

# Driving Purchases of Electric Vehicles in Ireland

Behavioural insights for policy series



# Driving Purchases of Electric Vehicles in Ireland A Behavioural Economics Perspective

Behavioural Insights for Policy Series

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## **Sustainable Energy Authority of Ireland**

SEAI is Ireland's national energy authority investing in, and delivering, appropriate, effective and sustainable solutions to help Ireland's transition to a clean energy future. We work with the public, businesses, communities and the Government to achieve this, through expertise, funding, educational programmes, policy advice, research and the development of new technologies.

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# Executive Summary

Electric vehicles (EVs)<sup>1</sup> represent a viable contribution to transport sector decarbonisation in combination with other crucial policies that support public transport, walking, cycling, and appropriate spatial planning. A fundamental shift in consumer vehicle preference is required for Ireland to meet the target of 936,300 EVs by 2030, as indicated by the Climate Action Plan (CAP). Previous experience with EV adoption targets in Ireland has seen lower-than-anticipated rates of uptake. The current market share of EVs remains relatively low, at approximately 3.4%. Based on vehicle purchase figures from 2019, this annual market share would have to increase to 75% on average for the next decade if the CAP's target is to be realised.

Generous market supports for EV adoption already exist in the form of a purchase grant, a home charger installation grant, vehicle registration tax (VRT) relief, a motorway toll incentive, a lower rate of motor tax, and free charging at standard (22kW AC) public charge points. The financial viability of EVs is also improving, with the total cost of ownership (TCO) of EVs proving cheaper than comparable internal combustion engine (ICE) vehicles in certain scenarios. Evidence from behavioural science, however, indicates that psychological biases and sociological barriers may prevent consumers from adopting energy-efficient goods, even when it is cost-effective to do so. Other factors relating to perceptions of vehicle range, charging infrastructure, and the in-dealership experience can also influence purchase decisions.

Taking these barriers into account in the context of the step-change required in EV purchase rates, this paper provides a list of proposed targeted behaviour change interventions designed to accelerate the adoption of EVs in Ireland in addition to pre-existing measures. The basis for the proposals is provided with reference to the latest behavioural science research. The proposed measures include:

- Emissions-linked congestion charging for large urban centres
- Vehicle comparison tools and total cost of ownership labelling
- Incentives for workplace charger installations
- One-stop-shop web platform for prospective purchasers
- Test drive availability and promotion
- Dealership training and award incentives
- Green licence plates
- Conditional and timebound bus lane access

While behavioural science provides evidence for the use of appropriate nudge<sup>2</sup> interventions, larger policy impacts are more likely when it is applied to identifying the barriers and drivers of a given behaviour, and subsequently designing appropriate policies to enable behaviour change. It should be noted that while nudge interventions are often extremely cost-effective in creating behaviour change, their impact alone will not be enough to change behaviour to meet the EV targets outlined above. A range of behaviourally informed policy responses, from nudges to regulation, will be required to meet the CAP's EV target.

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<sup>1</sup> For the purposes of this paper, the term "electric vehicle" includes both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEV)

<sup>2</sup> A nudge can be defined as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008)

