

# The Benefit of Remote Sensing in a Low Emission Zone

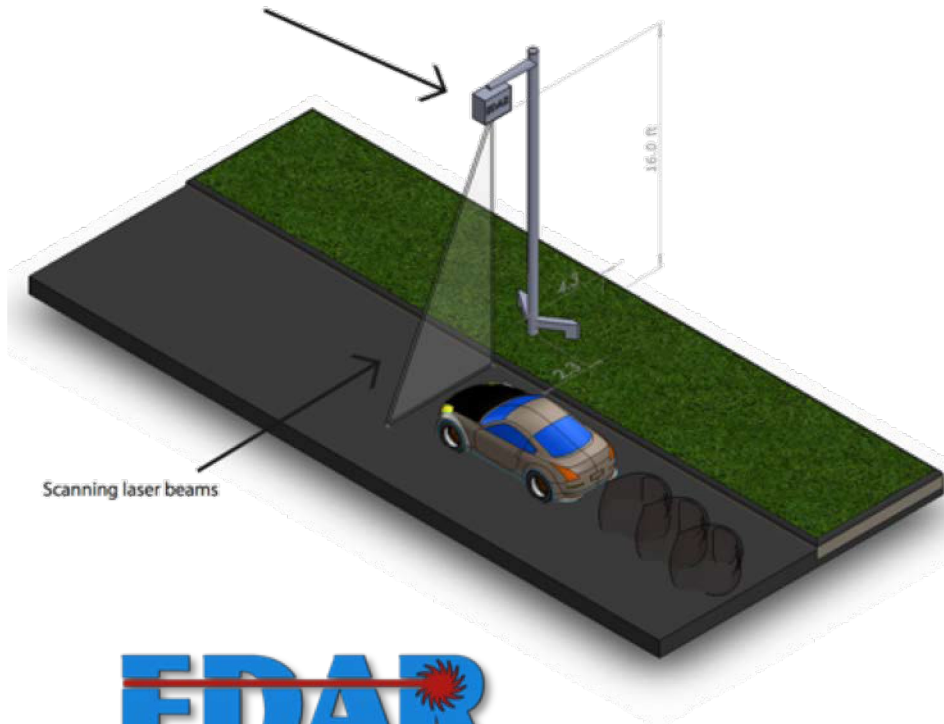


**Hager Environmental &  
Atmospheric Technologies**  
**HEAT**

# What is EDAR

**EDAR system includes:**

- License plate Recognition Camera
- Speed & Acceleration Detector
- Laser Remote Sensing of Vehicle Exhaust



**EDAR**  
Emission Detection And Reporting



The Emissions Detection And Reporting (**EDAR**) System is a laser based, NASA Recognized SPINOFF Remote Sensing Technology



EDAR quantifies & reports measurements in both grams/distance as well as ratios and concentrations directly for **CO<sub>2</sub>**, **CO**, **NO**, **NO<sub>2</sub>**, **HC** and **PM** for both gasoline and diesel vehicles using one footprint in real time



EDAR monitors 24 hours a day, 7 days a week, 365 days a year unmanned



EDAR has special capabilities that enables data collection in light rain and mist

# EDAR's Benefits and Capabilities



- Laser Based Remote Sensing Aerial Unit that Can Detect the Tailpipe No Matter Where it is Located with High Accuracy
- Proven Valid Hit Rate between 90 to 98 Percent
- EDAR Detects CO, NO, and NO<sub>2</sub> (NO<sub>x</sub>) Directly Independent of CO<sub>2</sub>
- Able to Detect the Temperature of Vehicle Exhaust

- No Calibration Needed
- Unmanned and Sits on Multi-lane Roads
- No Seasonal or Temperature Restrictions
- Front and/or back LPR Camera with Excellent Automatic Accuracy Between 88 to 98.8 Percent
- Not Affected by Light Rain, Fog, Smog, Humidity or Extreme Temperatures

- One Unit can Detect both Heavy Duty, Light Duty, as well as Petrol and Diesel Vehicles in addition to Evaporative Emissions

