Northern Ireland Electricity Networks

PROPOSED CHANGE TO NIE NETWORKS AFTER DIVERSITY MAXIMUM DEMAND DESIGN CRITERIA

Consultation Paper

CONTENTS

EXECUTIVE SUMMARY

Electric vehicles and heat pumps have a strategic role in reducing greenhouse gas emissions and are a key component of the transition to a low carbon economy. NIE Networks support this transition and are investing in our networks to ensure that we can safely and reliably meet the increase in electricity demand required to support these technologies.

As customer requirements are changing, so too must the criteria applied to the design of future networks. This consultation paper seeks to provide a background on how NIE Networks currently design connections for new housing and highlights the consequential shortfall in network capacity as customers transition to electrified heating and transport. The paper details the proposed changes to be applied to future connection designs, the impact this will have on the cost of a new supply, possibilities of different funding options and concludes with a series of questions seeking feedback from stakeholders.

1. Introduction

The United Kingdom Government has committed to bringing all greenhouse gas emissions to net zero by 2050 and has banned the sale of new petrol and diesel cars and vans from 2030, and hybrid cars and vans from 2035[1]. The Northern Ireland Assembly, through the Department for the Economy (DfE) has issued the Energy Strategy - Path to Net Zero Energy[2] for Northern Ireland. The Energy Strategy has not only included ambitious renewable electricity targets, but also a vision to facilitate heat and transport sector decarbonisation in Northern Ireland. As a result of the oncoming electrification of heat and transport, necessary to reduce carbon emissions, the maximum demand required at customer installations will increase. The current connection design methodology for domestic dwellings applied by NIE Networks is based on well established traditional load profiles for various house types. Traditional load profiles assume a mix of gas and electric for cooking, with heating provided via oil or gas (unless an Economy 7 Profile is selected). As a consequence of electric vehicle charging and/or electric heating, the traditional load profile is not considered to be reflective of future customer demand. Continuing with network designs based on historical demand profiles will result in the new assets being under-engineered and incapable of facilitating wide spread uptake of electric vehicle charging and decarbonised electric heating on residential networks. To avoid new networks becoming a blocker in the uptake of Low Carbon Technologies (LCTs) and requiring costly retrospective reinforcement of networks early in their asset life, NIE Networks propose to revise the After Diversity Maximum Demand (ADMD) utilised in the design of future connections to domestic dwellings.

NIE Networks are mindful that there are many aspects of connection design that will be impacted through the uptake of LCTs and domestic level generation and storage. This consultation represents the first step in ensuring connection design policies, connection procedures and associated funding and charging arrangements are fit for purpose and will facilitate the national and local government policies.

This consultation paper presents the proposed ADMD value to be used in the design of future domestic connections, the principles behind how this value was derived and the impact on future connection costs.

2. Current approach to design demand

In the design of new connections NIE Networks employs the use of a low voltage modelling software called WinDEBUT. WinDEBUT is widely used across many of the UK Distribution Network Operators (DNOs) and models network characteristics based on defined asset specifications and a number of load profiles that have been established and accepted to reflect different house types. Each new domestic electricity connection in Northern Ireland can facilitate an individual load of 18kVA however in practice there is diversity in when and how customers use electricity and as a result customers do not use this maximum load simultaneously. Therefore, it would not be efficient to design the network to meet 18kVA for each customer at the same time. When modelling a network for new connections WinDEBUT takes account of this diversity in demand and as a result varies the maximum demand for each dwelling. After Diversity Maximum Demand (ADMD) is a technique used to design network infrastructure to meet the anticipated actual demand on the network. ADMD is the coincidental peak load the network is likely to experience based on the number of customers connected to the particular network.

For ADMD to be an effective design tool it must be reflective of the load to be connected. Using WinDEBUT, NIE Networks currently designs connections based on three domestic customer types. Table 1 provides examples of the average ADMD per dwelling applied by WinDEBUT for a specific number of customers of each customer type connected to an LV network. For example, 25 detached dwellings will have a combined ADMD of 80kVA (25 x 3.2kVA).