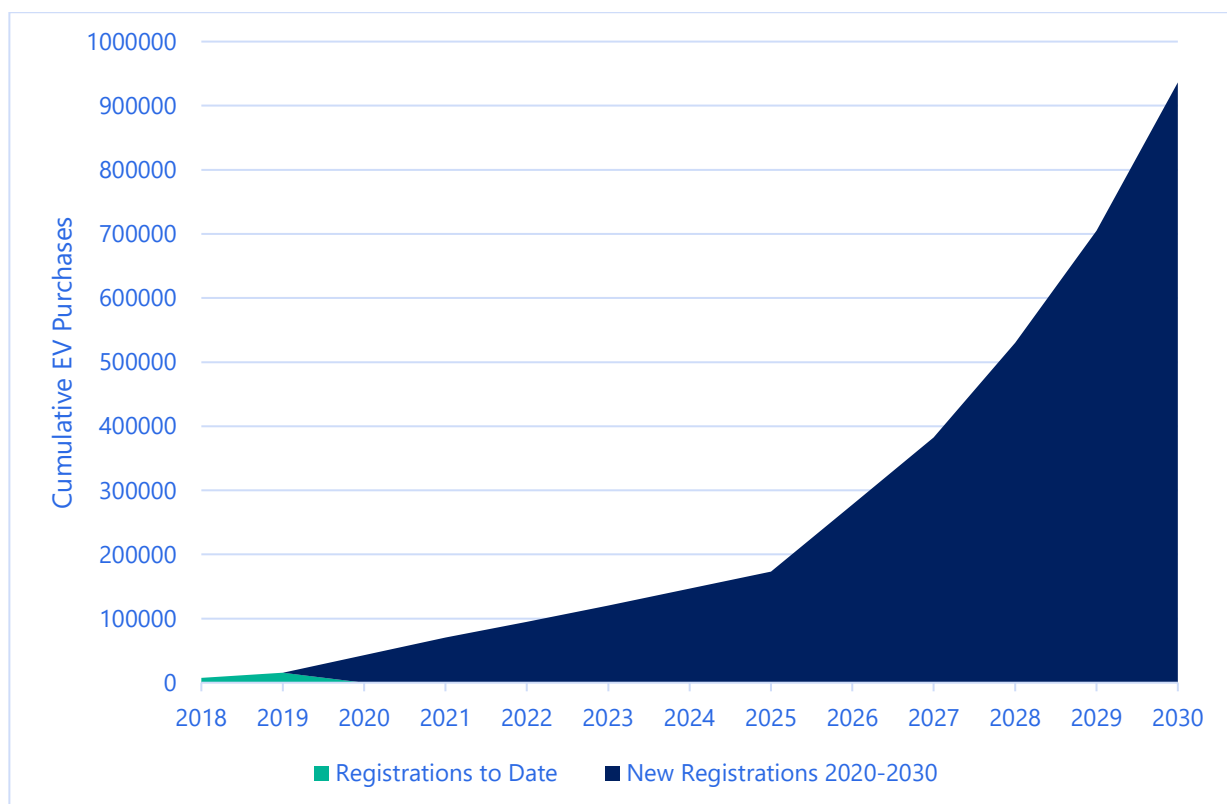
# 1. Motivation and Policy Background

When combined with policies that support increased use of public transport, walking, cycling, and appropriate spatial planning, EVs represent a viable pathway for transport sector decarbonisation.

Ireland’s low-density settlement patterns, relatively low public transport use by EU standards, and planned expansion of the national motorway network, indicate that private vehicles are likely to remain the dominant modality of transport for several decades. As such, the widespread adoption of EVs forms a key component of the CAP, with a target of 936,300 EVs on the road by 2030. This implies a step change in the rate of uptake that will require additional policy measures to achieve the desired consumer behaviour.

Ireland already has one of the most financially generous packages of support for prospective buyers of EVs (Kevany, 2019). It includes a purchase grant, home charger installation grant vehicle registration tax (VRT) relief, a motorway toll incentive, a lower rate of motor tax, and free charging at standard (22kW AC) public charge points. Despite the presence of these market incentives, Ireland has experienced mixed progress with EV deployment to date. An initial target of 250,000 EVs by 2020 (Department of Communications Energy and Natutal Resources [DCENR], 2008) was revised downwards on several occasions in response to lower-than-anticipated market uptake, with the target set at 20,000 by 2017 (Department of Communications Climate Action and Enviromnet [DCCAE], 2017). At the end of 2019, 15,594 EVs had been registered in Ireland, with annual EV sales representing 3.4% of the market (SIMI, 2020). By way of comparison, this is marginally below the EU and EFTA market share average of 3.6% for the same year (ACEA, 2020).

Achieving the necessary shift in EV adoption rates will require new behavioural policies as well as the measures already in place. With this challenge in mind, this report reviews behavioural barriers and drivers to EV uptake as well as behaviourally informed policies that have been successful elsewhere. The report concludes with recommendations for policy makers in Ireland based on this evidence.



**Figure 1: Modelled trajectory of cumulative EV purchases to meet the CAP’s 2030 target.**

## 2. Barriers to Electric Vehicle Adoption

### 2.1 Behavioural Barriers

The total cost of ownership of EVs is approaching parity with ICE vehicles in certain scenarios, as policy efforts intensify and the cost of batteries decreases (LeasePlan, 2019; Wappelhorst et al., 2018). Nevertheless, evidence suggests that consumers may still fail to adopt cost-effective energy related investments, a phenomenon referred to as the “energy efficiency gap” (Gillingham & Palmer, 2014). One explanation for the energy efficiency gap is the notion of behavioural failures; cognitive biases which lead to different outcomes than those predicted by models assuming rational economic behaviour (O’Callaghan et al., 2019).

**Table 1: Behavioural barriers which may influence EV adoption**

Behavioural Barrier	Description
Hyperbolic discounting	People often undervalue the future benefits of investing in energy efficient products (Allcott & Wozny, 2014). A disproportionate amount of consideration is given to the upfront cost of a vehicle, while the energy savings over the lifetime of the vehicle are heavily discounted (Wu et al., 2016). This leads to an underinvestment in EVs.
Status quo bias	People disproportionately resist change, even when presented with cost-effective economic opportunities (Samuelson & Zeckhauser, 1988). Unfamiliarity with EV technology and uncertainty surrounding the long-run financial and lifestyle implications of purchasing an EV, brings sentiments of doubt that can give rise to this inertia (Hearnshaw & Girvan, 2018).
Social norms	Decision making is often guided by the perceived attitudes and behaviours of others in our society (Tankard & Paluck, 2016). In the context of EVs, purchase decision making has been shown to be influenced by social norms at a magnitude comparable to cost-related factors (Barth et al., 2016; Ozaki & Sevastyanova, 2011).
Choice overload	People are less likely to make a financially optimal decision as the number of products and product attributes to consider increases (Lunn et al., 2016). An overabundance of choice in the absence of expert guidance can counterintuitively lead to a failure to make a decision (Iyengar & Lepper, 2000). This is referred to as choice overload, and is likely at play when comparing between EVs and other ICE vehicles (DellaValle & Zubaryeva, 2019).
Information problems	Knowledge gaps exist among Irish consumers regarding EVs. In particular, people lack awareness of lifetime vehicle costs, available charging infrastructure, charging times, and the environmental impact of EVs compared to ICE vehicles (Behaviour & Attitudes, 2017; SEAI Behavioural Economics Unit, 2019).

