Proposed Assessment Criteria for ECO Stars Taxi Scheme

Introduction and background

The objective of this document is to propose a set of criteria for formally assessing taxi[1] vehicles and operators in order to rate their environmental and operational efficiency. This rating will be used in the ECO Stars taxi scheme to award a number of stars, both at individual vehicle level and at overall operator level.

The criteria need to be flexible enough to meet the needs of different taxi operations. This needs to take in to consideration the differences between urban and rural operations as well as the distinction between small and larger taxi fleet operations.

A taxi is defined as a licensed vehicle that can carry a minimum of three fare paying adult passengers and a maximum of eight passengers. All vehicles are required to have four road wheels / tyres; at least four doors, excluding any tailgate; and windows with mechanisms that enable the passenger adjacent to the window to open and close it. Vans are sometimes converted by the manufacturer (or subsequently modified) and registered with DVLA as a passenger car. If these are also licensed as a taxi they are eligible for the scheme. Vehicles not eligible for the ECO Stars taxi scheme are minibuses (that can carry between 9 and 16 passengers) and vehicles registered as vans. Operators of minibus and vans should apply for those vehicles to join the ECO Stars fleet scheme for truck, van, bus and coach.

In Tiverton the majority of operations are private hire vehicles and fit a fairly typical taxi operation profile in that they carry either up to four passengers in a 4 (5) door saloon vehicle or between 5 and 8 passengers in an MPV (multi purpose vehicle or mini-van). Hackney carriages are less common.

Whilst a larger number of vehicles are diesel, petrol cars are also used by operators. The profile of activity varies from company to company. In the case of those operators we have spoken to in Tiverton, some carry out mostly ad hoc local work with some longer distance journeys e.g. to airports, whilst others work purely on a 'contract' basis e.g. school contracts on behalf of Mid Devon District Council (MDDC).

ECO-Stars for taxis is the first of its kind in the United Kingdom. The concept has been the subject of a feasibility study in Mid Devon and will be launched and become operational in October 2012. It is fully transferable and has the potential to be applied to other operational taxi fleets. Building the ECO Stars taxi scheme into Local Authority procurement policies on school and other transport contracts is seen as a key method for increasing take up and promoting its use in any given area.

Euro standard as a basis for basic star rating for vehicles

The original fleet ECO Stars scheme assesses both the vehicles in a fleet and the overall operation of the business. It is recommended to continue this format for the taxi scheme.

Initially each vehicle is considered on the Euro (emission) standard against which its manufacturer sought type approval. The Euro standard currently in force is Euro 5. The

[1] For the purposes of this scheme, the term taxi is used to cover both Hackney Carriage and Private Hire operators, drivers and vehicles. Hackney Carriage vehicles are licensed for carrying passengers, with the driver able to pick up passengers from the streets and ply for hire in public places, whilst Private Hire Vehicles (PHVs) are also licensed for carrying passengers but all fares must be pre-booked. PHVs are not allowed to pick up passengers from the streets or ply for hire in public places.

proposed Euro 6 standard will not be mandatory for new vehicles (requiring type approval) until September 2014.

The relevant Euro standards for passenger cars by date (for type approval) are as follows:
- Euro 3 - (01/2000)
- Euro 4 - (01/2005)
- Euro 5 - (09/2009)
- Euro 6 - (09/2014)

Note that it becomes mandatory to sell only the relevant Euro standard vehicle 1 year after the standard first applies to new type approvals, so there is a cross-over period when different vehicles are being sold new that meet one of two Euro standards.

In Mid-Devon taxi licensing already applies a minimum Euro standard:
- From 1 April 2010 all vehicles offered for licensing for the first time must meet Euro Standard 3.
- From 1 April 2011 all vehicles offered for licensing for the first time must meet Euro Standard 4.