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

[2] https://www.economy-ni.gov.uk/publications/energy-strategy-path-net-zero-energy

Number of Connections	Detached Dwelling	Semi-Detached Dwelling	Terrace Dwelling
1	5.3 kVA	4.9 kVA	4.1 kVA
2	4.5 kVA	4.2 kVA	3.5 kVA
3	4.2 kVA	3.8 kVA	3.2 kVA
4	4.0 kVA	3.7 kVA	3.0 kVA
5	3.8 kVA	3.5 kVA	2.9 kVA
6	3.7 kVA	3.4 kVA	2.9 kVA
7	3.6 kVA	3.4 kVA	2.8 kVA
8	3.6 kVA	3.3 kVA	2.7 kVA
9	3.5 kVA	3.2 kVA	2.7 kVA
10	3.5 kVA	3.2 kVA	2.7 kVA
15	3.3 kVA	3.1 kVA	2.5 kVA
20	3.2 kVA	3.0 kVA	2.5 kVA
25	3.2 kVA	2.9 kVA	2.4 kVA
50	3.0 kVA	2.8 kVA	2.3 kVA
75	3.0 kVA	2.8 kVA	2.3 kVA
100	3.0 kVA	2.7 kVA	2.3 kVA

Table 1: Current ADMD Per Dwelling for Domestic Connections.

The existing ADMD figures have been a proven and effective design approach utilised by NIE Networks for domestic connections in Northern Ireland.

3. Proposed approach to design demand

To better understand the impact of growing numbers of EV chargers and heat pumps connected to the network, a number of trials have been performed across the UK by various DNOs.

The Consumer Lead Network Revolution (CLNR) trial carried out by Northern Powergrid between May 2013 and April 2014 found that the addition of a heat pump (sample size of 89 households with air source heat pumps) increases household electricity consumption by approximately 82% over the course of the year; this increased to 122% of the average household consumption in January and there was a 102% consumption increase in the evening peak period[3].

WPD's Electric Nation trial found that 86% of customers involved in the trial charged their electric vehicles at home most of the time[4]. As EV uptake increases in the future, this will present a significant impact on domestic energy consumption and peak demand. The same report states that EVs typically consume between 1,800 kWh and 3,500 kWh of electricity per annum depending on the size of battery and distance driven. The higher end of this consumption equates to an approximate doubling of traditional electricity demand; however, it should be noted that if there are two or more EV's per household this figure can significantly increase.

[3] Customer Led Network Revolution (CLNR): Insight Report: Domestic Heat Pumps (http://www.networkrevolution.co.uk/wp-content/uploads/2015/01/CLNR-L091-Insight-Report-Domestic-Heat-Pumps.pdf)

[4] Electric Nation: Customer Trial Final Report (https://www.westernpower.co.uk/downloads/64378)

Based on these examples, as the country progresses towards a decarbonised economy, the existing ADMD design methodology is accepted as being inadequate. Many DNOs throughout the UK and Ireland have already increased the ADMD value that they are using for future designs to ensure that their networks can facilitate increasing levels of low carbon technologies. These include:

- WPD: ST:SD5A/5 (November 2020). "Design of Low Voltage Domestic Connections".[5]
- SPEN: ESDD-02-012 – Issue No 7 (March 2019). "Framework for Design & Planning of LV Housing Developments, including U/G networks and associated HV/LV S/S".[6]
- UKPN: EDS 08-5050 Version 3 (13/05/2019). "Electric Vehicle Connections".[7]
- SSEN: TG-NET-NPL-001 Revision 2.01 (October 2018). "Planning Standards for Low Voltage Distribution Network".[8]
- NPG: IMP/001/911 (November 2018). "Code of Practice for the Economic Development of the LV System".[9]
- ENWL: ES213 Issue 4 (September 2020): "Design of New Connection for Housing Developments".[10]

NIE Networks is proposing a revised ADMD to be applied to the design of new connections to accommodate both electric vehicles and heat pumps. This will allow the network to be designed to accommodate the likely scenario where areas will see houses with both technologies connecting to the network.