# EDAR's Report Card in Real Time

EDAR detects and quantifies gases in real time for every vehicle that drives under the unit

The Data Collected also Includes:

- Speed
- Acceleration
- Vehicle Specific Power (VSP)
- License Plate
- Exhaust Temperature
- Ambient Conditions



# Validation in the US, UK & by the European Commission

EDAR has been validated and confirmed by:



## US EPA:

*"EDAR is more much accurate than existing Remote Sensing technology"*

# Flexible Deployment Options With EDAR

## Able to be Adapted to Multiple Scenarios:

- Existing Networks and Structures
- New Frameworks
- Mobile Units

## Example Locations Where EDAR can be Installed:

- Gantries
- Bridges
- Specialized Truss or Trailer System
- Single Poles

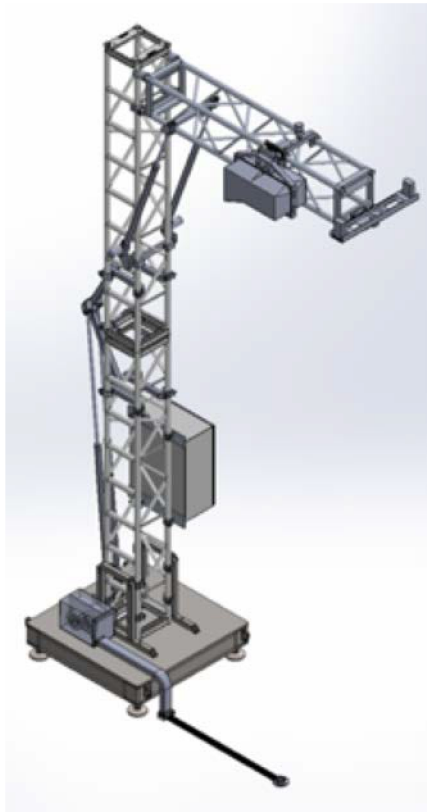
EDAR deployments are not limited to the examples listed above

