UCD Energy Institute response to the DECC Consultation on the EV Charging Infrastructure Strategy 2022-2025

31 May 2022

The UCD Energy Institute welcomes the opportunity to respond to the DECC Consultation on the EV Charging Infrastructure Strategy 2022-2025. The UCD Energy Institute (UCD EI) is Ireland's leading research institute focussed on decarbonisation of Ireland's energy systems. UCD EI brings together researchers from a wide range of academic disciplines to tackle the challenges associated with the decarbonisation of energy. Focusing on energy systems, energy management, and energy in society, we drive Ireland's position as a world leader in the integration of renewable energy.

This consultation response provides an overview of some of the research carried out within UCD Energy Institute which is relevant to the consultation topic. The EMPowER project looks at factors influencing the uptake of technologies, including Electric Vehicles (EVs), and the impact of these technologies on the electricity grid, both at transmission and distribution level. While widescale infrastructure for charging e-trucks or e-buses is not within the scope of this consultation, there should be efforts made to coordinate the infrastructure requirements where possible to reduce costs.

The state of play in electric vehicle charging services – A review of infrastructure provision, players, and policies

La Monaca and Ryan (2022)

In a recent review carried out by researchers at UCD Energy Institute (attached), La Monaca and Ryan (2022) reviewed how EV charging infrastructure has been deployed, supported, and financed in a range of countries and regions. The following broad questions were addressed:

1. How and where do drivers prefer to charge, and what is the strategic role of different types and locations of charging services?
2. What deployment models are currently in place for developing, operating, and owning charging infrastructure? What are the underlying cost and revenue drivers of EV charging stations?
3. Which approaches have governments used to support deployment of charging infrastructure, and what role can policy and incentives play in this area?

The conclusions from this review are as follows:

- Greater transparency is needed for customers to be fully informed about the prices they face when using commercial charging services. The variety of charging service pricing structures – e.g. through per-minute, per-hour, per-kWh, or through subscription services – obscures the comparative price of charging between operators and home charging. Improving consumer protection legislation or introducing standardized labelling could help to improve the customer experience when searching out charging services.
- Public charging infrastructure remains expensive to install and maintain. The full social benefits of electric vehicle usage are not captured in the price signals that consumers face with respect to private vehicle usage. Charging infrastructure in many geographies therefore requires continued support through various publicly-funded subsidies and public-private

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partnerships. In the long run with greater EV uptake, a transition to commercial operation is possible and desirable.

- Ways in which public authorities can support charging services efficiently include targeted demand-driven buildout programs and strengthened building regulations to encourage installation of chargers in new and renovated residential buildings.
- Policies governing utility ownership of EV charging infrastructure need to balance the importance of leveraging the institutional capability of electricity companies to build and maintain networks with the need to ensure that markets are efficient and competitive.
- Data on public charger usage is notoriously difficult to obtain. Private charging station owners could be required to make more data publicly available, while protecting customers' data and confidential commercial information. More easily accessible data would allow the research community and policymakers to conduct valuable analysis around usage of the existing network, and to better evaluate attitudes and behaviours for current and prospective EV drivers.
- Beyond charging infrastructure usage, a broader transportation survey effort could capture which driving and refuelling habits, commuting modes, travel distances, and other driver characteristics which would be essential to establishing detailed driver profiles. Such information would provide critical insight into planning and siting future assets by eliciting drivers' needs and preferences for where and when they wish to charge.

Renewable energy technology uptake: Modelling trends, eliciting public preferences, and informing policy design in early adoption

Sanghamitra Mukherjee, PhD Thesis

Public charge point infrastructure and BEV adoption

Researchers also carried out an analysis investigating the relationship between public charge point infrastructure and BEV adoption from the perspective of a long-distance driver. Most Irish EV drivers are homeowners with a home charge point and are likely to benefit more from the existence of public charge points at strategic locations *en route* to their final destination, rather than from a public charge point close to their home. The researchers investigated whether the coverage of public charging infrastructure posed a practical problem for Irish BEV owners and carried out a simple estimation of the location of blind spots in the charging network. The network used in this analysis is based on the ESB ecars network and does not include private providers due to the lack of available data. An assumed driving distance of 52km (corresponding to a 20km buffer) was used for the analysis. This implies that a driver could encounter issues if they were further than 20km away from one charging station and the distance to the next one was higher than 20km. The 20km buffer analysis identified eight inland areas in Ireland with a considerable lack of coverage, in addition to coastal County Galway and coastal County Mayo and some of the islands (Figure 1).

