

Written evidence submitted by the Institution of Civil Engineers (EVP0102)

Introduction

Established in 1818 and with over 95,000 members worldwide, the Institution of Civil Engineers (ICE) exists to deliver insights on infrastructure for societal benefit, using the professional engineering knowledge of our global membership.

Our submission to this inquiry primarily draws on ICE's work on achieving sustainable roads funding in England, including the option of a 'pay as you go' system for the Strategic Road Network.¹

Summary

Government policy is for the sale of all new cars and vans to be effectively zero emission by 2030. An increasing number of vehicles exempt from Fuel Duty and a continuation of the Fuel Duty escalator freeze will mean that Fuel Duty will likely raise significantly less than it does at present by the end of the next decade.

VED revenues are also a concern given the exemptions and discounts that currently exist for electric and lower emission vehicles. As ultra-low and electric vehicles attract reduced duties, this implies a long-term future trend of decreased VED revenues, in the absence of government intervention, and is especially important considering that VED is hypothecated to fund Highways England's second Road Investment Strategy, and will potentially do so for future Road Investment Strategies.

Due to these changes in how vehicles are fuelled, as engines continue to improve in efficiency and as technological developments and social change stress traditional ownership models, taxation of roads will need to be future-proofed.

ICE has explored this issue, producing a policy paper in 2019 that examined the practical, technological, social, political and regulatory challenges of establishing a 'pay as you go' (PAYG) model for the Strategic Road Network (SRN).² In doing so, the paper does not put forward a preferred option. Rather, it outlines a range of high-level recommendations that must be delivered in order for any future PAYG model to be effectively and fairly administered:

- **ICE recommends that the following principles should be adhered to in developing a future PAYG model:**
 - a) **Any PAYG model that is deployed should consider a range of measures, including vehicle weight, emissions, noise, overall efficiency and intensity of use.**

- b) **Any PAYG model should not raise more than is collected from existing VED and Fuel Duty revenues, and care should be taken to avoid additional financial burden so as to not create any additional financial pressures for people from lower socio-economic groups.**
 - c) **Government should consider a road ownership model for the SRN where government or private companies collect revenue, manage data and maintain roads on a concession basis.**
 - d) **In view of the existing simplicity of collecting VED and Fuel Duty revenues, collection methods underpinning any PAYG model should be transparent, simple to understand and protect the privacy of all users.**
- **The Government must examine the tax revenue implications of electric and self-driving vehicles within the scope of any further consultation into new regulation or legislation for the UK's self-driving future.**
 - **A PAYG replacement for road-related taxes, which safeguards funding of road infrastructure, should be in place well before 2030, before revenues from Fuel Duty decline significantly, or connected and autonomous vehicles become commonplace.**

Benefits of pay as you go

Implemented well, a PAYG system would have wide-ranging benefits for society and the economy. For example, it could reduce congestion, which in 2017 cost UK motorists (including SRN users in England) £37.7bn.³ Such a system would also be more equitable; those who cannot afford more fuel-efficient cars, generally buying older models, are penalised by the need to buy more fuel and, increasingly, as more people benefit from electric vehicles, the current system places a greater tax burden on fewer people.

PAYG has the potential to address both congestion and maintenance. By incentivising a shift to more efficient modes of travel, or encouraging car-pooling, existing capacity can be better utilised to reduce the number of individual vehicles making journeys relative to the population.

A key benefit of introducing PAYG on England's busiest roads, like the SRN, would be consistent measurement of use, based on access or distance. It would also allow for adopting road pricing, which could consider vehicle weight, emissions, speed or route efficiency.

A PAYG model can also be priced to factor in individual vehicle wear and tear costs on road maintenance based on realised usage. It could also price in incentives for non-domestic vehicles to use cleaner engines in a simpler way than the HGV Road User Levy does at present and apply it to other types of vehicle.