EDAR can be utilized in many ways

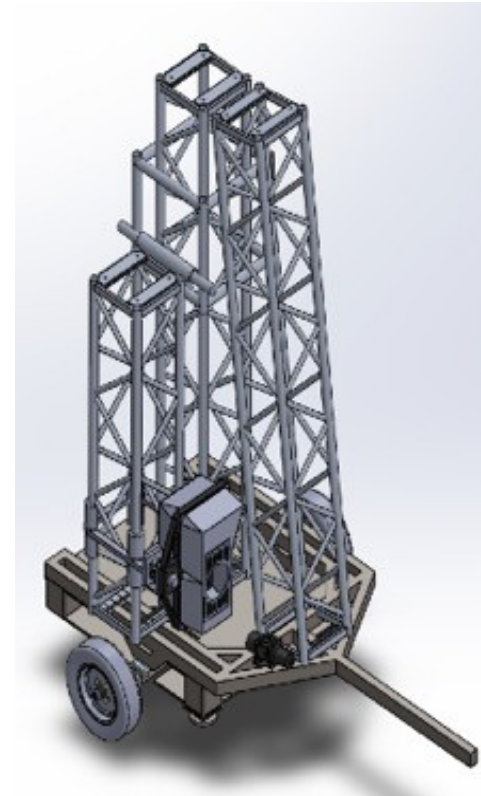


# The EDAR Temporary Deployment System

The EDAR Truss System has a 4X4 (FT) Footprint

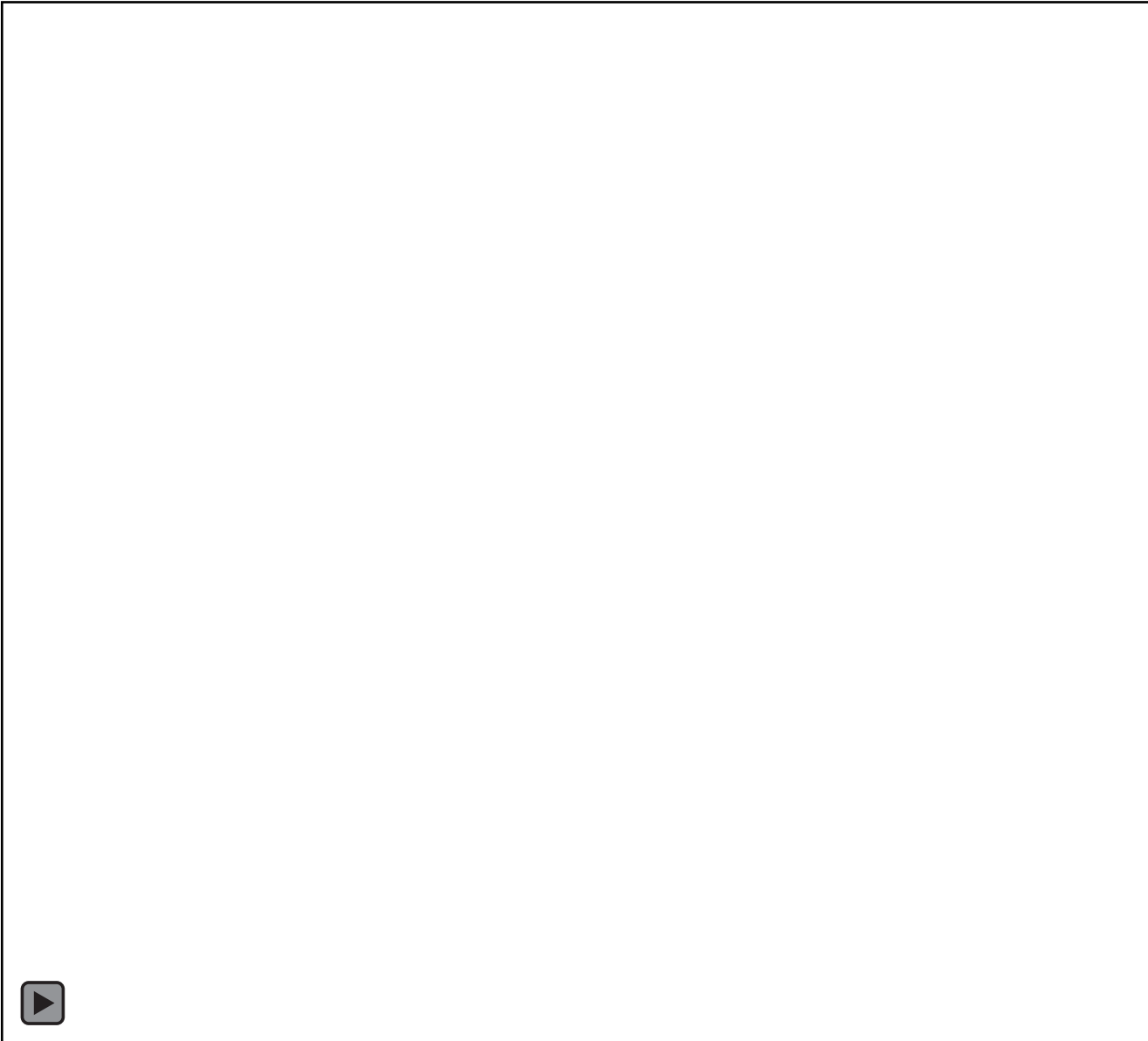


Truss Deployed



Truss Stowed for Transport

# Easily Deployed Truss



# EDAR in Europe

## EDAR Has Been Deployed In:

→ London, Birmingham, Edinburgh, Broxburn, North Lanarkshire, & Paris



**London**



**Paris  
Diderot**



**Edinburgh**



**Broxburn**



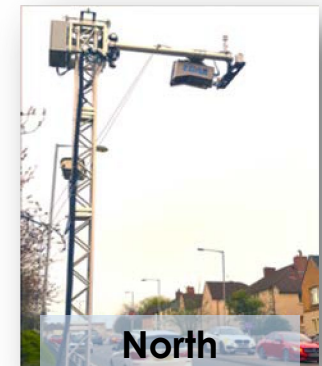
**Blackheath**



**Paris  
Tolbiac**



