

# Transport: The case for electric

## The need for change



With the publication of Directive 2014/94 the EU has established ambitious targets for member states to reduce green house gas emissions generated by the transport sector<sup>1</sup>. Current government policy targets a 20% reduction in carbon emissions from transport by 2020 and a 80% reduction by 2050<sup>2</sup>.

Between 1990 and 2015 transport emissions have increased by a staggering 130%, faster than any other sector of the economy<sup>2</sup>. While this did not hold between 2007 and 2012, subsequent years have seen this trend continue. Current estimates indicate that 2020 targets are likely to be exceeded by up to 11%, impacting health, the environment and raising concerns about the future role of traditional fuel sources across the transport industry<sup>2</sup>.

Our dependence on fossil fuels to run our transport systems leaves Ireland vulnerable to risks associated with availability, health and the environment. Prices per barrel of oil have fluctuated significantly over the past decade, from the high of \$140 per barrel in 2008 to the low of \$40 per barrel the same year<sup>3</sup>, and with similar fluctuations observed again in 2016. Additionally, in 2012 the World Health Organisation (WHO) declared diesel exhaust emissions to be a group 1 carcinogenic and a significant contributor to associated breathing difficulties in built up areas<sup>3</sup>.

Acknowledging these risks there is an urgent need to move towards a more sustainable and environmentally friendly approach to powering transport systems. By developing electric power based vehicles as a corner stone of our transport system there is an opportunity to significantly reduce the uncertainty risk, while also minimising the impact on the environment and human health.

## An international perspective

Growth in the Electric Vehicle (EV) market has been enabled by government support. In Ireland the Sustainable Energy Authority of Ireland (SEAI) scheme offers attractive tax incentives and grants for EV purchases. Over the last decade similar incentives internationally have seen the number of electric cars in use increase to over one million vehicles in 2015. A 41% increase in sales in the first quarter of 2017 illustrates the rapid growth of the electric car market across Ireland and internationally<sup>3</sup>.

By 2040 it is estimated that half of all new vehicles sold internationally will be electric<sup>3</sup>.

By 2020 over 120 different models of EVs will be available worldwide with major car companies investing heavily in R&D to meet future demand. Volkswagen, for example, has committed to tripling its spending on developing internal combustion engine alternatives over the next five years.

By 2025 the German manufacturer expects EVs to make up 25% of its total sales<sup>4</sup>. Furthermore, Toyota plans to phase out fossil fuels altogether by 2050 and Volvo has recently announced that all new models released from 2019 will be fully electric or hybrid vehicles.

Countries such as Norway and the Netherlands are leading in Europe with the highest stock of electric cars at 23% and 10% respectively, while China leads in terms of electric scooters and buses at 95%<sup>5</sup>.

1 Directive 2014/94/EU, [http://ops.wpci.nl/\\_images/\\_downloads/\\_original/1420722517\\_directive2014\\_94.pdf](http://ops.wpci.nl/_images/_downloads/_original/1420722517_directive2014_94.pdf)

2 Draft National Mitigation, March 2017, Plan Department of Communications, Climate Action and Environment <https://static.rasset.ie/documents/news/national-mitigation-plan.pdf>

3 Energy Information Administration and Bureau of Labour Statistics

4 <https://www.volkswagenag.com/en/news/2018/02/volkswagen-group-provides-active-support-for-use-of-electric-car.html>

5 [https://www.iea.org/media/topics/transport/Global\\_EV\\_Outlook\\_2017\\_Leaflet.pdf](https://www.iea.org/media/topics/transport/Global_EV_Outlook_2017_Leaflet.pdf)

Estimates from the International Energy Agency suggest that there could be 140 million electric cars on the world's roads by 2030<sup>5</sup>. Mexico City, Madrid, Paris and Athens have all committed to banning fossil fuel vehicles from their roads by 2025. Norway will ban the sale of all fossil fuel vehicles from 2025 and France will follow suit by 2040.

The development of EV technology has aided the roll out of electric public transport worldwide. London's public transport fleet currently includes 120 fully electric buses and 2000 hybrid electric buses, making up 20% of its total fleet<sup>6</sup>.

The move towards electrifying public transport in Europe is also evident in the *Zero Emission Urban Bus System Project*, which has published an e-bus strategy outlining aims to have 2500 fully electric buses operating in 25 major European cities by 2020<sup>7</sup>.

## Challenges

### Batteries

'Range anxiety' is a huge factor when it comes to the decision to buy an electric vehicle. Along with cost, the ability of EVs to travel long distances on a single charge is one of the main barriers to the large scale adoption of EVs internationally. EVs currently available on the Irish market are capable of traveling 100 to 150 miles on a single charge, whereas public transport buses remain limited to a range of less than 100 miles<sup>8</sup>. The limited market penetration of EVs also means that batteries are still relatively expensive, impacting vehicle costs and limiting the adoption of EVs as a credible alternative for many.

While improvements in technology have seen battery prices drop by two thirds since 2010 and energy density increase by 300% over the same period, further improvements are required from manufactures<sup>9</sup>.

Companies such as General Motors are pursuing projects aimed at reducing battery costs by 50% by 2022, while increasing energy density by 25% over the same period. As economies of scale develop, these costs are expected to drop further.

### Infrastructure

According to Directive 2014/94 EU guidelines, Ireland's current infrastructure can accommodate around 10,000 EVs<sup>1</sup>.

