Proposed Housing Development

Lahardane / Ballincolly

Ballyvolane

Cork

Electric Vehicle Charging & Design

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Submission to An Bord Pleanála

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Executive Summary

This submission addresses the manner in how a design solution can be delivered, supporting Electric Vehicle uptake in Ireland, in accordance with Government Policy, which aims to ensure the "*transitioning the car transport fleet to electricity and providing additional charging infrastructure, with at least 500,000 electric vehicles on the road by 2030",* can be facilitated and not compromised by current design choices. Based of current growth projections, this will amount to approximately 25% of the overall fleet.

This application provides for EV enabled spaces within house curtilages where parking is provided on curtilage and providing the services capacity for off site charging (public charge points) where required by the ESB in accordance with their network planning at construction stage.

The Board will note that Electric Vehicle penetration is increasing exponentially in the Irish Market. There are several apparent environmental and community benefits in encouraging the continuation this uptake. These benefits include reduced carbon and noise emissions, maximising grid infrastructure and the ability to increase the levels of renewable energy penetration, leading to on-going long-term societal benefits not possible with the current Internal Combustion Engines.

There are however a number of challenges in achieving a design solution which will deliver this sustainability and promote widespread Electric Vehicle adoption. Central to this discussion is the DMURS guidelines. Although this document provides worthy broad design principles that both developers and authorities should aspire to achieve, it predates the rapid uptake of Electric Vehicles. Although the reduction or Carbon Emissions is mentioned (via increased public transportation usership), there is no direct guidelines addressing Electric Vehicle directly.

DMURS guidelines when applied in their current format promotes parking solutions within developments that does not encourage the adoption of Electric Vehicles. The most effective manner of promoting a "network" solution that encourages the cost effective and efficient uptake of EV charging, is a design solution that allows for parking within the curtilage of each domain with charging infrastructure stemming from the individual electricity connection. DMURS design solutions encouraging car parking away from the curtilage will lead to charge points and associated infrastructure crossing public footpaths which is not practice, cost efficient and leads to legal issues as to the ownership of this infrastructure.

The direction in design implementation relating to EV's within developments will heavily impact the future environmental landscape. The conventional DMURS solution will impact the adoption of Electric Vehicles or serve to create scenarios leading to multiple charging infrastructure off curtilage. A number of issues arise from this, most prominently the need for additional infrastructure, barrier/crash protection, separate grounding and maintenance agreements with third parties. This will also serve to diminish the landscaping and visual appearance of future developments. Importantly, DMURS states that *"On-street parking on public streets should not be allocated to individual dwellings. This allows for a more efficient turnover of spaces and, as such, fewer spaces are needed overall".* While this is a recommendation, this can mean that car parking/charge points cannot be associated with individual properties and additional metering infrastructure will also need to be installed. This diminishes the viability of providing charging infrastructure and is not viable.

While the general demand of a Development Plan is to provide for EV charging in a residential context, there is no specific design detail as to how to achieve this. Longview's proposal is that this can only be delivered in a cost efficient and sustainable manner with the installation of a charge point within the demise of each property and will provide for this where possible for each property.

1.0 Electric Vehicle Take Up in Ireland

The penetration of Plug-in's is continuing on an upward trajectory and is gaining pace. Year on year increases in sales of new and imported PHEV and BEV's is seeing the market share of EV's in Ireland increasing. This rapid pace of increase means that decisions adopted today in relation to the layout of parking in new developments must address this trend and must allow for charging at driver's ease. The increase can be seen Fig.1 below.

Designs are currently being determined based on the DMURS guidelines, which will put infrastructure in place for the foreseeable future. With the introduction of the Fast Track Planning Process, designed to deliver housing to address national policy, larger developments are emerging. As these developments are predominantly large in nature, it is vital that these will be "future-proofed" for Electric Vehicles and will reduce barriers to EV ownership. DMURS is designed to encourage modal shifts towards public transport in order to reduce carbon from individual ICE's, however as EV's are becoming increasingly more important in the environmental shift, they also need to be prioritised. *Investing in the Transition to a Low-Carbon and Climate Resilient Society 2018 – 2027,* published under Ireland Project 2040 states in relation to decarbonising the economy that ***;***

> *"Transport accounts for 20% of Ireland's overall emissions (and 27% of our non-ETS emissions), with 52% of overall transport emissions coming from private cars, 24% from freight, and 4% from public transport. The National Mitigation Plan highlights, as a priority, the necessity to progressively electrify transport systems, making a shift away from polluting and carbon intensive propulsion systems to new technologies such as electric vehicles and introduction of electric and other alternatively fuelled systems for public transport fleets. The main actors planned to achieve this are securing an early transition to zero/low-emission vehicles in the private and public fleets and setting targets for substantial progress in phasing out the Internal Combustion Engine and replacing it with Electric vehicles/other alternative fuels through schemes to incentivise Low-Emission Vehicles".*

As previously noted, the uptake of EV's is a central fact to government policy to achieve Ireland's environment and carbon emission reduction goals. Providing a convenient, safe and secure way for drivers to charge their vehicles is of paramount importance.