### 2.2 Financial Barriers

The higher upfront cost of an EV compared to similar ICE vehicles remains a deterrent to uptake, despite the presence of incentives (Behaviour & Attitudes, 2019). In contrast, the cost of owning an ICE vehicle in Ireland is still relatively cheap and is well below the European average (LeasePlan, 2018). This has been linked to the persisting tendency of manufacturers to produce premium EV models, with less offerings available at entry levels (Cattaneo, 2018). The resulting perception of EVs as a premium option, with a higher price, can dissuade prospective purchasers (Tsang et al., 2012). However, a cost-of-ownership comparison by the International Council on Clean Transportation (Wappelhorst et al., 2018) finds that consumer-ownership costs for battery electric vehicles (BEVs) are lower than those of comparable ICE vehicles and plug-in hybrid electric vehicles (PHEVs), based on the first four years of ownership. The study focused on various models of the Volkswagen Golf in five European countries. From a commercial perspective, a recent TCO analysis by LeasePlan comparing EV and ICE vehicles in 13 European countries across four vehicle categories, finds that EVs outperformed ICE vehicles 56% of the time (LeasePlan, 2019).

### **2.3 Range Anxiety & Charging Infrastructure**

Concerns about range and charging infrastructure persist despite advances in battery size (Behaviour & Attitudes, 2019) and new vehicle ranges now extending to over 400km per charge. A survey of Irish consumers indicated range anxiety to be the second most common perceived barrier to EV uptake after upfront cost (Behaviour & Attitudes, 2017). Ireland's low-density settlement patterns and relatively high levels of rural living suggest this barrier is likely to be more influential here than in other European countries, as it places higher necessity on private car use (Devaney & Torney, 2019). The average car journey in Ireland is just 16km (Central Statistics Office, 2016). This is well within the range of any EV on the market and suggests that range anxiety is more a perceived barrier than a technological limitation (Rauh et al., 2015), although the anticipation of being out of range for irregular, longer journeys may offset this. Based on insights from interviews and survey questionnaires with consumers in five Nordic countries, Noel et al., (2019) suggest that people frequently reject the feasibility of EVs based on "knee-jerk" assumptions about range characteristics and scenarios that are not grounded in fact or realistic driving scenarios.

Concerns regarding EV range are closely linked to the availability of public charging. The importance of public charging infrastructure for the deployment of EVs is demonstrated in an analysis of EV uptake in 30 countries by Sierzchula et al. (2014). The model developed by the authors finds the availability of public chargers per capita to be the strongest predictor of EV adoption rates. A recent survey study of a nationally representative sample of Irish car owners by the Behavioural Economics Unit at SEAI found significant knowledge gaps in awareness of availability of public charging infrastructure and required charging times. For example, 82% of respondents overestimated charging times, and 49% were unable to give directions to their nearest public charging point. Respondents who were aware of the location of their nearest public charging point were significantly more likely to be willing to invest in an EV for their next vehicle purchase, highlighting the importance of addressing those knowledge gaps in public awareness. A sizeable market share (36%) also reported a lack of access to off-street parking for charging purposes.

### **2.4 Dealership Conditions**

The consumer experience at car dealerships is a key component of the customer journey towards EV adoption. As the adoption curve progresses from the "early adopters" phase, towards the broader consumer base, it is likely that the direct advice from dealers at the point of sale will become an increasingly influential factor in the customer's decision-making process.

The barriers encountered by prospective purchasers are delineated in a recent study by Zarazua de Rubens et al. (2018). The authors carried out an investigation into the experience of the "average" mass market customer at dealerships in Sweden, Iceland, Norway, Finland, and Denmark. Interviews with car dealers indicated a lack of willingness to sell EVs compared to ICE vehicles due to anticipated longer sales time, lack of knowledge and competence to sell, lower profitability for the dealership, less after-sale revenue from servicing, and the hassle required to install charge points. Indeed, for two thirds of the 126 shopping experiences, dealers actively dismissed EVs and either strongly or solely directed the customer to purchase an ICE vehicle, even when an EV was in stock. The authors estimate the chances of a customer purchasing an EV as a result of their interaction at dealerships to be just 4%. A similar study conducted in Ontario by Matthews et al. (2017) found that a lack of in-store EVs for test driving, and prolonged wait times (three to four months) were significant barriers to investment.

Research conducted by Matthews et al. (2017) and Zarazua de Rubens et al. (2018) indicates certain conditions at the point of purchase that may inhibit EV uptake. These insights may be relevant for Ireland. However, it would be useful to conduct similar field studies focusing on consumer experience at dealerships in Ireland, to provide insights specific to the Irish scenario. It is likely that other factors relating to supply-side constraints are at play for a peripheral left-hand-drive market such as Ireland.

# 3. Proposed Solutions

## 3.1 Vehicle Comparison Tools & Total Cost of Ownership Labelling

Comparison tools, as mentioned in Section 2.1, aim to overcome the barriers to EV adoption presented by information problems. Such tools typically compare vehicles across a range of factors, including upfront cost, available purchase incentives and tax relief, estimated annual electricity/fuel costs, battery range, available charging infrastructure, etc. Tools of this kind have been developed for public use by government bodies in Canada, Germany, the United Kingdom, Norway, and the United States (Jin & Slowik, 2017). As the operator of Ireland’s EV grant scheme, SEAI currently hosts a comparison tool on its website.

The obvious goal of these tools is to present the end user with reliable and accurate vehicle comparisons, but how this information is framed can also have a significant influence on consumer preferences. A recent study by the Behavioural Economics Unit at SEAI found significantly greater willingness to invest in EVs when prospective purchasers were presented with personalised cost estimates using a map-based interface versus the traditional tabular format (see Figure 2). Similar results have been substantiated elsewhere by Sanguinetti et al. (2017). Future iterations of SEAI’s comparison tool intends to apply these learnings by incorporating these features.