Therefore in Mid Devon this means that the oldest vehicles that can be newly licensed for taxi operations are Euro 3 models, type approved after 01/2000. Elsewhere, for example in London, taxi operators (Hackney Carriages) have only been issued new licenses if they meet Euro 3 standards since June 2008. Older vehicles registered before the policy began can continue to be operated, with turnover of vehicles naturally removing more of these older vehicles as time goes by.

It is proposed that the ECO Stars taxi rating is based on Euro standards and starts at Euro 3 standard.

Booster stars for vehicle modification and equipment

In addition to the basic star rating awarded to applicants for each vehicle, it is recommended that a number of booster star options are made available to member applicants. These are listed in the following table and described in more detail below.

Table 1 – Booster stars for vehicle star rating

List A : Vehicle Specifications for fuel and / or emissions savings	List B: Telematics and monitoring equipment

• Alternative fuels
  ○ Hybrid electric drive technology using either diesel or petrol engines
  ○ Liquefied Petroleum Gas (LPG)
  ○ Other alternative fuels (CNG, biomethane, bioethanol, biodiesel)*
• Vehicle performance limiters
• ECO model variants
• Automatic Stop/Start
• Low rolling resistance tyres
	• In-car fuel consumption monitoring
	• Telematics monitoring equipment for driver and/or vehicle performance
	• 'In-car navigation and communication equipment
	• Tyre pressure monitoring
	• Cruise control

* Check with scheme manager.

List A: Vehicle Specification for fuel and / or emissions savings

List A focuses on some of the direct benefits relating to the taxi vehicles, in terms of specifications for fuel and / or emissions savings. Some background and supporting rationale on each benefit is provided in the following.

Alternative Fuels

With respect to alternative fuels the most relevant at this point are electric hybrid vehicles, using either petrol or a diesel engine, and vehicles powered by LPG.

Hybrids, by using a blend of engine power and assistance from the electric motors typically offer greater fuel efficiency though the benefits may be greater in urban deployments.

LPG is not generally popular with the operators of car fleets; few manufacturers have offered new LPG models. The quality of conversions can vary widely, warranties can be affected and they are generally unpopular with drivers. On-board fuel tanks can also reduce payload space, potentially restricting operational capability. However, in the local taxi market, where vehicles are often pre-owned and, when they are driven by a user who has an empathy with the fuel type, they can deliver cost savings and benefits to air quality.

Whilst other alternative fuels could have significant environmental benefits in taxi fleets it is unlikely they will be taken up in the short term. In the longer term this may change, and therefore we propose including CNG / biomethane, electric vehicles, bioethanol and biodiesel while acknowledging the following barriers:

- The application of CNG/Biomethane is currently far more relevant to heavy goods vehicles. It is perceived by managers of car fleets to be a 'niche' fuel, generally appropriate to a specific and continuing duty cycle where a robust arrangement can be made to take on fuel in a manner wholly integrated into that duty cycle. As far as general fleet car use is concerned, fleet managers are sceptical about the ability to collect fuel reliably on open routes and concerned that the space taken up by onboard fuel storage will have an adverse impact on operational capabilities.
- Duty cycles of electric vehicles, by reason of their limited range and battery recharging time are limited. Whilst options exist to use rapid charging cycles, they are generally expensive and rare. Consequently, electric vehicles can only represent a restricted opportunity to a taxi operation where the vehicles only attract revenue when they are moving and represent a cost when they are static.
- Bioethanol (E85) vehicles have been available in other parts of Europe and the Americas for a number of years, and trialled successfully in the UK (e.g. BEST project, Somerset CC, based on Ford Focus Flex-Fuel vehicles) with E85 fuel available on the forecourt (Morrison's). Significant reductions in emissions were achieved. However, changes in UK duty regulations on alternative fuels effectively removed any duty incentive to use this fuel (similarly to biodiesel) and it is no longer cost effective. A change in duty rules could change the case for Bioethanol.
- Biodiesel (in blends over the normal minimum in forecourt fuels of around 7%) can reduce green-house gas emissions and particulate matter. There is some evidence of increased NOx emissions, and therefore it is a risk to local air quality. It is suggested that biodiesel might be credited in the scheme *if* the operator can prove no raised NOx levels.

