV – Refuse collection vehicle



Fuels and vehicle types in the scope of the Blueprint



Market availability for natural gas vehicles



Recommendations for gas refuelling focus mainly on infrastructure for **trucks and buses**

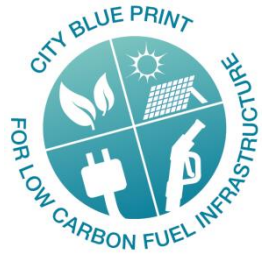
Market availability for other technologies

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





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

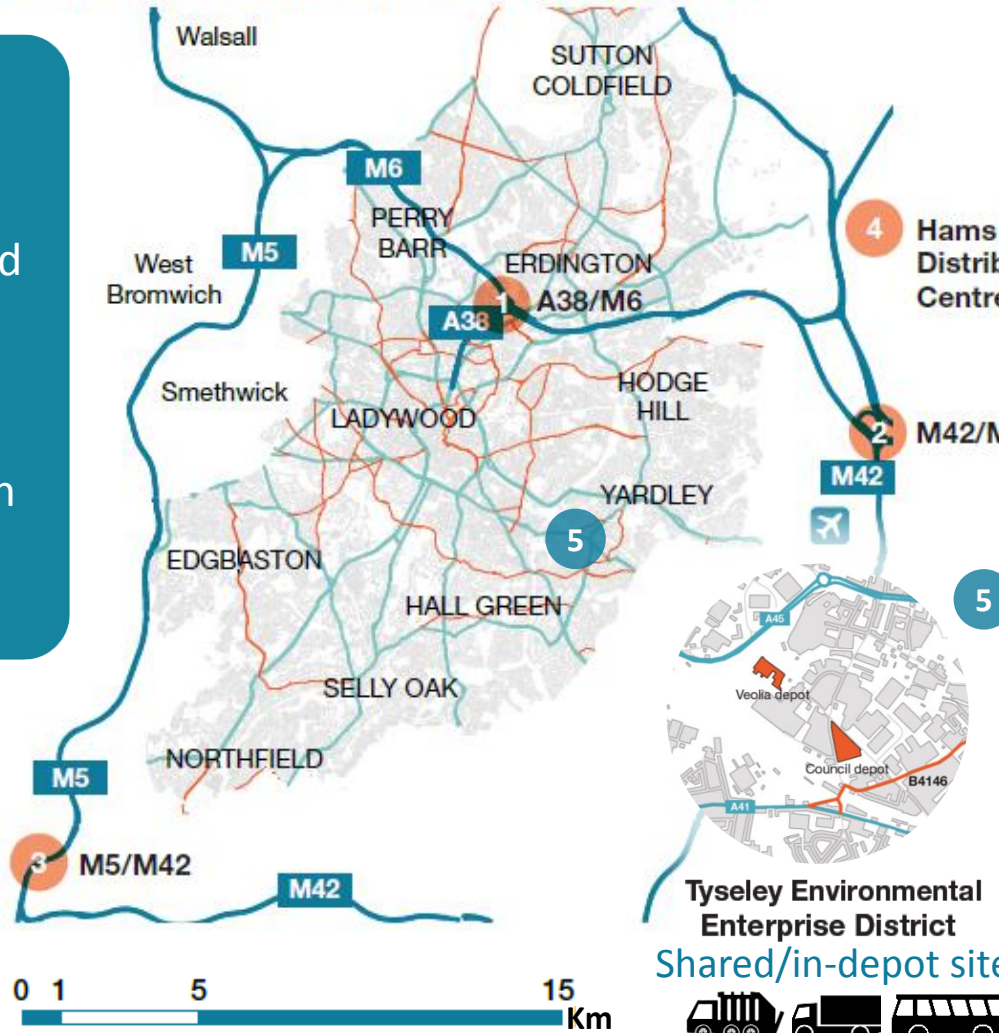


Strategy for gas infrastructure

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



- 1 A38/M6
- 2 M42/M6
- 3 M5/M42
- 4 Hams Hall Distribution Centre
- 5 Tyseley Environmental Enterprise District
Shared/in-depot site

Relevant vehicle types (public stations):