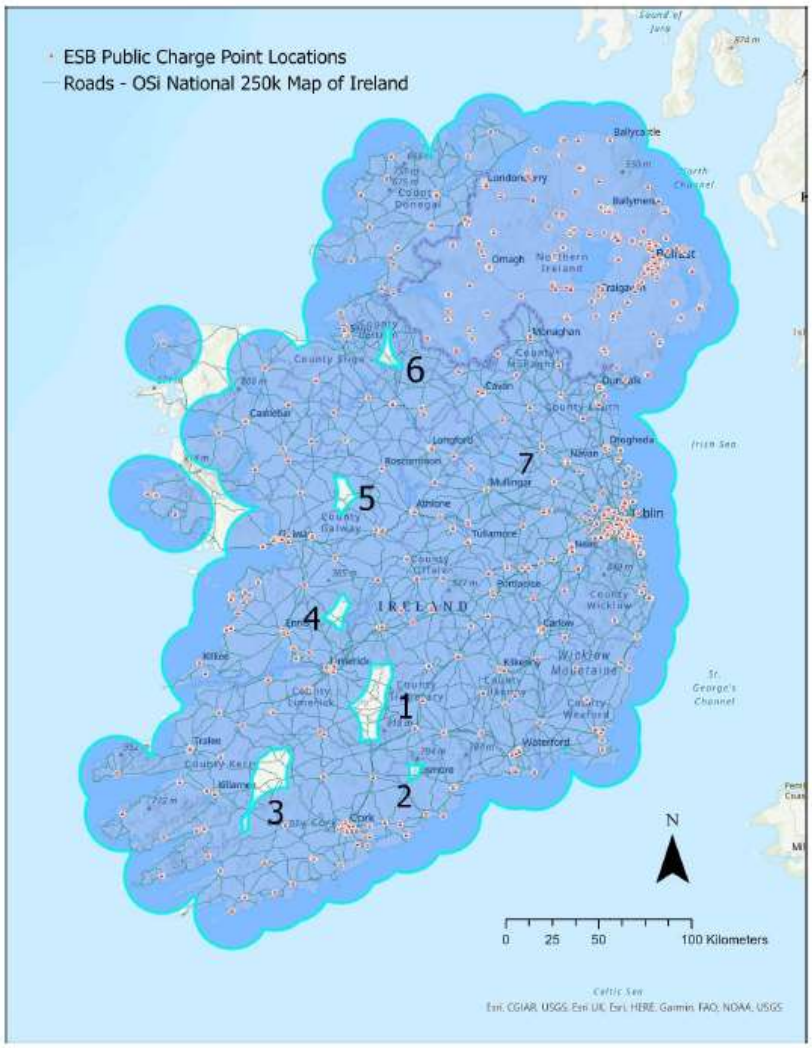

Figure 1: Buffer ring analysis of the current public charging network in Ireland assuming an effective driving distance of 52km (corresponding to a 20km buffer zone). The areas of the map still visible demonstrate the gaps in infrastructure coverage where a BEV driver may face difficulties if they need to recharge. Source data: ESBN ecars

Where more public charge points are needed, consumer behaviour and the current level of incentives are driving a move towards more charging stations, with two or more individual charging points, rather than single public charge points. Multiple charge points allow for simultaneous charging of two or more vehicles thus eliminating long waiting times and queues for users. Service stations alongside the national road network provide the most logical sites for new charging stations, as EV owners tend to primarily need to use public charging points on longer journeys.

An analysis was also carried out looking at the number of trips made by Irish residents (in thousands) in 2019 by origin and destination (Figure 2). Figure 2 shows that counties Dublin and Cork had a large population travelling outwards to other counties, particularly to the West and South-West of Ireland, underlining the importance of getting public charging facilities right in these particular regions. These long-distance drivers have much to gain from BEVs as the cost benefits increase considerably with distance travelled due to the lower running and maintenance costs of BEVs. This is an opportunity that policymakers can harness when planning for new charging stations.