It is suggested that the criteria allow for the above alternative fuels, but operators seek guidance from the ECO-Star scheme managers about their specific use and recognition within the scheme.

Vehicle performance limiters

These devices prevent a pre-determined road speed or engine revolutions per minute (rpm) being exceeded. Given that fuel consumption per mile increases with higher road and engine speeds, this restricts the vehicle to usage parameters which are more fuel efficient.

Limiters can often be configured either to deliver one or both of road speed or engine rpm limits.

ECO model variants

Many manufacturers now offer an ECO specified model. These models carry their own sub-brand identity, for example Volkswagen's Blue Motion, BMW's Efficient Dynamics, Skoda's Green Tech, Mercedes Blue Efficiency and others. A mixture of lighter components, enhanced fuel efficiency of the power train, improved energy efficiency of the tyres and the inclusion of additional technology fitments result in a more fuel efficient model.

Automatic Stop-Start

The auto stop-start system stops the engine after a pre-determined period of engine idling. The engine automatically restarts when the clutch is depressed or a gear selected. This system may either be included in the specification of some models or can be specified as additional equipment.

Stop-start technology is likely only to deliver benefits in more urban deployments where congestion is likely to be encountered. It is less likely to offer fuel reduction opportunities in rural duty cycles thus, whilst it may not be relevant to the Mid Devon taxi scheme, it may be more appropriate to future schemes where urban operations are encountered.

This system may be included in the specification of ECO model variants.

Low rolling resistance tyres

Tyres with a lower rolling resistance require less energy to power them past the deformation phase as they roll through the load bearing part of each rotation. These may be included as part of the specification of an ECO model variant.

The practical difficulty which may be encountered with the ECO Stars scheme for taxis is that tyres might not be replaced on a like-for-like basis thereby prejudicing the integrity of the original ECO Stars vehicle assessment. However, in situations where a very robust maintenance management system ensures like-for-like replacements, they can represent an acceptable measure.

It is recommended to include low-rolling resistance tyres only if they are replaced like-for-like and a maintenance management system also ensures correct inflation.

List B: Telematics and monitoring equipment

List B identifies some of the more indirect benefits of operating a taxi vehicle, focusing on telematics and monitoring equipment. As with List A, the following supporting text describes the associated context of each criterion.

In-car fuel monitoring equipment

This equipment provides information to the driver on the fuel efficiency of the style of driving being demonstrated at that time. It allows an immediate correlation of the driver's actions to the fuel consequences with the objective of encouraging the driver to adopt better practice techniques.

Methods of indication are specific to the vehicle manufacturer but may include optimum gear indicators, increasing displays of lights to indicate higher levels of driving efficiency, and real-time miles per gallon or litres per 100km readouts. In its most simple format a basic trip computer will record mileage travelled and fuel consumed, which may then be converted in to miles per gallon / litres per 100km.

Telematics for monitoring vehicle efficiency

Telematics systems are able to pass defined elements of information back to the point of management control. Commonly, the information considered includes vehicle location and speed though the systems are capable of delivering a vast range of data elements and advanced applications can identify, for example, rapid acceleration or heavy braking, as well as idling and over-revving, which are themselves indicative of a fuel inefficient driving style.

There is a perception that this is 'spy in the car' technology and deployment is sometimes resisted by drivers. However organisations which have been able to install these systems generally report very significant improvements in total fuel consumed as well as benefits for general business efficiency.

In car navigation and communications equipment

Generally takes the form of satellite navigation and two way radios and enables journey scheduling and routing to be planned and communicated to provide the best opportunity for journeys to be undertaken in a consistently smooth manner thus promoting fuel efficiency. This helps minimise two efficiency 'eroders' – namely empty running and excess/duplicate mileage. Job allocating systems ensure the most appropriate vehicle i.e. the closest and most suitable for the customer is assigned to the job.