The proposed revision to the ADMD applied to new designs can be broken down to provide greater clarity on the final value. The proposed ADMD value for a dwelling will comprise of:

1. A basic ADMD value based on house type;
2. EV Charger ADMD of 2.5kVA;
3. Heat Pump ADMD of 2.5kVA.

[5] WPD: ST:SD5A/4 (November 2020). "Design of Low Voltage Domestic Connections" (https://www.westernpower.co.uk/downloads-view-reciteme/475213)

[6] SPEN: ESDD-02-012 – Issue No 7 (March 2019). "Framework for Design & Planning of LV Housing Developments, including U/G networks and associated HV/LV S/S" (https://www.spenergynetworks.co.uk/userfiles/file/ESDD-02-012.pdf)

[7] UKPN: EDS 08-5050 Version 3 (13/05/2019). "Electric Vehicle Connections" (https://g81.ukpowernetworks.co.uk/library/design-and-planning/smart-grid/eds-08-5050-electric-vehicle-connections.pdf)

[8] SSEN: TG-NET-NPL-001 Revision 2.01 (October 2018). "Planning Standards for Low Voltage Distribution Network" (https://www.ssen.co.uk/workarea/DownloadAsset.aspx?id=16204)

[9] NPG: IMP/001/911 (June 2018). "Code of Practice for the Economic Development of the LV System" (https://www.northernpowergrid.com/asset/0/document/4628.pdf)

[10] ENWL: ES213 13 (28/02/2020): "Design of New Connection for Housing Developments" (https://www.enwl.co.uk/globalassets/get-connected/cic/icpsidnos/g81-policy/policy-library-documents/design-and-planning/es213---design-for-new-housing-developments.pdf)

Table 2 below shows the separate basic ADMD value to be applied to each of the different house types.

House Type	Basic ADMD (per house)
Detached Dwelling	2 kVA
Semi-Detached Dwelling	1.5 kVA
Terrace Dwelling	1 kVA
Apartment	1 kVA

Table 2: Basic ADMD value for each House Type.

A 2019 ESB paper ("Review of LV network development and design for electrified domestic heat and transport") stated that "neither the impact of fast EV chargers (>7kVA) nor the size of increased EV energy (battery) storage capacity have been assessed in [any] trials." Within Northern Ireland, the overwhelming majority of home EV Chargers are 32 Amp (7.36kW). With such a high proportion of EV chargers now being installed in Northern Ireland rated at 7.36kW, the contribution from EV charging to the proposed ADMD will be based on a 7.36kW rated device. Other UK DNO's apply varying degrees of diversity to the installed EV charger rating to ensure their ADMD is sufficient. This includes SSEN who apply no diversity for up to 20 charge points and a diversity of 0.5 for greater than 20 charge points on a circuit, WPD apply a diversity of 0.5, UKPN who apply a diversity of 0.5 reducing to 0.22 for greater than 140 charge points on a circuit and SPEN apply a 2.5 kVA allowance per 32 Amp EV charger (diversity of ~0.34).

Due to the present uncertainty on what diversity should be applied to the rating of EV chargers as illustrated by the numerous approaches taken by other UK DNO's, NIE Networks is proposing to apply a 2.5 kVA EV charger allowance in Northern Ireland. This modest value is to accommodate future projected uptake of electric vehicles meanwhile minimising the risk of unjustified costs by designing unnecessary capacity into the network. This value will be reviewed and possibly revised in the future as greater evidence becomes available regarding the impact of electric vehicle charging on ADMD.

A 2.5 kVA heat pump allowance has been added to the basic household ADMD value to accommodate the future projected uptake of heat pumps. The 2.5 kVA figure is based on the findings of Delta-EE's 2016 report "Managing the future network impact of electrification of heat" which was commissioned for ENWL[11]. It should be noted that the 2.5 kVA maximum air source heat pump load is for a semi-detached dwelling during an 'average' peak winter day, and on a '1 in 20' peak winter day the peak demand may be significantly higher.