Public support

YouGov polling on behalf of ICE in September 2018 found that 47% of GB adults would support a PAYG model if it replaced both VED and Fuel Duty, with just 23% opposed.^{4 5}

The same polling found that nearly 50% of GB adults would support the introduction of PAYG if it meant more money would be spent improving and maintaining local roads.⁶

However, updated polling from January 2021 shows that public support has decreased; 40% of GB adults would support a PAYG model if it replaced both VED and Fuel Duty, with 28% opposed.⁷ However, this means that support still outweighs opposition. The exact reasons for the decrease in support are unknown without further interrogation of the survey cohort.

These results show that there is some public support for a PAYG system that is coupled to clear and tangible benefits, particularly on improved maintenance and condition of roads, and if there was no overall increase in the tax burden.

It is clear that, whatever the policy option pursued, there is a pressing need to bring the public along on the journey to net zero and clearly explain the rationale, benefits and indeed disbenefits where applicable.

To do so, the narrative around the net-zero target needs to change. At the moment, it is presented as a significant challenge which needs to be overcome regardless of the cost. However, there are other impacts over and above halting a rise in global warming that come as additional benefits. Net-zero infrastructure is cheaper for the consumer in the long-term. A net-zero economy also supports UK economic competitiveness through greater resource efficiency. It is vital that the public understand that the road network – and their usage of it – is an important part of reducing emissions and ensuring long-term prosperity.

Options for a pay as you go model

There are three main forms of PAYG models or road pricing currently in use worldwide, which could serve as a pay as you go model. These have different costs and benefits in relation to each other. ICE believes the cross-cutting challenges include:

- Technology
- Privacy
- Affordability
- Regulation
- Revenue collection

These would all need to be addressed with each system having strengths or weaknesses.

The table below sets out our estimation of the challenge, cost or risk inherent in three of these models. This is not to rule one system out, but to give a realistic overview of where

challenges might need to be prioritised and where most effort might need to be expended if that model were to be adopted.

	Low	Medium	High				
	Technological challenge	Privacy and social concern	Cost for motorists	Need for regulation	Collection cost	Adaptability	Network coverage
Gated tolls	Low	Medium	Low	High	Low	Medium	High
Distance-based	Medium	High	Low	High	Low	Low	Low
Zonal	Medium	High	Medium	Medium	High	High	Medium

Table 1: Potential impacts of different PAYG models

Gated toll roads

Gated toll roads are used in much of Europe, most noticeably in France through the Autoroute system. Roads are tolled directly with physical or electronic booths, regulating access and egress from the network. Autoroutes are managed by private companies responsible for the construction, operation and maintenance of owned sections of the motorway network on a concession basis.

Revenue from tolls goes back into maintaining and expanding the Autoroute network, with collection as and when the Autoroute network is accessed. Depending on the model, this could be a single access charge, or a charge based on distance with gates at off-ramps.⁸

Distance-based models

Technology is in place to allow for active monitoring of a vehicle's location, speed and direction as part of a fully connected road network. There are three potential distance-based systems that could be adopted, the first two of which could exclude roads from the charging network.

- 1) Telemetric 'black box' GPS units placed in individual vehicles reporting to a real-time database over an 'always on' GSM connection as used by the insurance industry.⁹
- 2) Onboard units that periodically report mileage to roadside transponder markers, as is the case with the LKW Maut in Germany.¹⁰
- 3) A full road network charge could, in theory, use a simplified reporting system, reporting mileage between MOTs.

Further, car manufacturers have begun to adopt GPS/GSM based systems to allow direct communication with the manufacturer for maintenance purposes or as part of the eCall¹¹ system. As new vehicles join a connected fleet, they will have the technology to monitor location.

Cordon, zonal and congestion charging

London, Stockholm, and Singapore deploy a form of area-based charge to control pollution, congestion, and raise funds for maintenance. Vehicles are registered as having entered the chargeable zone automatically through number-plate recognition cameras mounted on overhead gantries.

While these schemes were implemented to tackle congestion and emissions and are supplemented with additional public transport options, they do allow for variable charges and represent an alternative to traditionally-gated toll roads. However, they do generally have significantly higher running costs than alternatives.¹²

Challenges facing a pay as you go model

Technology

A PAYG scheme would likely rely on a technological solution. There are various examples of how this could work; however, an alternative tax regime should seek to replace the existing generation of road-related taxes, rather than add to the overall tax burden.