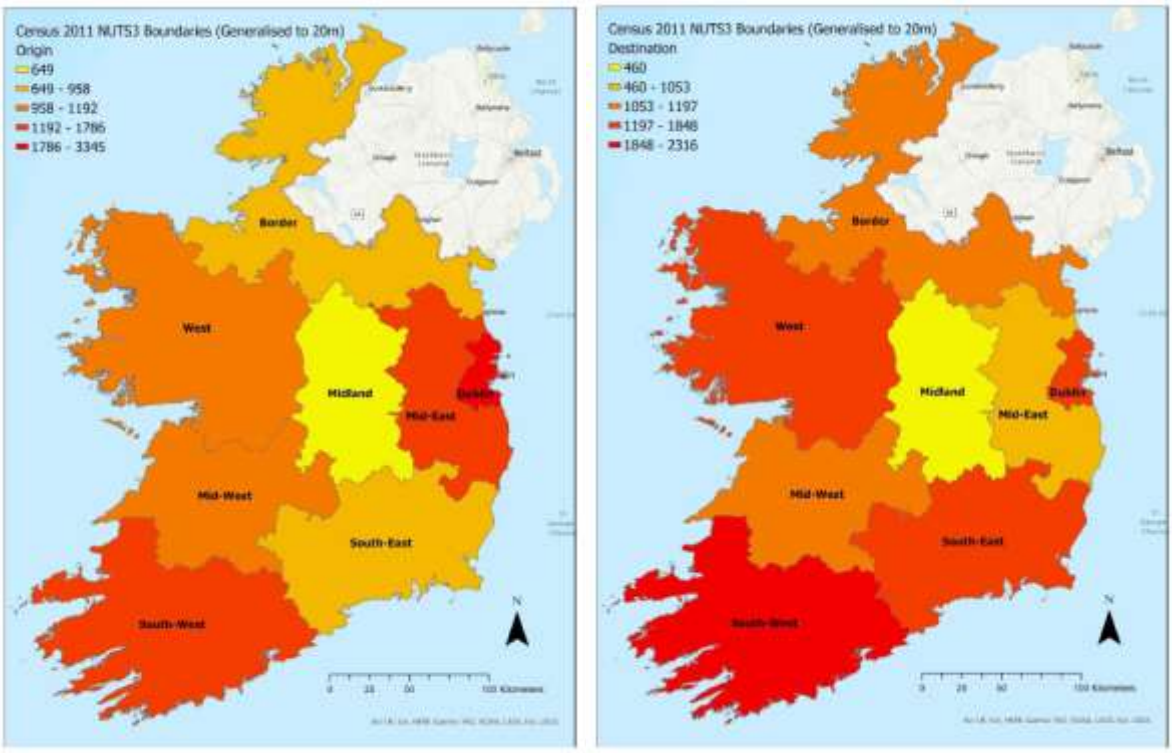

Figure 2: Choropleth maps showing the number of trips (in thousands) by Origin (left) and Destination (Right) by NUTS3 regions in Ireland in 2019. Source: CSO

The key conclusion from the spatial analysis is that location matters for uptake of BEVs, through various channels that help or hinder adoption such as resources, information, and policy. Additional investment in public charging infrastructure facilities may be needed as gaps in coverage exist, especially in rural areas to the West and South-West of the country. Although Ireland enjoys good network coverage overall, this study suggests that more charge points may be needed in some counties and Dublin city and suburbia where the number of charge points is currently disproportionate to a minimum network coverage comparable to the land area, population size, number of private vehicle owners, and travel behaviour.

Managing Energy Demand and Grid Capacity

The consultation document refers to the potential for charging solutions to help balance demand on the grid. One of the key challenges with the electrification of transport is the additional demand this will place on the electricity system, and the distribution network in particular. There are technical limits on the equipment on the distribution system that cannot be breached. In order to maintain a secure electricity network, demand management and/or additional infrastructure will be required to cater for the increased load. This is an area of research at UCD Energy Institute.

Figure 3 below shows a range of charging profiles for EVs for both residential and public charging. The charging profiles are obtained from the data of existing residential and public EVs in Ireland and the UK. The red curve in each graph shows the scenario where there is no demand management of vehicle charging. The figure shows the difference in EV charging profiles across demand management scenarios, with residential charging peaking in the evening time (Figure 3(a)) and public charging peaking during the daytime (Figure 3(b)). An optimised scenario is shown by the blue

line where there is 100% flexibility in charging times to enable demand management based on the characteristics of a typical distribution network. In this scenario, demand management techniques can be used to shift the electric vehicle charging demand away from times of peak demand on the network to times of lower demand, thereby reducing demand peaks and the need for infrastructure upgrades.