Table 3 illustrates how each of the elements described above are combined to provide the proposed total ADMD value for each house type.

House Type	Basic ADMD	Electric Vehicle Charger ADMD	Heat Pump ADMD	Total ADMD per House
Detached Dwelling	2 kVA	2.5 kVA	2.5 kVA	7 kVA
Semi-Detached Dwelling	1.5 kVA	2.5 kVA	2.5 kVA	6.5 kVA
Terrace Dwelling	1 kVA	2.5 kVA	2.5 kVA	6 kVA

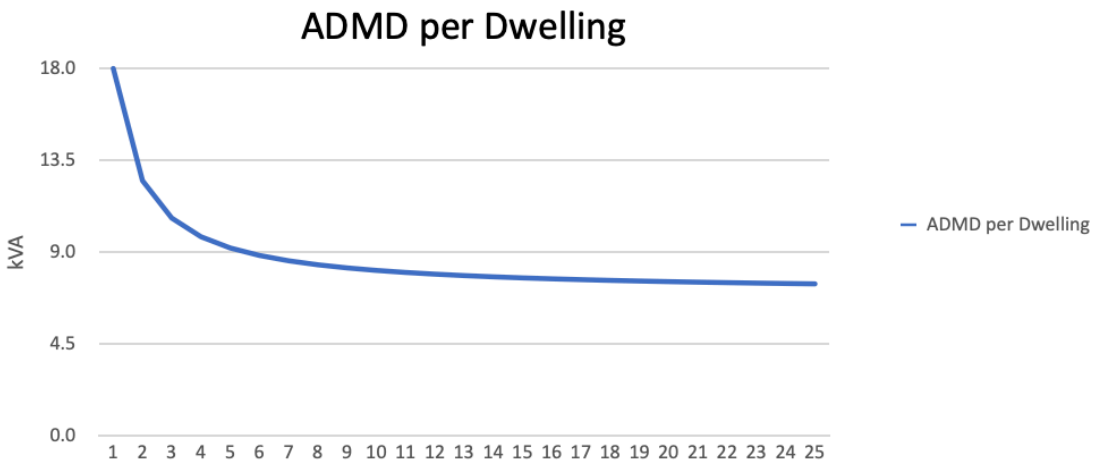
Table 3. Proposed ADMD for each house type.

[11] Managing the future network impact of electrification of heathttps://www.enwl.co.uk/globalassets/innovation/enwl001-demand-scenarios--atlas/enwl001-closedown-report/appendix-2---delta-ee---managing-future-network-impact-of-electrification-of-heat.pdf)

A standard domestic service connection is rated for 80 Amps (Approximately 18kVA) however; rarely will a household simultaneously switch on appliances that will result in the total demand exceeding the 80A rating meaning a level of diversity is applied to each individual dwelling. The addition of LCT devices within a domestic installation will reduce the diversity as a result of the prolonged duration for which they will operate. This is particularly the case when a single dwelling is considered, but as the number of dwellings increase, the concurrent usage of LCT devices by each customer will decrease. To ensure that sites with small numbers of houses (e.g. rural houses with EV chargers and heat pumps) are sufficiently accommodated, an additional allowance of 11kVA is added to the total demand.

Adding a site allowance of 11 kVA to a design, allows the basic household ADMD value (without EV or Heat Pump allowance) to be reduced compared to the current design standards (see Table 1 and Table 2).

For example: If a single detached dwelling is connected, then the 7kVA ADMD would be used, to which an 11kVA site allowance would be added to give a total ADMD of 18kVA. This site allowance provides a disproportionately large increase to network capacity required for small numbers of houses and decreases rapidly as the number of houses increases; due to a greater diversity in consumer demand as this occurs – see Graph 1.



Graph 1; Using an example of detached housing, this graph illustrates the decline of ADMD per dwelling as volume increases.

To provide clarity on how site maximum demand can be calculated the formula derivation is shown in Appendix 1 and a number of examples are provided in Appendix 2.