Figure 1

Date	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Year to Date
BEV New Sales	799	325	311	295	171	53	734	172	116	247	3223
Growth vs 2017	668.00%	351.00%	195.00%	108.00%	95.50%	212.00%	91.90%	4.24%	20.60%	568.00%	166.00%
BEV Used Imports	49	47	54	41	38	46	39	44	68	88	514
Growth vs 2017	-2.00%	-19.00%	-10.00%	0.00%	-45.70%	-16.40%	-18.70%	-41.30%	-2.80%	22.20%	-14.20%
PHEV New Sales	300	171	144	98	89	23	252	91	67	70	1305
Growth vs 2017	176.00%	125.00%	35.80%	28.60%	72.20%	145.00%	79.60%	39.40%	52.00%	118.00%	84.10%
PHEV Used Imports	221	182	198	208	195	117	182	181	216	275	1965
Growth vs 2017	207.00%	237.00%	133.00%	153.00%	145.00%	21.90%	101.00%	53.30%	53.80%	50.50%	118.00%

2.0 DMURS - A guideline for low carbon transport solutions

The Design Manual for Urban Roads & Streets (DMURS) was prepared for the Department of Transport, Tourism and Sport and the Department of Environment, Community and Local Government by a multidisciplinary project team.

It also states that "the cumulative economic, social and environmental impacts of transport choices on the design of the built environment are often overlooked. A focus on improved street design will contribute to better value for money, social inclusion and reduced carbon emissions"[1].

While EV vehicles are not referred to in DMURS, the document does support reduced energy consumption in that it states that it aims to prioritise "more sustainable modes of transport, improving safety and reducing energy consumption".[2] It also states that it will *"Promote the efficient use of land and of energy, and minimise greenhouse gas emissions".*[3]

Furthermore;

"Additional features of sustainable neighbourhoods include: Compact and energy efficient development"[4]

"Traffic is also the main source of air pollutants in cities, towns and villages. Whilst air pollutants generally have declined in recent years, those pollutants associated with traffic have not, principally because of an increase in traffic volumes and congestion."

"Busy or congested roads can create pollution 'hot-spots' and can have a significant negative impact on adjacent street activities. Pollution can also seriously affect the attractiveness of walking and cycling along affected routes……..The creation of a permeable street network which promotes walking, cycling and public transport will also lead to reductions in vehicular traffic and less concentration of traffic and consequently of noise and air pollution".[5]

It is evident that DMURS is attempting to drive the move towards low carbon transport by promoting the use of public transport and permeability in new developments. The adoption of EV's will also play a central role in achieving these goals.

[1] Page 4 DMURS

[2] Page 53

[3] Page 7, In reference to "Guidelines for Planning Authorities on Sustainable Residential Development in Urban Areas (Cities, Towns & Villages) (2009)

[4] Page 30, Regarding Street Networks.

[5] Page 59, DMURS, Section 3.4.5 Noise and Air Pollution

3.0 Drawbacks of DMURS Design Solutions For EV Charging

Although parking within the demise of individual units is referenced in DMURS, "On-Street" parking takes priority. The primary reasons for this approach are outlined below as included in the manual;

• To calm traffic by increasing driver caution, visually narrow the carriageway and reduce forward visibility.

• To add to the vitality of communities by supporting retail/commercial activities that front on to streets through the generation or pedestrian activity as people come and go from their vehicles.

• To contribute to pedestrian/cyclist comfort by providing a buffer between the vehicular carriageway and foot/cycle path.

• To reduce the need or temptation for drivers to kerb mount and block foot/cycle paths".[6]

Although all of these deserve attention and have merit, as previously noted, parking outside the demise is unsuitable with the use of Electric Vehicles and the guidelines to date have not referenced this. In order to future proof future developments there are a number of design preferences that will increase compatibility with EV uptake.

Currently, the conventional approach to EV charging is to fit the infrastructure to the external wall of a house and connect into the electrical supply of each unit. This normally involves works to be carried out on existing properties in order to adapt the electrical infrastructure to enable this additional connection, however if included in the original design of new houses can be done at the building stage, which will reduce the works that need to be carried out and the financial implications of doing such.

All houses with on site car parking in this scheme will be designed to accommodate EV charging by way of the conventional external charge point. This is in accordance with the Development Plan Policy which demands (Appendix D – Cork County Development Plan) which advises that;

> "Non residential developments will provide facilities for battery powered vehicles to be recharged at a rate of 10% of the total carparking spaces (metered-fast charging 220-240V, 32A three phase). All other parking spaces including residential should be constructed to be capable of accommodating future charging points a required (coded/metered slow charging 220-240V, 13A single phase)"

All commercial areas with dedicated car parking on site will be designed so as to allow for the ESB to introduce on site charge points in accordance with their prevailing design approach at a 10% rate as required by the Development Plan.