Tyre pressure monitoring

Whilst the fuel efficiency of most tyres has improved in recent years, the downside is the need to maintain tyre pressures. Where pressure is allowed to fall too far, the rolling resistance of the tyre increases very significantly, increasing the amount of fuel used.

Cruise control

Cruise control allows the driver to select the required speed and then manages power train control settings to automatically maintain that speed and minimise fuel consumption.

Taxi operation criteria and rating

The taxi operator will receive a rating based on a combination of their vehicle fleet rating (percentages achieving certain thresholds) plus organisation and technology measures to monitor fuel use, vehicle maintenance, driving behaviour and routing. This will need to recognise that in the Tiverton case study there are not only small operations e.g. 2 or 3 vehicles, but also individually owned / driver i.e. single vehicle operations.

Recommendations in this section identify those management practices which will be of value to reduce the total fuel consumed by the fleet and to offer opportunities for continuous improvement in the operational efficiency of the business.

The recommended management practices include:

- Fuel management programme
- Formal driver training
- Maintenance control processes
- Formal operating policy review
- Initiating management strategy from customer feedback
- Integrated telematics systems
- Business performance indicators

Maintenance control, policy review and using customer feedback to develop strategy are valuable approaches to managing cost and environmental impact. However, the most significant fuel consumption reductions are likely to be derived from a fuel management programme, driver training and/or integrated telematics.

The consistent use of business performance indicators is likely to identify an organisation which has a clear focus on all the supporting tactics and strategies.

Fuel management programme

There is clear evidence to validate the value represented by formal fuel management programmes, in that they are proven to be effective in minimising fleet fuel consumption. The continuing focus ensures that all members of staff are aware of the importance attached to this key element of performance and cost.

The specific approach applied must be tailored to reflect the operational requirements and nature of the organisation e.g. larger operations will inevitably have more staff at their disposal some with specific functions. Techniques which have been found to add value include:

- Appointment of a ‘Fuel Champion’ who is responsible for raising the profile of the initiative, delivering the required improvement and then maintaining performance.
- Communicating overall fuel performance to employees.
- Use of league tables to promote an element of competition between, for example, one driver and another.
- Rewards and incentives at individual and group levels.

At its core however, any fuel management programme must have:

- Appropriate refuelling policies to ensure that precise volumes of fuel can be attributed to the specific mileage of each vehicle. This is often achieved by applying a ‘brim the tank’ approach to all fuel pick ups and may be supported by a requirement to fill the tank at specific days during each review period.

- Data collection systems to capture fuel volumes and cost for each fuel fill. This may be implicitly achieved where fuel cards are used.
- Robust practices to ensure that the odometer mileage is collected and reported at every fuel fill. This may also be achieved by use of a fuel card.
- Reliable processes for holding all fuel volumes, costs and mileage data in such a manner that inconsistent data can be identified and corrected and that the miles per gallon / litres per 100km yield can be readily computed on a scheduled periodic and cumulative basis and benchmarked against an agreed standard either for that car, the fleet or a sub-group of the fleet.
- A process for identifying and addressing, on a sustainable basis, adverse variants and validating the subsequent improvement in their performance. Many fleet operators find that an approach in which a small proportion of cases, often the most significant variants, are addressed during each review period results in an approach which is tenable over the longer term.

Formal driver training

Most fleet operators report significant improvements in fuel efficiency achieved through driver training. Some drivers may be unaware of good driving practice and the specific behaviours which improve fuel efficiency. Communication and coaching will typically be beneficial. However, many fleet operators also report that drivers all too often revert to poor practices unless focus is maintained by the fleet manager.

Operators should be able to demonstrate a robust approach to the identification of training needs of their drivers and a suitable process for continuing management of driver performance. This will include assessing how the training is delivered, the continued management and monitoring of its impact and operators demonstrating that the training they've selected is appropriate e.g. it delivers enhanced safe and fuel efficient driving skills.