4. Additional PV capacity

In addition to greener transport and heating the impact of the uplift to Part F of the NI Building Regulations in 2022[12] may lead to a much greater penetration of PV installations in the coming years. Although moderate levels of domestic photovoltaic installations have been connected across Northern Ireland, the aforementioned building regulations and renewable energy targets will lead to a much greater penetration in the coming years. Studies carried out by NIE Networks as part of this consultation work have proven that increasing the ADMD value proposed in this paper will also create generation capacity on new LV networks. This will facilitate the connection of PV microgeneration that fall within the G98/NI or G99 Fast Track process (≤3.68kV single phase or ≤11.04kW three phase).

[12] https://www.finance-ni.gov.uk/consultations/consultation-proposals-amendment-technical-booklet-guidance-part-f-conservation-fuel-and-power

5. Three phase service cables

The electricity network for new housing developments will comprise of underground cables. There will be mains cables running in the footpath with a service cable connecting each new dwelling to the mains cable. Within the mains cable, there are three cores known as phases and the service cable supplying a dwelling will connect to one of these cores. Maintaining a balance in the load on each of the phases is an important requirement which NIE Networks must manage. As the demand at each dwelling increases due to the addition of EV charging or heat pumps, there is a risk that the sporadic uptake of the various technologies will lead to phase imbalance on the network.

In addition to increasing the ADMD value for network design, some other DNO's within the UK are proposing to make three phase services cables the standard for connections to new domestic premises. Western Power Distribution, a UK DNO, implemented a minimum standard of three phase service cables for domestic connections in 2020 following consultation[13].

NIE Network are also proposing to make three phase services cables the standard for connections to new domestic premises. The installation remains a single phase connection but installing a three phase service cable from the mains cable to the premises offers system benefits such as;

- much greater flexibility in balancing the network without the need for excavating service connections, maximising load potential of network assets
- reduced electrical losses that arise on LV networks due to imbalance
- future proofing of service arrangement for customers to embrace LCTs and remove requirement to revisit and replace service cable within asset life

As noted above a three phase service cables provides future network benefits while also enhancing options for customers to embrace three phase LCT equipment, such as EV chargers, heat pumps and micro generation.

Future proofing the service arrangement at the time of original construction provides cost and sustainability benefits along with minimising future disruption. Whilst excavations remain open it is relatively simple to install a larger service cable. Once the ground is reinstated and landscaped this opportunity is lost. The opportunity diminishes further as house owners develop their gardens and driveways. We hope to avoid the "why wasn't this done when the house was built?" question for properties built in the future.

A three phase service installation does increase the cost of connection but in relatively low terms. The cable used is more expensive than the single phase alternative. To offer space for metering and termination equipment a larger meter box is also required. The typical service cable length in a modern house is around 20m. The approximate additional costs are around £270 per connection.

As part of this consultation paper we would also seek the views of all stakeholders on NIE Networks plan to implement three phase service cables to domestic premises as the standard in Northern Ireland.

[13] https://yourpowerfuture.westernpower.co.uk/superfast-electricity-consultation

6. The impact on future connection costs

NIE Networks design and build electricity infrastructure based on a 40 year asset life meaning new equipment installed today, as a minimum, should be expected to remain in service until 2062. It is anticipated that demand levels will significantly increase on the distribution system through the electrification of heat and transport; most notably from the connection of heat pumps and electric vehicles. With network assets to date having been designed using traditional consumer load profiles there is insufficient spare capacity available on the existing network to meet future LCT demands. Whilst the volume of LCTs being connected to existing networks is currently modest, it is expected to grow at an increasing pace over the coming years. The Development of Electric Vehicles in Northern Ireland[14] report prepared for DfI in 2021 forecasts there will be between 200,000 and 400,000 electric vehicles in Northern Ireland by 2030. The intentions to phase out fossil fuel heating within the Energy Strategy for Northern Ireland[15] will likely lead to a rapid increase in heat pump deployment and the renewable electricity targets will lead to the growth of installed PV microgeneration.