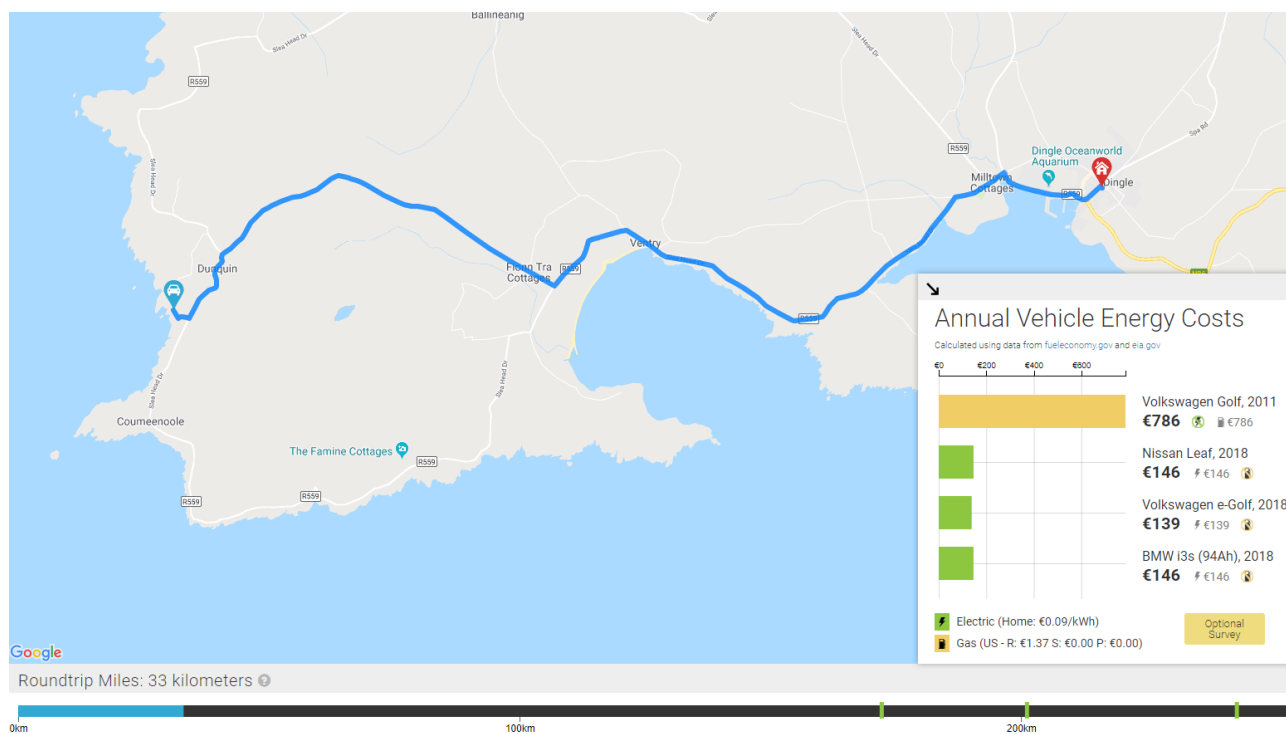


Figure 2: An example of personalised annual vehicle energy cost feedback based on user commute information (UC Davis, 2018).

The efficacy of comparison tools could be further improved by conveying total cost-of-ownership information to the end user. Doing so can offset the effects of hyperbolic discounting, which can cause people to place a disproportionate emphasis on upfront vehicle costs, while disregarding future costs, such as fuel, taxes, and maintenance (Wu et al., 2016). Indeed, a recent study of German citizens responsible for household finances found that the average respondent underestimated vehicle lifetime costs by 52% (Andor et al., 2020). This tendency of human judgement has negative implications for the uptake of EVs, as one of their key benefits are lifetime savings made through ongoing energy costs.

This misperception might be redressed through information provision in the form of total cost of ownership (TCO). Andor et al. (2020) estimate that providing TCO information to the respondents of their study would increase willingness to invest in EVs by 73%, assuming they respond rationally to financial information. A TCO comparison by the International Council on Clean Transportation (Wappelhorst et al., 2018) finds that consumer-ownership costs for battery electric vehicles (BEVs) are lower than those of comparable ICE vehicles and plug-in hybrid electric vehicles (PHEVs), based on the first four years of ownership. The study focused on various models of the Volkswagen Golf in five European countries. From a commercial perspective, a recent TCO analysis by LeasePlan comparing EV and ICE vehicles in 13 European countries across four vehicle categories, finds that EVs outperformed ICE vehicles 56% of the time (LeasePlan, 2019). This evidence suggests that the use of such labelling could help to mitigate the perceived barrier of upfront vehicle costs associated with EVs. For example, Californian utility PG&E have recently developed a TCO calculator on its electric vehicle website (PG&E, 2020). Users can compare costs between EVs and ICE vehicles while tailoring the assumptions to their choosing, as illustrated in Figure 3.

In addition to inclusion on web-based platforms such as the SEAI website, behaviourally informed vehicle comparison tools and/or standardised TCO labelling could be deployed at dealerships to be used as a decision aid that could help spur EV investment at that important decision point in the customer journey.