However, only 71 of Ireland's charging stations are 'fast chargers' and the National Policy Framework only expects this number to increase to 100 by 2020. Drivers accustomed to the convenience of petrol stations are put off by basic and limited EV infrastructure which does little to entice future owners.

Companies and governments require strategies that go beyond policy guidelines to combine environmental needs and population wants. Investment decisions need to be made on a sustainable basis, analysing current and future trends, which avoid technologies and infrastructure that have a high probability of becoming obsolete. Ireland needs a clear strategy for the development of charging infrastructure which facilitates the free movement of transport and which does not require drastic changes in behaviours.

### Upskilling

A shift away from petrol and diesel engines will decrease the need for the traditional maintenance skill sets prevalent across the sector. As the gear box, transmission and engine designs commonly used in combustion engine based vehicles are not present in EVs, substantial retraining efforts will be required. In addition to changes in the workforce, companies should also

expect substantial changes to the traditional supply chain and will need to anticipate the necessity to establish relationships with new and alternative suppliers. To address these issues companies will need to develop an understanding of the competencies required to maintain and operate EVs and the associated infrastructure. While it is inevitable that some skill sets will become defunct, it is likely that existing staff and resources will need to be utilised to support new equipment and facilities. As such, strategies will be required that facilitate the transition of staff to new roles by providing the necessary upskilling and training to support these new technologies.

### Tax revenue

Fully adopting EVs across the transport system represents a significant challenge for governments from a tax perspective. While governments need specific plans to incentivise the shift to EVs and to develop initiatives to support their wide spread adoption, careful consideration is also needed to mitigate the loss in revenue generated by the existing tax structures. Ireland currently obtains 2% of its GDP from motor related taxes under the current emissions based system<sup>10</sup>. With a shift towards EVs it will be essential to fully understand the rate of change and to design policies which replace lost tax revenue, while not limiting the uptake of EVs.

Policies need to be established to address this loss of tax. Maintaining tax revenues for public expenditure is essential and alternative models of taxation based on congestion (as per the UK system), location or usage will require careful consideration.

<sup>6</sup> <http://content.tfl.gov.uk/fleet-audit-31-march-2017-final.pdf>

<sup>7</sup> <http://www.uitp.org/%E2%80%98zero-emission-urban-bus-system%E2%80%99-project-major-milestone-greener-urban-transport>

<sup>8</sup> <http://www.thejournal.ie/electric-vehicles-with-longest-range-3224466-Feb2017/>

<sup>9</sup> [www.energytrend.com](http://www.energytrend.com)

<sup>10</sup> <https://www.irishtimes.com/business/economy/electric-cars-a-game-changer-for-motor-tax-revenue-1.3138408>

## Recycling and reuse

Concerns about disposal, reuse and recycling of batteries used in EVs counter the perception of EVs as a truly green alternative. Limited profit is to be made from recycling the complex chemistry of lithium ion batteries as insufficient quantities have reached their 'end of life', to support large scale recycling plants. The EVs dependency on lithium ion batteries also raises questions about the emissions associated with the extraction of the rare materials needed to manufacture the batteries, and their full 'carbon foot print'.

Factors relating to the production and recycling of lithium ion batteries bring into question the 'life cycle' emissions of EVs. Solutions are needed which are environmentally responsible from an 'excavation of material's' and 'disposal' perspective.

## Benefits

EVs have the potential to drastically decrease the level of air pollution and noise pollution in congested urbanised areas. Electric vehicles could reduce the level of CO<sub>2</sub> emissions from transport by 50%, even where the underlying energy used in the production of EV's is derived from fossil fueled power stations. Additionally, the cost of fueling such vehicles is estimated to be one third the cost of traditional engines. Governments and transport operators can benefit from the use of EVs within their transportation fleet, as the lifetime cost to own and operate an electric vehicle is estimated to be 35% lower than that of a diesel vehicle<sup>10</sup>.

With regards to infrastructure, Ireland currently possesses more than 800 publicly accessible charge points, 71 of which are fast charge stations with the ability to charge a vehicle to 80%

capacity in 30 minutes. Through the use of public and private charging stations, EVs have the potential to help balance electricity supply and demand. As the production of renewable energy does not always match energy demand it is possible that the excess energy available during periods of low demand are wasted, or that there is insufficient energy produced during periods of high demand. To mitigate this issue EVs can store energy produced during the night, for example, to be used during the day when energy is more expensive, thereby reducing energy costs and increasing the efficiency of the renewable energy system.

**With 30% of Ireland's energy coming from renewable sources, there is significant opportunity for Ireland to operate completely carbon neutral transport in the near future.**

The need to change is evident, however, in pursuing an electric vehicle policy, transport and infrastructure operators need to fully understand the implications and benefits of their investment decision to ensure that the selected options succeed in delivering the targeted benefits of the organisation.

For governments it is imperative that policies are implemented which increase the uptake of EVs across the entire transport sector. Benefits such as tolling and parking charge exemptions for owners of EVs would deliver real and immediate savings for users and greatly increase the viability of EVs. An extension of the existing grant systems which currently reduce the cost of

electric vehicle purchase and the cost associated with the installation of home chargers should be expanded to target professional drivers such as taxis. This would fast track the change out of vehicles within the sector and drive the development of a taxi fleet predominantly made up of EVs.

Finally, while the three to five year zero rate BIK on EV's announced in budget 2017 is welcomed, consideration should be given to the implementation of this policy on a longer term or permanent basis. In parallel, an increase in BIK paid on traditional vehicles should also be examined in order to dissuade their future use and drive change within the sector.

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