Maintenance control processes

Keeping any vehicle in a peak operating condition will preserve its ability to deliver lower overall fuel consumption.

Operators should have processes in place to ensure that vehicles are serviced in accordance with the manufacturers' recommendations as well as established routines for day-to-day checks on, for example fluid levels, tyre pressures and the general vehicle condition, in addition to fault reporting and rectification.

Formal operating policy review

Operators of fleets should have established a formal policy to clarify how vehicles are specified for acquisition and subsequently operation.

Routine and scheduled formal review of the policy will allow the fleet to respond to changes in operational requirements, legislation and to meet the established and evolving needs of the business.

Policy review should include, but not be restricted to:

- Vehicle qualification rules and specification
- Fuel type investigation and specification
- Operating procedures
- Reporting and management information

- Driver management

Initiating management strategy from customer feedback

A taxi fleet operator may seek to establish dominance over their competitors by excelling in customer service. Existing nationally recognised training programmes, such as NVQ[2], already provide taxi driver training in customer service, focusing on key areas such as disability awareness, health and safety, transporting children and young people, and dealing with difficult customers.

ECO-stars will not replicate, but rather seek to complement such training programmes.

Some customer service techniques however are likely to deliver the information which will be found useful by the operator in identifying driver characteristics which suggest that fuel economy can be improved.

This could be accommodated by the use of a customer feedback process to gather information on:

- Timeliness of taxi arrival
- Suitability of the vehicle
- Cleanliness of the vehicle
- Smoothness of the journey
- Helpfulness of the driver
- Perception of the level of importance of environmental performance

Consolidation of the outputs will allow the identification of training and development needs.

Integrated telematics systems

As the capability of telematics systems develops, enhanced applications are coming onto the market. These are capable of providing information to the fleet manager on the quality of driver behaviour, often displaying information in such a way that the controller is directed to the priorities for action, sometimes by red, amber or green indicators. These applications currently have relevance to insurers as they seek to differentiate between the levels of risk associated with different standards of driver behaviours. However, these systems also have great potential for fleet operators and to deliver the economies of scale they are usually applied to the entire fleet.

Currently, these systems are costly and perceived as more relevant to large fleets, however, over time, and as costs reduce, it is expected that they will become increasingly relevant to operators of smaller fleets.

Business performance indicators

At the very heart of efficient taxi operations is the core aim to reduce overall total mileage. There are two key considerations within this, namely to maximise the revenue generating percentage and minimise the dead or stem mileage.

The first is the objective of maximising mileage for which fare income can be derived and simultaneously to minimise the 'dead' miles which represent only an operating cost.

[2] The Road Passenger Vehicle Driving (Taxi) NVQ

Secondly, it is desirable to better utilise the larger, more spacious vehicles by using them, to the greatest extent possible, for the carriage of multiple passengers rather than fewer occupants than their capacity.

Management systems which are able to collate data on charged mileage, the number of passengers and 'dead' mileage will allow management information and ratios to be developed to support and guide the actions necessary to improve that ratio.

Suitable ratios could include:

- Charged mileage versus dead mileage as percentages of total mileage
- Fuel volume per passenger mile