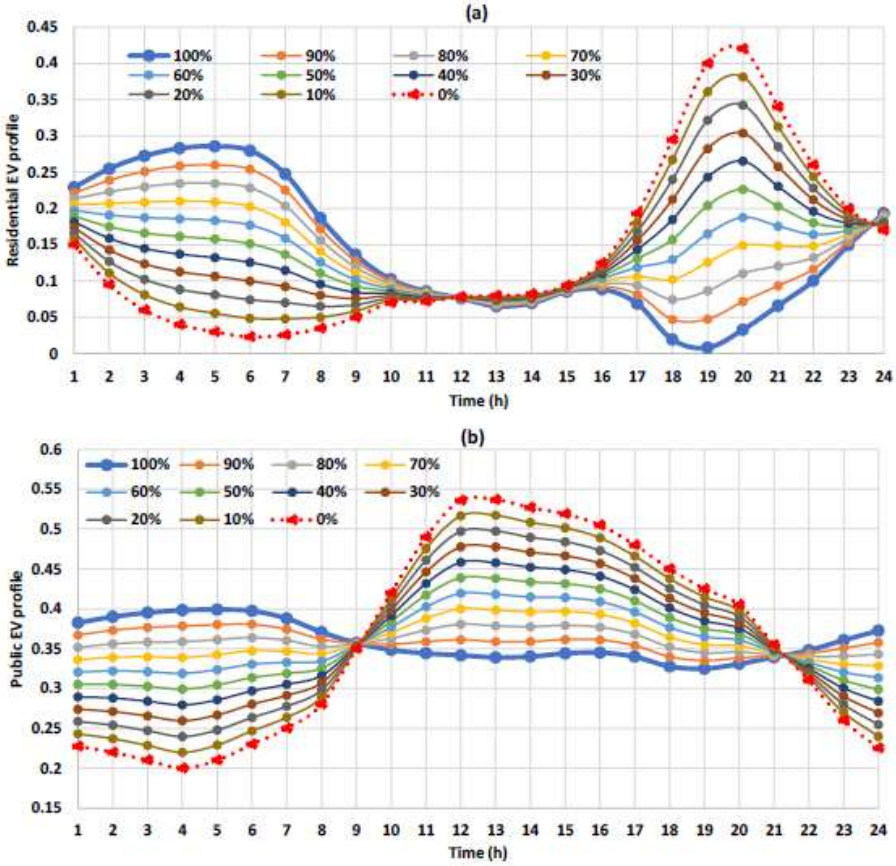

Figure 3: EV profiles evolution versus flexibility degrees: (a) Residential EVs, (b) Public EVs.

Ireland's 2030 targets also include targets for the installation of heat pumps and for renewable generation. The installation of heat pumps will add to the demand at distribution level with a different demand profile to EV charging. The addition of domestic Solar PV generation on the distribution network will also have implications for EV charging. If there is a large amount of solar generation present (with energy available during daylight hours) on the distribution network, the optimised profile for EV charging will be different to a network with no PV generation installed (see Figure 4 for a sample scenario). Demand management needs to be carefully managed with a degree of flexibility to account for different levels of EVs, heat pumps and renewable generation on the network. Any incentives to promote a particular type of behaviour, such as time of use tariffs, need to take into account the evolving demand and generation mix.