**Paris  
Choisy**



**North  
Lanarkshire**

# PARIS

# Paris Project

Deployed in June at 3 Separate Locations

200,000 Valid Vehicle Emissions  
Records Collected

110,000 Valid Light Duty Emissions Records  
Collected in Less than 2 Weeks



# EDAR in Paris



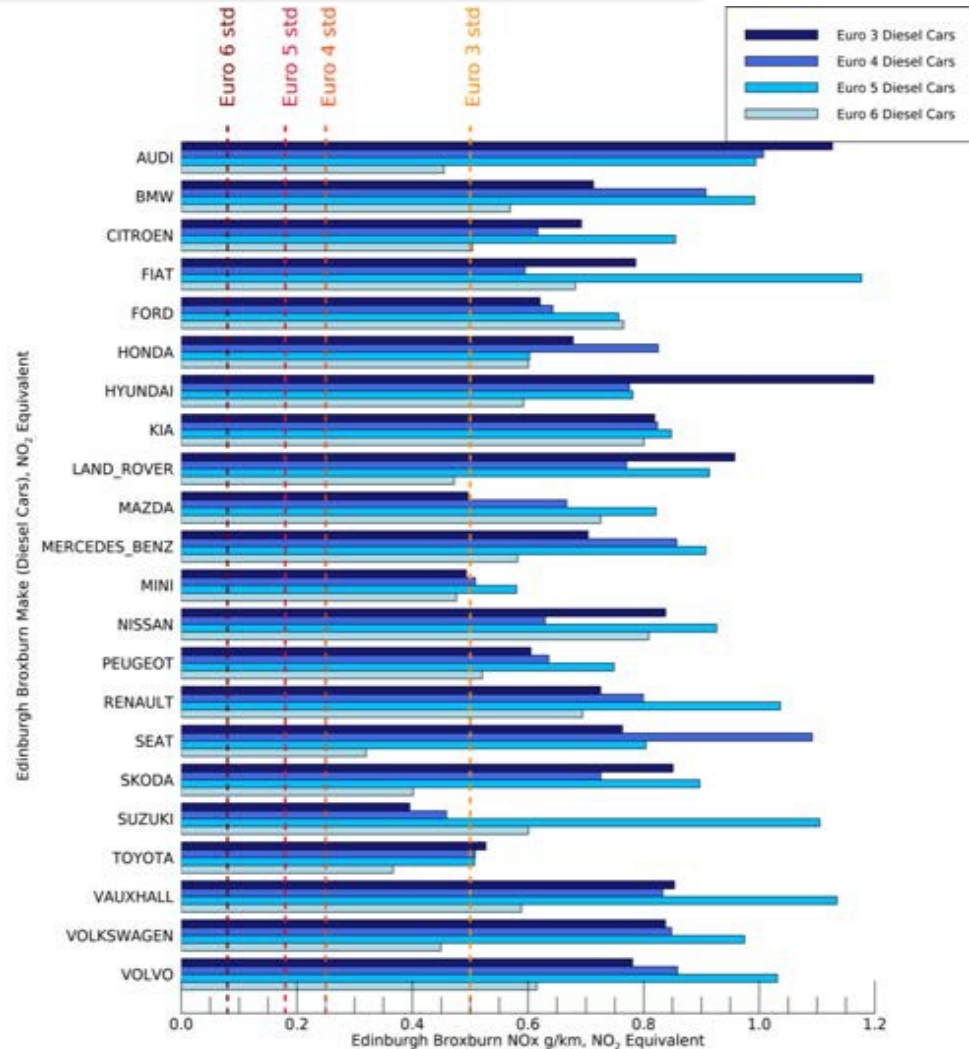
# SCOTLAND

# Scotland Pilot Findings in 2017

EDAR Collected over 140,000 Valid Records at 3 Locations in Under 25 Days

## Results Showed:

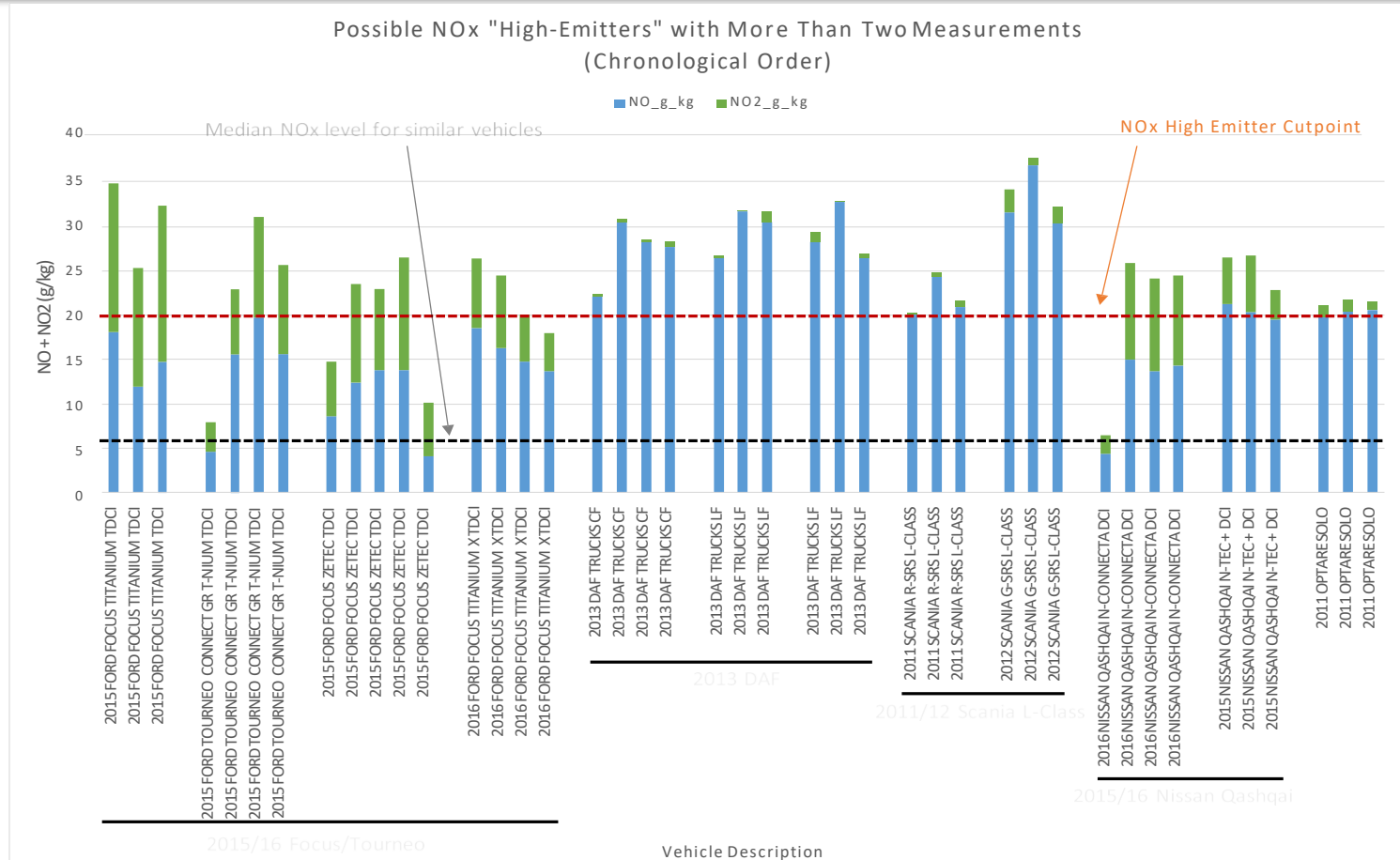
- The average NOx emission value of Euro 4, Euro 5, and Euro 6 diesel cars was significantly higher than EU standards
- This data set provided substantial evidence that trying to lower ambient pollution levels in LEZs by using the vehicle Euro Standards as a proxy for in-use emissions levels will not be a reliable method



# Summary of Scotland Findings (continued)

Continuous Monitoring can Provide Repeat Measurements which can Identify Anomalies in the Fleet

- ➔ The evidence of repeat measurements show pattern failures and emissions system design deficiencies in the Scottish fleet