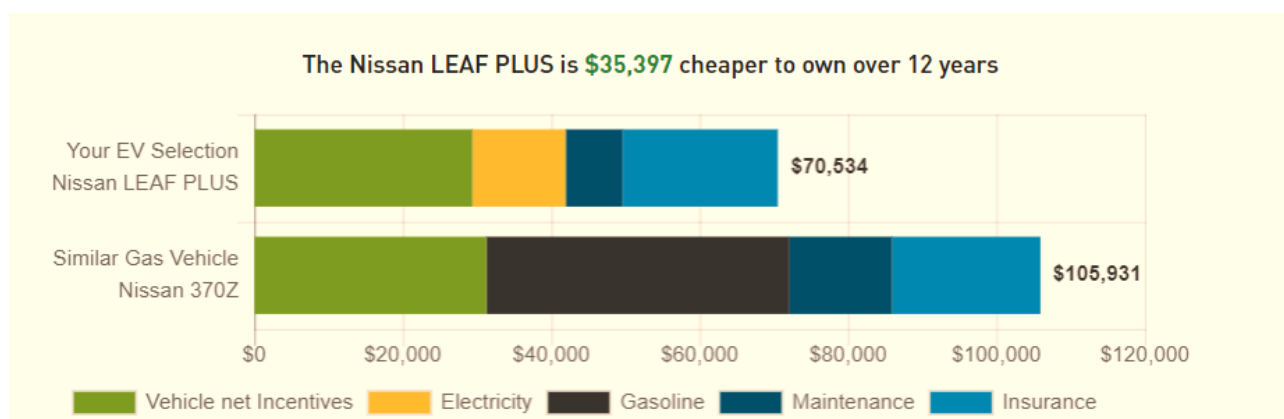


Figure 3: A 12-year cost of ownership comparison between a Nissan LEAF PLUS and a Nissan 370Z (PG&E, 2020).

### 3.2 Emissions-Linked Congestion Charging

Emissions-linked congestion charges have been introduced in London, Milan, Stockholm, and Singapore. With respect to EVs, Morton et al. (2017) employ a spatial regression model to demonstrate that the introduction of the London Congestion Charge is associated with higher rates of hybrid electric vehicle (HEV) adoption in areas closer to the city centre, accounting for other relevant factors that might influence HEV demand. An earlier survey study by Ozaki & Sevastyanova (2011) supports this finding. The sample of that study consisted of 4000 respondents who had all purchased a Toyota Prius in the previous 24 months. Following a factor analysis of respondents' answers to open-ended questions on their reasoning for deciding to purchase a HEV, those living closer to the London Congestion Charge indicated a strong motivation to purchase HEVs based on that policy measure.

Similar trends were observed in Stockholm, where alternative fuel vehicles were exempt for the first two years of the congestion charge between 2007 and 2009. A study by Whitehead et al. (2014) modelled the effect of the charge on purchases of energy efficient vehicles (including HEVs) for the 2008 period. The estimated model indicated a 10.7% increase in purchases as a result of the charge, holding other pertinent factors constant. Another analysis by Börjesson et al. (2012) observed a 12% increase in alternative fuel vehicles sold for the same period. Such was the success of the charge at increasing the uptake of energy efficient vehicles, that policymakers gradually limited the exemption until its full removal in 2012. Despite some initial public opposition prior to its introduction, a poll of residents of Stockholm in 2011 indicated that over 70% supported the continued implementation of the charge (Börjesson et al., 2012).



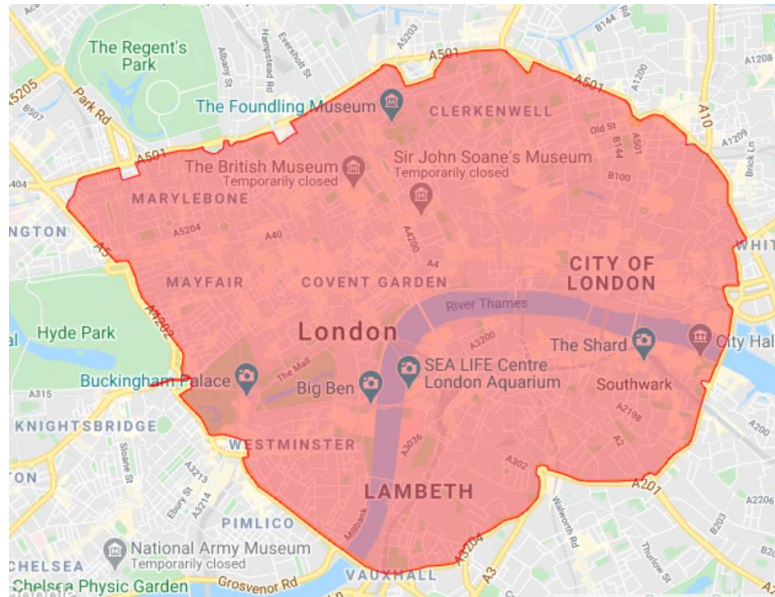


Figure 4: The boundaries of the congestion zone in London (Transport for London, 2020).

Evaluation studies indicating the multiple public benefits of congestion charging are well-documented. Wider benefits, beyond the increased adoption of more efficient vehicles, include reduced traffic congestion, improved air quality, and an increased uptake of public transport. A comprehensive study of the congestion charge trial period for Stockholm by Eliasson et al. (2009) indicated a reduction in traffic on arterial roads by 22%, a reduced travel time of approximately 33%, a 6% increase in the use of public transport, and reductions in carbon dioxide and nitrogen oxides of 14% and 8.5% respectively. The costs of establishing the charge were recovered within four years of its implementation (Eliasson et al., 2009). Santos & Fraser (2006) report a 12% increase in bus use and an 18% reduction in traffic entering the congestion zone after the introduction of the London Congestion Charge.