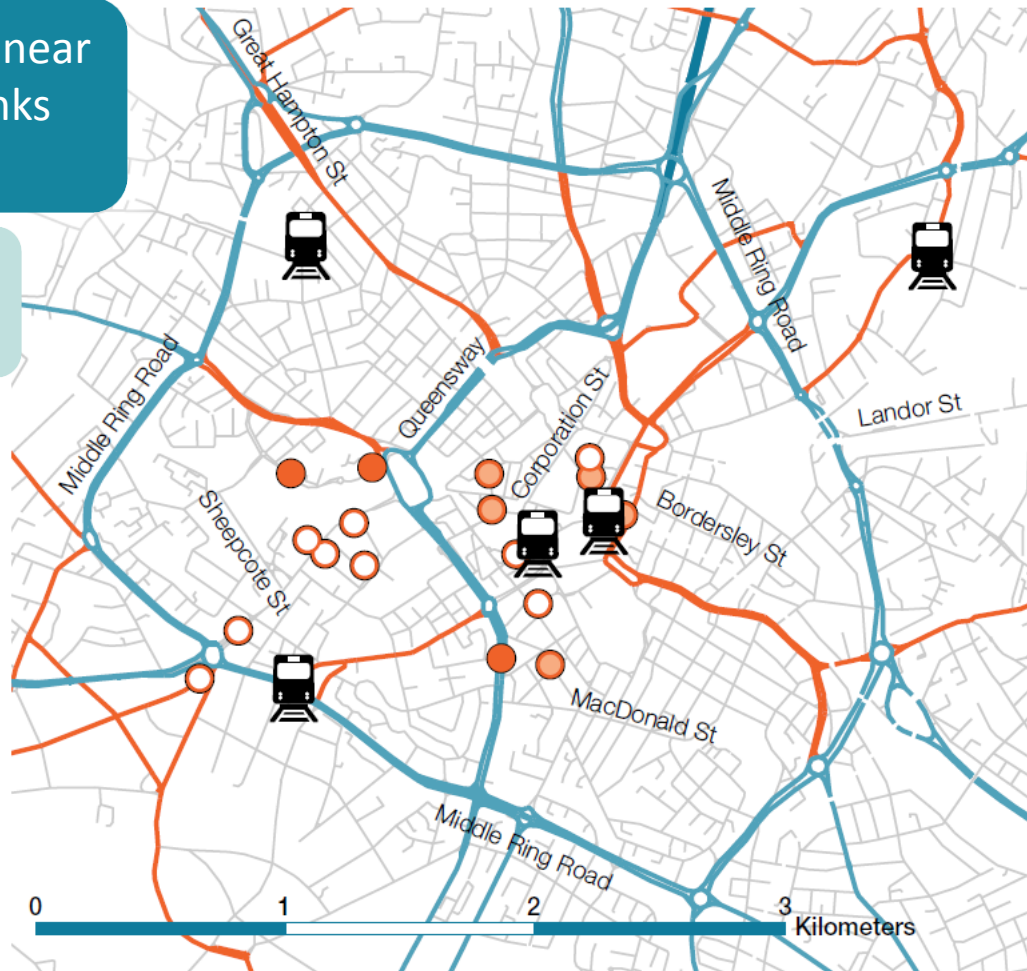
Strategy for public infrastructure – plug-in vehicles



Rapid charging near popular taxi ranks (city centre)