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# An EDAR Network Around a City can Provide

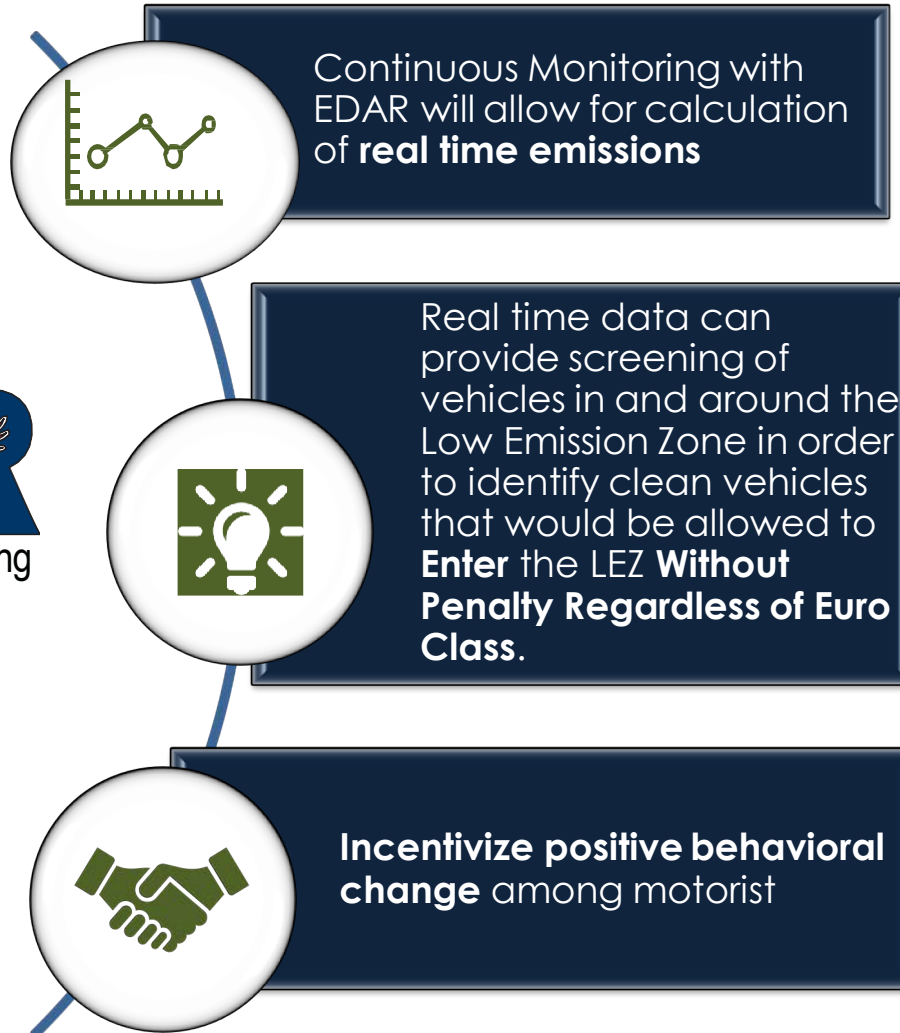


## Superior and Statistically Significant Data

### Ability to have Real World Data to Support Air Quality Initiatives such as:

- Low Emission Zones
- Scrappage Schemes
- Vehicle Ban
- Identification of Defeat Devices
- Observing Trends and the Degradation of Emissions Control Systems

# A Valid & Fair Low Emission Zone Begins With EDAR



# In Summary, Remote Sensing Data can be Used to:

- Continuously monitor real-world driving emissions
- Identify clean vehicles to allow into LEZs, regardless of Euro class
- Incentivize positive behavior for both the motorist and the car manufacturers
- Identify high polluters on the road and direct them to Car Test Station for further evaluation
- Identify vehicles with disconnected/disabled diesel particulate filter (DPF) & selective catalytic reduction (SCR) systems
- True assessment of complementary emissions reduction programs, such as retrofits, can be evaluated effectively overtime therefore identifying the degradation of the retrofit components in real time