As mentioned in Section 2.2, it is still relatively cheap to own an ICE vehicle in Ireland, compared to other European states. **Based on available evidence, implementing a congestion charge in suitable locations could increase EV adoption rates and the number of passenger journeys using public transport.**

### 3.3 Test Driving Availability and Promotion

The opportunity to gain familiarity with a new technology has the potential to overcome the barrier of status quo bias outlined in Section 2.1, the status quo being characterised in this case by ICE vehicles. Several studies indicate that direct prior experience with EVs positively predicts investment likelihood and evaluation of key EV characteristics. A survey of a nationally representative sample of Irish car owners by the Behavioural Economics Unit at SEAI found that respondents who had previously driven an EV were significantly more likely to indicate a preference for an EV when making their next vehicle purchase (SEAI Behavioural Economics Unit, 2019). Similarly, Schmalfuß et al. (2017) find that direct prior experience with EVs favourably influenced evaluation and purchase intention towards EVs. A before/after test drive study of Danish citizens by Jensen et al. (2013) found that real world experience of EVs significantly alters preferences for a host of vehicle attributes. With regards to range, evidence indicates that range anxiety diminishes with increased EV familiarity (McKinsey & Company, 2017; Rauh et al., 2015). This highlights the importance of EV availability at dealerships and suggests that a lack thereof may inhibit EV uptake. Indeed, a field study of EV shopping experiences in Ontario carried out by Matthews et al. (2017), where only half the dealers had an EV on-site, found that a lack of test-drive vehicles was a barrier to uptake.

Based on this evidence, incentivising Irish dealerships to always have EVs available for test driving would likely encourage greater EV uptake. This provision could be encouraged by incorporating it into a service level agreement that enables participating dealers to receive SEAI certification or similar. Certification of this kind may be of value to businesses who wish to gain a competitive advantage by enhancing their corporate social responsibility status in the eyes of consumers (Ashton et al., 2017; Leonidou et al., 2017). This concept regarding staff training and awards is explored further in Section 3.7.

Offering free test drives to the public has been an extremely popular feature of the annual SEAI Energy Show. Expanding the test drive model to several test drive "roadshow" events across Ireland could improve the general

public's attitude towards and willingness to invest in EVs. This model is well demonstrated by Plug'n Drive's Electric Vehicle Roadshow in Ontario (Plug'n Drive, 2020). The initiative, funded by Ontario Power Generation, provides the general public with the opportunity to test drive EVs and gain direct experience with the technology. The Electric Vehicle Roadshow also offers businesses and event organisers the opportunity to provide test-drive experiences for event attendees and staff. Similarly, New Zealand's Energy Efficiency and Conservation Authority (EECA) host "ride-and-drive" events that provide the general public with the opportunity to test drive an EV (EECA, 2018). Fifteen percent of attendees of the 2015 ride-and-drive series hosted by the PEV Collaborative in California had either purchased or leased an EV within the first six months of the events (Pauwe, 2016).

Finally, providing timely nudges for people to arrange a test drive at key consumer touch-points could also be influential here. For example, providing a link to users who have used SEAI's comparison tool might encourage prospective buyers to take the critical next step on the consumer journey to EV adoption. This notion is elaborated in further detail in Section 3.5.

### 3.4 Incentives for Workplace Charging Installations

While the development of public charging infrastructure, particularly on motorways, is of great importance to the effective rollout of EVs in Ireland (La Monaca & Ryan, 2018), incentivising employers to install workplace chargers could also play an influential role. This type of infrastructure is particularly attractive for those with long commutes or without access to off-street parking for home charging purposes (Hall & Lutsey, 2017). A survey by the US Department of Energy indicates that people whose place of work has an EV charger available are 20 times more likely to own an EV (Olexsak, 2014). Another survey study of employers in California offering workplace chargers suggests that the presence of chargers increased EV purchase rates among staff for the vast majority (87%) of respondents (Plug-in Electric Vehicle Collaborative, 2013)<sup>3</sup>

The option to charge EVs at work can have other benefits for grid management, which can be realised when an increased proportion of EV owners charge their car during daytime hours rather than in the evening (Nicholas et al., 2019). This will become more important as projected evening-time grid demand increases with higher levels of EV ownership (Electric Nation, 2019). An employer incentive scheme like those already operating in other jurisdictions could be established in Ireland. In Quebec, employers that provide free charging are offered 50% funding from the government. A rebate of £300 is available for employers in the UK for workplace charging installations. In France, employers can claim 40% of the cost of charger installations.

Benefits of workplace charging for employers include the attraction and retention of staff, and a boost to the corporate social responsibility profile of the organisation (Fetene et al., 2016). Furthermore, the presence of workplace chargers would reduce operational costs for firms which own a fleet of vehicles, once ICE fleets are eventually replaced with EVs (Huang & Zhou, 2015). Early evidence from workplace charging experiences in the US indicates that most employers chose to provide free charging to staff, but that this was associated with charger congestion at the workplace (Nicholas & Tal, 2013). A more recent analysis of EV owners' willingness to pay for workplace charging by Garas et al. (2016) suggests that the inclusion of a charging fee for employees that is marginally above the home charging rate dissuades charger congestion at the workplace while providing sufficient access for those who need it, and simultaneously making the investment model more attractive to employers.