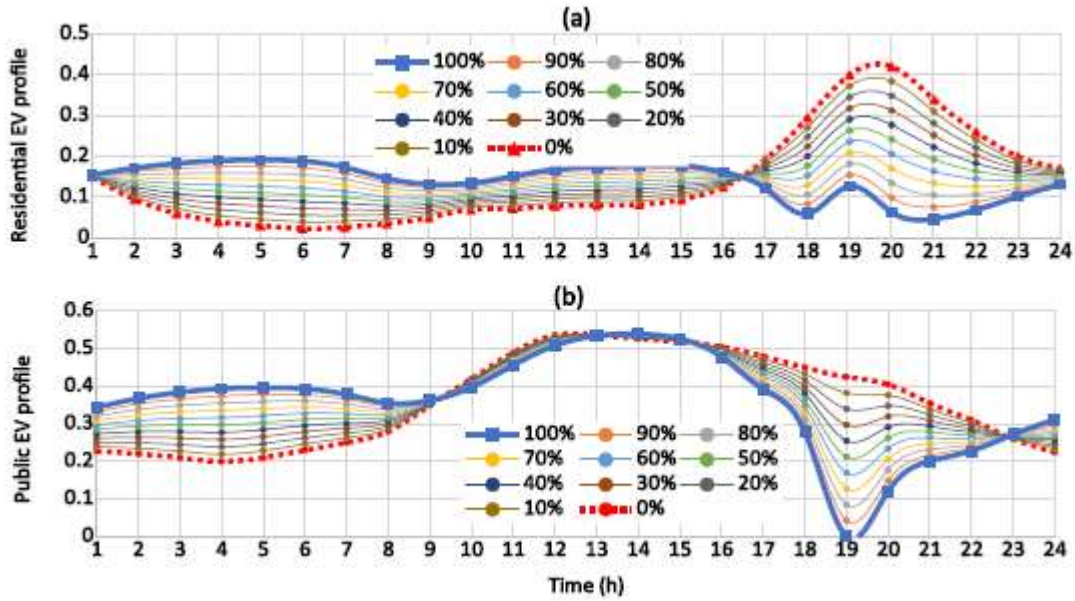

Figure 4: EV profiles versus flexibility degrees considering the impact of Solar PV; (a) Residential EVs; (b) Public EVs.

As we move to an electricity generation mix dominated by renewable generation, the availability of electricity to meet demand is also likely to change. Flexible demand will play an important role in enabling the integration of renewable generation and in ensuring more efficient use of available energy supplies. Electric vehicles can play an important role through flexible charging profiles and through potential vehicle-2-grid (V2G) solutions. It is likely that these solutions will be provided via home charging, tariff structures and aggregators, but there may also be implications for some of the public charging infrastructure, in particular in areas where longer duration charging is in use.

<u>Additional comments relating to the consultation document</u>

Chapter 2 – Fundamental Principles

The importance of a Just Transition to a climate resilient society is also key, and this Strategy specifically considers ways in which to support wider access to EVs in population groups with low car ownership levels.

In areas with low access to public transport, access to EVS could provide increased access to mobility services. Policies promoting car-sharing and improved active transport infrastructure could complement EV policies in these instances to avoid increasing transport emissions and other externalities.

While a Just Transition to a climate resilient society is extremely important, care needs to be taken to ensure policies do not have unintended consequences that conflict with other CAP21 targets. For example policies to support wider *access to EVs in population groups with low car ownership levels* may serve to increase car ownership overall, conflicting with the policy objectives to reduce vehicle kilometres travelled (VKT) by 2030.

Chapter 3 – Network Demand

Destination Charging

Destination charging will provide rapid charging solutions (50-100kW typically) at trip attractor locations such as leisure centres, parks, hotels and visitor attractions where EV drivers could charge their vehicle for 1-3 hours before returning home.

Different types of charging may be appropriate in different destinations. For example at a hotel where residents are staying overnight, an increased number of 11 kW or even 7 kW would be appropriate. For destinations with shorter duration stays, faster chargers may be more appropriate and should be sized in line with the duration of a typical visit. Given that typical battery sizes are 50-75 kWh, fast chargers of 50-100kW wouldn't be needed for much longer than 30 minutes. For towns in more remote tourist destinations (e.g. the Wild Atlantic Way) faster speed charging may be appropriate to enable people to cover longer journeys and to cater for those who do not have adequate charging facilities at their accommodation. There is significant cost and infrastructure implications for fast charging in particular, so a pragmatic approach should be taken to manage costs.

Chapter 5 - Pathway to Strategy delivery

Our research has shown that there is a lack of clarity around the different charging options and costs. Zero Emission Vehicles Ireland (ZEVI) should provide up-to-date easy-to-access information on all publicly available charge points with real-time information on how they can be accessed as well as information on home charging costs under a range of available tariffs.

Conclusion

In conclusion, UCD Energy Institute welcomes the opportunity to respond the DECC Consultation on the EV Charging Infrastructure Strategy 2022-2025. Appropriate development of EV Charging Infrastructure has implications for the uptake of electric vehicles as well as for the impact on the electricity network. These various aspects need to be understood in the development of this strategy. If you would like to discuss any aspect of our response in more detail please do not hesitate to contact us.

References

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