All apartment buildings, e.g. the basement areas of the Apartment buildings will be designed so as to accommodate for EV Charging solutions at selected locations subject to ESB / Electricity Undertaking requirements and network planning; detailed ESB network design as part of M&E delivery on site will occur.

On site solutions allows for each individual to manage their Electric Vehicle charging profile, giving control to the user, due to the ease of access and practical nature associated with adjacent infrastructure. This can be done by optimising for periods when electricity prices are most favourable for the consumer, resulting in a cheaper charging solution. This will further increase the adoption of

[6] Page 117, DMURS, "On Street Parking and Loading", Page 117

EV's. Additionally, this solution allows for each individual user to provide grid services to the District Network Operator (DNO) by means of selling electricity back to the provider (V2G). Units equipped with solar panels (which are becoming more widespread with the introduction of NZEB) will also be afforded the ability to charge their EV from this source under this solution.

In general, where infrastructure is outside the demise completely, it would require an additional connection to the distribution network. Each point would need to be metered individually and the possibility of having to assign spaces to individuals would become prevalent from a billing perspective. It could also lead to the monopolisation of the infrastructure, resulting in the benefits of EV ownership again being directed away from the owner. Group charge locations and district Fast Chargers are being investigated by the ESB as a method of enhancing EV charge point management.

The above shows that in order to adhere to the current guideline as laid out in DMURS, substantial infrastructure would need to be provided. This, along with the ownership and safety issues may act as a deterrent to the continued uptake of Electric Vehicles in Ireland.

4.0 Carbon and Cost Benefits of EV vehicles over Internal Combustion Engine

Ireland has set ambitious targets for both the reduction of carbon emissions and for Electric Vehicle penetration. Recent trends in innovation and cost reductions have resulted in the acceleration of Electric vehicle sales. Eirgrid have outlined future energy scenarios which aim to have between 275,000 – 520,000 EV's registered in Ireland by 2030. There are a number of both direct and indirect benefits to carbon emissions as a result of EV adoption, which will increase as the smart charging concept develops.

A new car (ICE) has an efficiency rating average of approx. 120g of carbon per kilometre. The average person travels approx. 18,000 KM's per annum. To achieve this distance a total of approx. 3,500Kwhrs of electricity is needed. This equates to 10Kwhrs per day. Taking Eirgrid's assumptions, the carbon intensity of the grid per kw can be calculated as being between 100g-160g per kw in 2030. Using the highest scenario of 160g as an example, the carbon needed per KM to charge EV's equates to 35g/km as an EV will travel 4.5 KM per Kwhr. This results in a reduction of 85g/KM when compared to ICE's.

From the above example the carbon emission reduction per driver per annum equates to 1.5 tonnes (85g x 18,000km). This is not only beneficial to the environment, but also creates carbon cost savings. The current cost of Carbon in Ireland is €20 per tonne. However, this is anticipated to rise dramatically with the Climate Council of Ireland calling for €80/tonne by 2030 in order for Ireland to achieve its carbon emission reduction targets. Taking a prudent cost of €40/tonne, 500,000 registered EV's and a saving of 1.5 tonnes/driver/annum, a total reduction of 750,000 tonnes are achieved saving €30,000,000 per annum.

The above is assuming that all charging will be done via "dumb charging" however it is anticipated that there will be an increased uptake in "smart" charging as outlined above (i.e. OhmE). This also brings with it numerous benefits from both a Carbon and Cost perspective.

Although the uptake of EV's will result in the reduction in direct carbon emissions as outlined above, the adoption of smart charging will further increase these benefits in a secondary nature;

1) Will allow for the increase in renewable energy generation on the grid further increasing the use of low-carbon generation

2) Will reduce curtailment and avoid the need for high carbon peaking generation (coal/gas) plants to meet the additional demands of EV charging

3) Will reduce the need to reinforce the grid which will result in a substantial CAPEX savings

4) The use of Smart charging especially in the public environment will reduce the need to install expensive high-powered charging infrastructure

5) Will increase the lifetime of EV batteries by using a “smart battery management system”

All of the above can also be quantified and the assumptions used can be provided along with any further additional information required

These benefits will become more prevalent if the option to install smart charging infrastructure at home is widely available as this is where the majority of EV charging takes place. Due to the delay capability of smart charging, it is also possible that charging will be able to occur when electricity prices are projected to be at their lowest (due to lower demand) normally during night time. This will allow users to avail of these prices resulting in personal savings on the cost per charge, which will undoubtedly feed into the increased uptake of EV’s.