### 3.5 One-Stop-Shop Web Design

A one-stop-shop can be defined as a single location, virtual or otherwise, that enables the customer to access all the information and resources required to complete their objective. This significantly reduces the hassle involved for the customer as it removes the need to navigate multiple points of information and simplifies the decision-making process. The implementation of one-stop-shops can be particularly useful in a domain such as vehicle purchasing where the variety of lifestyle factors, finance requirements, and sheer multitude of vehicle product attributes to be considered can be daunting to prospective buyers and lead to choice-overload (Cheng et al., 2019).

Developing a one-stop-shop web platform for prospective EV purchasers that incorporates vehicle comparison tools, financial incentive information, public charging maps, local dealerships information, test drive booking, vehicle availability, and testimonials from current EV owners, can improve uptake rates by maximising the likelihood of progression through the customer journey (Bakker & Jacob Trip, 2013). Such tools can also act as a critical signpost for

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<sup>3</sup> These observations are correlational. It is not possible to assume causation.

prospective buyers. The Behavioural Economics in Action at Rotman team in Toronto have designed a prototype website that incorporates many of these features and addresses the barriers outlined in Section 2 (Bin Latheef et al., 2018). SEAL's website includes many of these attributes, and the organisation is currently undertaking a project that will optimise the experience for the end user by intuitively linking these together.

### 3.6 Conditional and Timebound Bus Lane Access

Several jurisdictions, such as Norway<sup>4</sup>, Ontario, and California, have introduced bus lane or high occupancy vehicle (HOV) lane access for EVs (Department of Motor Vehicles, 2020; Norsk elbilforening, n.d.; Ontario Ministry of Transportation, 2020). A survey study of Norwegian EV owners by Bjerkan et al. (2016) finds that bus lane access was the only key determining factor for EV uptake for almost a fifth of purchases, behind only grant and tax incentives. A similar trend is observed in a choice experiment by Langbroek et al. (2016) who demonstrate that the prospect of bus lane access increases willingness to pay for an EV by €3200 for residents of Stockholm. A survey study by Tal & Nicholas (2014) of 3,659 EV owners in California found HOV lane access to be the primary purchase motivation among 43% of respondents, with higher proportions observed for urban dwellers. Norway, Ontario, and California all use varying demarcation methods (green licence plates, decals provided at the point of purchase, etc.) to enable the easy identification of vehicles with permission to access bus and HOV lanes (see Figure 5).



Figure 5: A decal for a super ultra-low emission vehicle provided by the State of California Department of Motor Vehicles (Department of Motor Vehicles, 2020).

Any policy which enables private vehicle usage of bus lanes (including taxis) should be carefully considered in the broader context of transport sector emissions reductions. Increasing public bus network capacity and usage forms a crucial contribution towards the CAP's modal shift component, with a targeted 50% increase in passenger numbers over the lifetime of the BusConnects project. Bus lanes are obvious enablers of those policy targets. For these reasons, any policy which allows EV access to bus lanes should be conditional and timebound. For example, Norway granted bus lane access to EVs only until adoption rates reached a critical mass and before it became an obstacle to public transport. Since 2017, the inclusion of the incentive is now at the discretion of Norwegian local authorities (Norsk elbilforening, n.d.). Concerns about the regressive effects of HOV lane access in California are being mitigated through a means-tested access policy for those in ownership of a second-hand car that meets the criteria for a Clean Air Vehicle and who have a salary at or below \$65,760 (Department of Motor Vehicles, 2020).

### 3.7 Dealership Training and Award Incentives

As outlined in Section 2.4, certain factors can influence the consumer experience at dealerships in ways that may inhibit EV purchases (Matthews et al., 2017; Zarazua de Rubens et al., 2018). One approach to mitigating these effects is the provision of training and guidelines. Providing dealers with these resources may enable them to provide expert advice to customers and reduce lead times as the sales process becomes more routine and formalised.

For example, in response to survey evidence indicating the influence of dealers on vehicle purchase decisions in the United States, Plug In America developed the web-based PlugStar EV training platform for EV dealers in collaboration with James Madison University and Virginia Clean Cities (Moloughney, 2020). The platform provides EV-specific training to dealers and sales staff to enable them to effectively communicate with prospective buyers on key topics such as range capability, grant availability, tax incentives, running and charging costs, and public charging. As an added incentive to raising EV sales competency among staff, Plug In America also rewards participating dealerships by including them in its list of available sellers on its consumer website (Plug In America, 2018). For Ireland, combining

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<sup>4</sup> Norway has recently begun to remove bus lane access incentives, as EVs approach a critical mass there.

training with some form of service level agreement among participating dealers could allow for a certification system, thereby further incentivising a high-quality approach towards EV sales.

Dealership status incentives can also be incorporated to encourage EV sales. Publicly acknowledging high performance in EV sales reinforces a social norm among dealers, while also offering a clear opportunity for dealers to improve their brand and reputation among consumers by signalling an environmentally friendly action. One example of such an award is the annual Governor’s Environmental and Economic Leadership Award for Zero Emission Vehicles in California (CalEPA, 2020), which recognises both EV sales and other environmentally responsible activities undertaken by dealerships. The aforementioned Plug In America also provides awards to participating dealerships who outperform their peers in the market on EV sales (Plug In America, 2018).

In a similar vein, efforts to improve the public’s knowledge of EV specifications and capabilities would likely lead to reduced times for completing a sale, as dealers would require less time to explain and demonstrate EVs to prospective buyers. Other interventions mentioned in this report, such as vehicle comparison tools and one-stop-shop web design, speak to this.