Depending on the system's complexity, a communicative system that tracks vehicles in real-time and manages traffic flow, something similar to the automatic number-plate recognition system as used in London, or a simpler database that cross-checks reported mileage, any PAYG model will need new systems and infrastructure. This inevitably will require time to implement as well as potentially significant set-up costs.

The most efficient way to implement this system is on a distance-based approach, using electronic, real-time and location systems. Real-time road monitoring of vehicles is already deployed in the UK with insurers using telematics technology to monitor distance and average speed.

This technology, alongside infrastructure supporting connected and autonomous vehicles, could be adapted to monitor a distance-based PAYG scheme. It could also incentivise behaviour which rewards efficient driving, at speeds which maintain traffic flow, by passively adjusting the distance charge for drivers maintaining a speed which supports traffic flow.

A system connected with real-time road traffic monitoring could also better manage traffic flow by advising drivers or vehicles of routes which are not congested, have road works or

have suffered an accident, encouraging rerouting and making better use of the capacity of the whole network.

Privacy

Privacy is the most immediately identifiable social concern, especially for road user charging models that track location data. A survey conducted by the Information Commissioner's Office in 2017 found that only 20% of the UK public have trust and confidence in companies and organisations storing their personal information.¹³ An always-connected vehicle would, in theory, be able to be tracked in real-time.

There would likely be security concerns in relation to the hacking of a road user charging network and issues around acceptability, particularly for those who, whilst travelling over the speed limit is illegal, do so with routine. According to DfT statistics, of nearly 350,000 observed cars, some 48% exceeded motorway speed limits.¹⁴ A system of active monitoring which could be perceived as raising a levy on established habits would be resented, even if it only enforced existing law.

Opposition to location data can be overstated; some 87% of people in the UK own a smartphone.¹⁵ Significantly, 84% of these people are concerned their personal data is being shared with third parties,¹⁶ but it is a device which has all the same technology a vehicle would have. While people do have misgivings, as long as appropriate privacy safeguards and oversight is in place, especially if managed by a trusted organisation or intermediary, people will likely come to accept a new system.

Affordability

Some users and stakeholders will have concerns about the affordability of a PAYG system for those from lower socio-economic groups who may be disincentivised from accessing the road network. Any model should not raise more than VED and Fuel Duty do at present.

Larger vehicles and freight traffic will, on average, pay more in VED and Fuel Duty due to vehicle classification and increased mileage. On the other hand, many low-charged or VED-exempt vehicles, such as newer electric or lower emission vehicles, tend to be more expensive, meaning those able to update their vehicles, or avoid buying second hand, pay less tax when initially registering the vehicle and benefit from better fuel economy.

The ICE is clear that driving with a future PAYG system should not cost the average driver any more than it does currently.

Regulation

While PAYG revenue could be collected centrally, expanding the concept of the National Roads Fund (which will hypothecate VED to the second Road Investment Strategy) should

be explored. Allowing direct grant of a concession to a management company, either a private entity or Highways England, would allow that company to collect the revenue from a PAYG scheme and use it to directly maintain the roads it would manage.

Providing concessions would have the likely effect of increasing efficiency and operation in a way which makes sense from an asset management perspective, with revenue raised from use linked directly to the costs of maintaining the infrastructure asset. Operating the SRN on this basis would also allow leveraging of additional private investment as there would be a direct investable asset with a revenue stream which is feasibly linked to future performance.

The regulation of charges and operation will also be a necessary consideration. The recent experience in France, where the French Competition Authority reviewed road charging prices in 2014 and found that rising revenues as a result of traffic growth and higher toll rates were divorced from the costs of maintaining the concession,¹⁷ show that close regulation would be necessary, as it is under the Regulated Asset Based model.

It would be necessary to establish a regulator with comparative powers to Ofwat or Ofgem, a function that the Office for Rail and Road (ORR) might fulfil.