For taxis in short term

Shared by other users as network expands

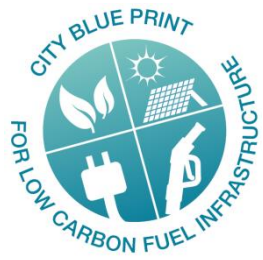


Legend

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

Main taxi ranks

- 5-6 places
- 7-9 places
- 10-14 places




Strategy for public infrastructure – hydrogen vehicles



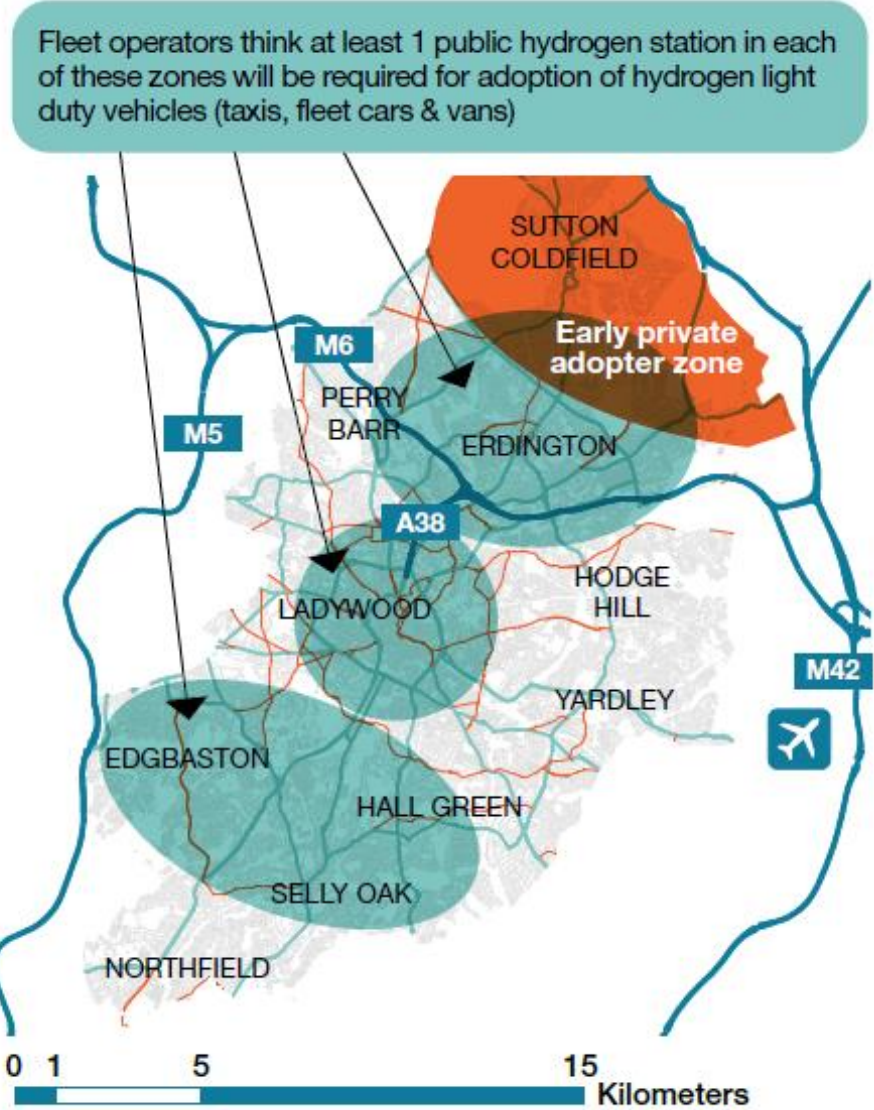
Fleet feedback indicates that at least **3 public stations** will be needed for significant vehicle uptake in Birmingham

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

Relevant vehicle types:



taxis, fleets, private vehicle users





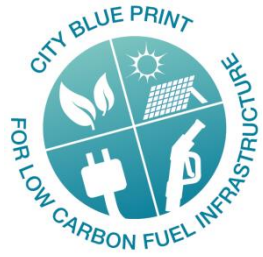
Potential vehicle uptake and emissions savings by 2035



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

	Potential fleet uptake (average across fleets)	WTW GHG savings (tonnes CO _{2e} /year)	Percentage WTW savings for Birmingham road transport emissions ¹
Plug-in vehicles	20% (Taxis, vans, private cars, buses and small trucks)	190,000 tonnes (based on 100% renewable electricity)	12%
Hydrogen vehicles	3% (Taxis, vans, private cars and busers)	48,000 (based on carbon neutral electrolysis)	3%
Gas vehicles	7% (Buses, heavy goods vehicles, Refuse collection vehicles)	26,000 tonnes (based on injected biomethane)	2%
Liquid air refrigerated vehicles	45% (Refrigerated heavy goods vehicles)	Dependent on applications / duty cycles	Dependent on applications / duty cycles

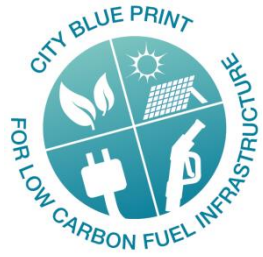
1 - Compared to a baseline case without low carbon vehicles



Wider recommendations for Birmingham City Council



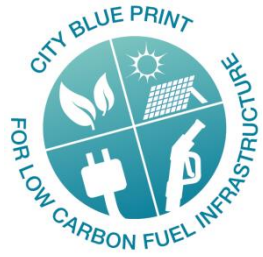
- Encourage and contribute to uptake of low carbon vehicles
 - Use planning guidance to deliver strategy recommendations for infrastructure
- Assist infrastructure providers in finding/assessing land for installation
 - Streamline planning processes for renewable fuel production and infrastructure
 - 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



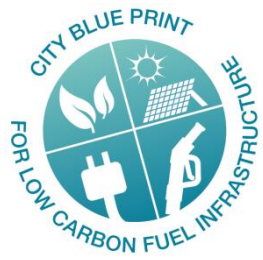
- Launch Green fleet strategy for Council fleet & engage private sector fleets e.g. National Express
- Public/private sector and University collaboration to align energy system strategies – from waste strategies to bio-methane injected into the grid, hydrogen production and electricity for heat & power.
- 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



eit Knowledge &
Innovation
Community
Climate-KIC