Under the current Regulatory Price Control (RP6) the Utility Regulator (UR) has provided a budget allowance for the investment required in the existing network to facilitate LCT connections. To date, this investment has been allocated to reinforcement works associated with the installation of LCTs within the existing housing stock connected to the electricity network. In parallel to the retrospective reinforcement being carried out on existing assets, NIE Networks are developing innovative solutions that should assist with the connection of LCTs to the existing electricity system without the immediate need for costly traditional network reinforcement.

With processes in place to remedy constraints on the existing network caused by the connection of LCTs, this consultation is considering how new build houses with LCT connections should be treated. For context, figures published by the Department for Communities[16] show that the total number of houses in NI (as of April 2021) was 814,210. This was a c.1% increase from 2020 i.e. 6,398 new houses built. With the understanding we now have of the demand required from future homes, new networks need to be capable of meeting future requirements for the full asset life.

When designing new connections NIE Networks will offer the Least Cost Technically Acceptable (LCTA[17]) connection, unless an alternative is requested by the customer. Increasing the ADMD may mean assets with a greater capacity (and typically a higher cost) shall be required for a connection to be deemed technically acceptable. As a consequence, the connection costs (made up of the connection assets themselves and any necessary network reinforcement) will increase in comparison to current quotation offers for the majority of new domestic applications. Separate from this consultation, NIE Networks have begun to investigate the current connections charging approach and welcome engagement with the Utility Regulator and our customers moving forward, more of which is detailed in section 8.

[14] https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/energy-strategy-transport-research-project-2.pdf

[15] https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Energy-Strategy-for-Northern-Ireland-path-to-net-zero.pdf

[16] https://www.communities-ni.gov.uk/system/files/publications/communities/ni-housing-stats-20-21-full-copy.pdf

[17] LCTA means the connection which: (1) complies with the Distribution System Security and Planning Standards; and (2) complies with any other applicable standard, regulation and code; and (3) takes into account committed developments on the Distribution System; and (4) is the least overall cost.

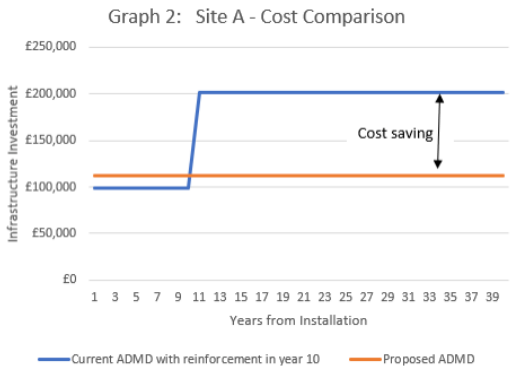
7. The need for change

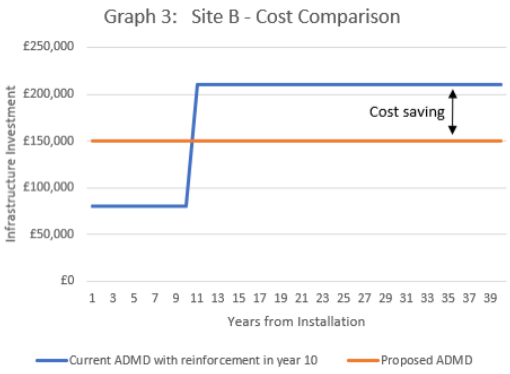
As highlighted earlier, NIE Networks is currently carrying out retrospective works on existing networks as a result of LCT's being installed in properties where the network was not designed for such equipment. By continuing with current design criteria retrospective reinforcement will continue to be required and, in some cases, result in the excavation of roads and footpaths in relatively new developments to replace underground assets. The effect of such works can cause:

- **disruption:** excavation works and traffic management can cause disruption and inconvenience to residents, businesses and road users
- **poor sustainability through:**
  - **Wasted resources:** replacing equipment before the end of 40 year asset life is waste of material resources. For example, it is not cost effective to excavate and remove previously laid cable therefore the resource cannot be recycled
  - **Increase in Carbon Footprint:** replacing assets before the end of 40 year asset life, particularly underground cables, will increase the carbon footprint associated with that infrastructure
- **Increase in cost on the Northern Ireland customer base:** retrospective reinforcement costs are passed on to the Northern Ireland customer through electricity bills

NIE Networks are proposing that the higher cost connection criteria (resultant from an increased ADMD) is applied when designing new assets as it shall create less disturbance, improve sustainability and be considerably more cost efficient in comparison to retrospective replacement and reinforcement.