Revenue collection

The cost of individual collection in PAYG models

A Congressional Research Service report found that administrative and enforcement costs of collecting user fees for mileage-based charges to be “in the range of 5% to 13% of collections” for electronic billing, card and bank fees, alternative methods of payment and enforcement.¹⁸

The Midland Expressway reported staffing costs of £4.44m in 2017 against an operating income of £89.07m, indicating around 5% of income spent on the day-to-day staffing costs of collection.¹⁹ The LKW Maut collected some €4.34bn in revenue in 2014, with costs of some €0.54bn to operate enforcement, maintenance, a central database and staffing – a ratio of 12.4%.²⁰ By way of comparison, Shell estimates that of the consumer cost of fuel, 7% is retained for transport, retailer site costs and profit. They state only “a few pence profit on every litre of fuel” sold.²¹

Collection by insurance, telecoms or manufacturing companies

There are existing relationships which could be leveraged without adding any significant administrative burden, including a single per-mile charge which could be collected by insurance companies acting as collection agents. This would need a ‘one-off’ investment of around £100m to adapt their systems and allow for billing, with mileage collected by insurance companies through telematic data or self-reporting cross-referenced against MOTs.²²

Aviva estimate that there is a £100 per customer cost for installation of a black box unit, with ongoing running costs of around £20 per user, though they expect costs to fall as technology improves.²³ Further, as more vehicles are built with connective technology as standard, the set-up costs for pay as you go relying on GSM and GPS enabled vehicles will fall over time. Competition could also be opened to other sectors, with telecoms or car manufacturers being possible candidates.

Electric fuel duty

A key element of the National Infrastructure Strategy is investment in EV charging infrastructure, with commitments both for home charging and along the SRN.²⁴ It would be an attractive proposition to raise revenue from these charging points and may be possible with domestic supply.

However, the long-term business case for private companies developing rapid charging points infrastructure could be undermined in the future by emergent technologies, including on-road charging.

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Endnotes

¹ ICE (2019) [Pay As You Go – Achieving Sustainable Roads Funding in England](#)

² Ibid

³ Inrix (2019) [Traffic congestion cost UK motorists over £37.7bn in 2017](#)

⁴ ICE (2018) [State of the Nation 2018: Infrastructure Investment](#)

⁵ All figures, unless otherwise stated, are from YouGov Plc. Total sample size was 1,643 adults. Fieldwork was undertaken between 21st - 24th September 2018. The survey was carried out online. The figures have been weighted and are representative of all GB adults (aged 18+).

⁶ Ibid

⁷ All figures, unless otherwise stated, are from YouGov Plc. Total sample size was 1,692 adults. Fieldwork was undertaken between 28th - 29th January 2021. The survey was carried out online. The figures have been weighted and are representative of all GB adults (aged 18+).

⁸ RAC Foundation (2016) [Governance and Funding of National Road Networks: Three case studies](#)

⁹ MoneySuperMarket (2018) [Compare black box car insurance quotes online](#)

¹⁰ T-systems (2018) [Go Maut 2.0 speaks European](#)

¹¹ European Commission (2019) [The interoperable EU-wide eCall](#)

¹² Tri-State Transportation Campaign (2018) [Road Pricing in London, Stockholm and Singapore. A Way Forward for New York City](#)

¹³ ICO (2017) [ICO survey shows most UK citizens don't trust organisations with their data](#)

¹⁴ Gov.UK (2018) [Vehicle speed compliance statistics: data tables \(SPE\) SPE0111 Vehicle speed compliance by road type and vehicle type in Great Britain](#)

¹⁵ Deloitte (2018) [Mobile consumer Survey 2018L The UK Cut](#)

¹⁶ Ibid

¹⁷ RAC Foundation (2016) [Governance and Funding of National Road Networks: Three case studies](#)

¹⁸ Congressional Research Service (2016) [Mileage-Based Road User Charges](#)

¹⁹ Midland Expressway Limited (2018) [Annual report and financial statements for the year ended 31 December 2017](#)

²⁰ Fraunhofer (2016) [Economic impact of introducing road charging for Heavy Goods Vehicles](#)

²¹ Shell (2019) [Pump Pricing](#)

²² Wolfson Economics Prize and Policy Exchange (2017) [Miles Better](#)

²³ ICE (2019) [Pay As You Go – Achieving Sustainable Roads Funding in England](#)

²⁴ HMT (2020) [National Infrastructure Strategy](#)