### 3.8 Green Licence Plates

Green licence plates (or similar) have been introduced in a number of jurisdictions, including Canada (Ontario & Quebec), Hungary, China, and Norway<sup>5</sup>. The UK is also considering the introduction of such a measure, and the decision is currently out for public consultation (see Figure 6).



Figure 6: Suggested green licence plate designs for the UK (Department for Transport, 2019).

These plates serve two main functions. Firstly, the colour (or other indicator) allows for the easy identification of vehicles (for accessing certain “EV-only” privileges such as bus/HOV lane access or free municipal parking, if such measures were to be introduced). Secondly, a salient indicator of this kind allows for a social norm that enables people to observe the growing proportion of drivers adopting the technology and “doing their bit” for climate action. The signalling of a dynamic social norm in this manner may have a positive feedback effect on consumer preferences as the proportion of vehicles registered increases over time (Sparkman & Walton, 2017). Furthermore, these plates enable a form of virtue signalling, through which purchasers seek status by outwardly demonstrating their environmentally friendly product choices. Virtue signalling has been shown to have a positive influence on willingness to invest in more sustainable vehicles (Sexton & Sexton, 2014). A study by Graham-Rowe et al. (2012) found that a considerable proportion of consumers in the UK view the purchase of an EV as an opportunity to make social identity gains due to the “green” attitudes implied. This has a positive effect on intentions to purchase EVs.



Figure 7: Green licence plate for Ontario, Canada (Ontario Ministry of Transportation, 2019).

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<sup>5</sup> In Norway, EV licence plates are not green. They are instead denoted with an “EL” prefix.

Studies of the effectiveness of green licence plates are sparse, which is unsurprising given their novelty as a policy measure. One survey study by She et al. (2017) finds that special licence plates in Tianjin, China, increase interest in adopting BEVs among those who own a second car and have larger families. Evidence from other domains suggest that saliently labelling a product's sustainability/green credentials has a positive impact on consumer preferences (Department of Energy & Climate Change, 2014; Hardisty et al., 2014; Palmer et al., 2013). The Ontario Ministry of Transport asserts that the introduction of the green licence plates has had a positive influence on the purchase of EVs (Department for Transport, 2019).

## 4. Customer Journey

An outline of the EV purchase customer journey is depicted below, with the relevant barriers and associated proposed policy solutions from Sections 2 and 3 for each stage included. Simplified explanations of some of the barriers are detailed in bold parentheses.

Stage 1: Contemplation Not actively looking for a new vehicle, but forming opinions	
Barrier	Proposed Solutions
Social norm bias <b>(We do what others do)</b>	Green licence plates
Status quo bias <b>(We stick with traditional approaches)</b>	Free test drive events
Range anxiety	Workplace charging
Lack of financial incentive	Conditional and timebound bus lane access Emissions-linked congestion charging



Stage 2: Investigation Gathering information and forming vehicle preferences	
Barrier	Proposed Solutions
Hyperbolic discounting <b>(We focus too much on up-front costs and too little on long term costs)</b>	Vehicle comparison tools Total cost of ownership labelling
Choice overload <b>(We struggle to make decisions when faced with many options)</b>	Vehicle comparison tools
Information problems <b>(We often make decisions without complete information)</b>	One-stop-shop web platform
Range anxiety	Vehicle comparison tools Workplace charging



Stage 3: Decision Finalising vehicle choice or deferring purchase	
Barrier	Proposed Solutions
Lack of dealer knowledge	Dealer training and certification
Longer sales time for dealer	Dealer training and certification
Lack of dealer incentive	Annual/monthly EV dealer awards
Status quo bias <b>(We stick with traditional approaches)</b>	Test drive availability at dealerships
Hyperbolic discounting <b>(We focus too much on up-front costs and too little on long term costs)</b>	In-store total cost of ownership labelling In-store vehicle comparison tools
Range anxiety	In-store vehicle comparison tools

## 5. Summary

The CAP target necessitates an unprecedented shift in consumer preferences for EVs over the next decade. Evidence from behavioural science indicates that market incentives alone might not be sufficient to enable this transition. Factors relating to human appraisal of energy efficient investments can shape decision making in ways that are incongruent with climate policy objectives. With this evidence in mind, this report outlines some potential solutions that can complement existing measures that support EV uptake.

Policy actions to support the 2030 EV target will need to reflect the scale of the challenge. A multitude of policy measures will be required. While some of the measures mentioned here are relatively unrestrictive and information-based (e.g. vehicle comparison tools, green licence plates, etc.), others, such as emissions-linked congestion charging, would place distinct rules on driver behaviour in a manner that makes EVs more attractive. Indeed, the field of behavioural economics can indicate cost-effective nudge interventions. But it is also useful for delineating drivers of, and barriers to, EV adoption and thereby helping to identify financial or regulatory policies that may produce larger impacts.

The measures outlined in this report are based on existing evidence of their ability to spur EV investment. The economic and practical feasibility of these in an Irish context is not the primary focus here, and other exercises would be necessary to fully assess their appropriateness in that regard. Furthermore, the delivery of such measures should be done in a manner that does not conflict with the key policy objective of modal shift. Consideration should also be given to the potential regressive impact of EV policies in general, with those in higher socioeconomic brackets being most able to afford EVs, avail of incentives, and avoid penalties for ICE use.

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