Table 2: Taxi vehicle criteria and rating

Basic Star Rating Criteria[3]	Basic Star Rating	Booster Star Rating options		Booster Stars Available	Maximum Stars Available
		List A : Vehicle Specifications for fuel and / or emissions savings	List B: Telematics and monitoring equipment		
Euro 3 (01/2000)	Zero	• Alternative fuels (CNG, biomethane, bioethanol, biodiesel)[4] • Hybrid electric drive technology using either diesel or petrol engines • Liquefied Petroleum Gas (LPG) • Vehicle performance limiters • ECO model variants • Automatic Stop/Start • Low rolling resistance tyres[5]	• In-car fuel consumption monitoring • Telematics monitoring equipment • In-car navigation and communication equipment • Tyre pressure monitoring • Cruise control	1: – for any item from lists A or B and 2: 1 for any item from list A, and 1 for any item from list B	2
Euro 4 (01/2005)	✪	• Alternative fuels (CNG, biomethane, bioethanol, biodiesel) • Hybrid electric drive technology using either diesel or petrol engines • Liquefied Petroleum Gas (LPG) • Vehicle performance limiters • ECO model variants • Automatic Stop/Start • Low rolling resistance tyres[2]	• In-car fuel consumption monitoring • Telematics monitoring equipment • In-car navigation and communication equipment • Tyre pressure monitoring • Cruise control	1: – for any item from lists A or B and 2: Either **3** items from list B or 1 for any item from list A, and 1 for 2 items from list B	3
Euro 5 (09/2009)	✪✪	• Alternative fuels (CNG, biomethane, bioethanol, biodiesel • Hybrid electric drive technology using either diesel or petrol engines • Liquefied Petroleum Gas (LPG) • Vehicle performance limiters • ECO model variants • Automatic Stop/Start • Low rolling resistance tyres[2]	• In-car fuel consumption monitoring • Telematics monitoring equipment • In-car navigation and communication equipment • Tyre pressure monitoring • Cruise control	1: – for any item from lists A or B 2: Either **3** items from list B or 1 for any item from list A, and 1 for 2 items from list B	4

[3] The Euro standard dates are for guidance only and for use in this paper only. The stated dates apply to new vehicle type approvals and for passenger cars only. Some vehicles will not have been type approved to this standard until up to 1 year later. Vehicles manufactured and registered as light commercial vehicles (i.e. vans) but registered as passenger cars will be subject to a slightly different set of Euro standard timescales (1 year later in some cases).
[4] Alternative fuels: Check with scheme manager regarding qualifying fuel quality and vehicle technologies
[5] Low rolling resistance tyres: If an appropriate replacement (like-for-like) is made and maintenance practices ensure correct inflation.

Euro 6 (09/2014) / Zero Emission Vehicles*	✪✪✪	• Alternative fuels (CNG, biomethane, bioethanol, biodiesel) • Hybrid electric drive technology using either diesel or petrol engines • Liquefied Petroleum Gas (LPG) • Vehicle performance limiters • ECO model variants • Automatic Stop/Start • Low rolling resistance tyres[2]	• In-car fuel consumption monitoring • Telematics monitoring equipment • In-car navigation and communication equipment • Tyre pressure monitoring • Cruise control	1: – for any item from lists A or B 2: Either **3** items from list B or 1 for any item from list A, and 1 for 2 items from list B	5

***Note**: Euro (emission) standards, noting that Euro 6 is not mandatory for new vehicles (requiring type approval) until September 2014, so the typical Euro standard available now reaches Euro 5.*

**Zero Emission Vehicle: at point of use,* using battery electric power or hydrogen.

Table 3: Taxi operation criteria and rating

ECO Stars Taxi scheme – Operator Rating
1) One Star - minimum 75% of fleet One Star vehicles or 50% one star vehicles and **three** operational practices.
2) Two Stars - minimum 75% of fleet Two Star vehicles or 50% two star vehicles and **three** operational practices.
3) Three Stars - minimum 75% of fleet Three Star vehicles or 50% three star vehicles and **four** operational practices.
4) Four Stars - minimum 75% of fleet Four Star vehicles and **five** operational practices in place.
5) Five Stars - 100% Four Star vehicles plus at least **five** operational practices in place.
This applies **until** Euro VI vehicles are available (in 2014) when the scheme will require 20% Five star vehicles per each full year passed from introduction of the standard in order to qualify as a 5* Operator.

Operational Practices (which need to be adequately described and demonstrated during the application process) are:

- ✓ Fuel management programme;
- ✓ Formal driver training;
- ✓ Maintenance control processes;
- ✓ Formal operating policy review;
- ✓ Initiating management strategy from customer feedback;
- ✓ Integrated telematics systems; and
- ✓ Business performance indicators.