Graphs 2 and 3 indicate how the change in ADMD applied to a domestic development increases the upfront cost of the connection, but longer term becomes cost positive, effectively an overall reduction in investment, by avoiding retrospective reinforcement. Site A is based on the connection of 42 semi-detached dwellings in a rural housing development and site B is based on the connection of 98 semi-detached dwellings in an urban housing development. It should be noted that these are two examples demonstrate the cost savings of future proofing new network assets and should not be interpreted as representative of a 'typical' site cost. Connection costs may vary considerably on a site by site basis subject to the specific characteristics and may also require additional upstream network reinforcement.





Graphs 2 and 3; Cost comparison for two sample developments with the revised ADMD applied against current design methodology with reinforcement works undertaken in year 10.

By revising the design methodology to address changes in the consumer needs, NIE Networks is acting to comply with the Electricity (NI) Order 1992[18], Article 12(1), 'It shall be the duty of an electricity distributor to develop and maintain an efficient, coordinated and economical system of electricity distribution'. Accounting for this additional load when designing and installing new assets will allow us to continue to design and build the network based on a 40 year asset life.

[18] https://www.legislation.gov.uk/nisi/1992/231/contents

8. Funding options

As stated above the increase in ADMD may have a direct impact on the costs associated with new domestic connections. We recognise that in some cases the cost associated with the electricity connection may be considerable and could have an impact on the commercial viability of developments.

The current costing methodology for domestic connections falls into two categories:

1. Less than 12 domestic premises – the customer must pay the full cost associated with facilitating the connection i.e. the installation of new assets and reinforcement of existing assets[19].
2. 12 or more individually serviced domestic premises - the customer will pay a Standard Connection Charge[20] for each domestic premise, assuming the customer undertakes necessary excavation and reinstatement within the development.

With the implementation of this proposed change in ADMD, the connection cost will increase for the majority of developments within category 1 and raise the standard connection charge for all housing sites within category 2.

Recently, there have been initial discussions into a distribution connections charging review in Northern Ireland, and the outcome from this consultation will be an important enabler for a full review. A distribution connection charging review for Northern Ireland may propose a change to the current 'deep' charging methodology where customers pay the full cost of both the installation of new assets and the reinforcement of existing assets. One option would be to move to a 'shallow' charging methodology, where customers pay only for the cost of the installation of new assets, and reinforcement of existing assets are recovered through socialised costs. This would be similar to the approach in GB, where Ofgem have recently published a decision paper on their Access and Forward-Looking Charges minded-to consultation[21], which proposes reducing the contribution to network reinforcement from the customer for generation and removing all network reinforcement costs for the customer for demand. An alternative would be a 'shallowish' charging methodology where customers pay for the cost of the installation of new assets, and a portion of the reinforcement costs of existing assets with the remaining portion of costs recovered by the general customer base through socialised costs. Any move to a shallower charging approach will require a full consultation process and agreement with all parties, including relevant government departments and the Northern Ireland Utility Regulator.

With that in mind we have identified two potential funding options for new connections which are detailed below.

1. **Fully chargeable** – As per the current distribution connection charging methodology. 100% of costs associated with new infrastructure and reinforcement of existing assets paid by the connecting customer.
2. **Subsidised reinforcement works** – Subject to a full distribution connection charging review and relevant approval processes. New assets required to facilitate the connection will be 100% chargeable to the connecting customer but the reinforcement of existing assets will be subsidised.

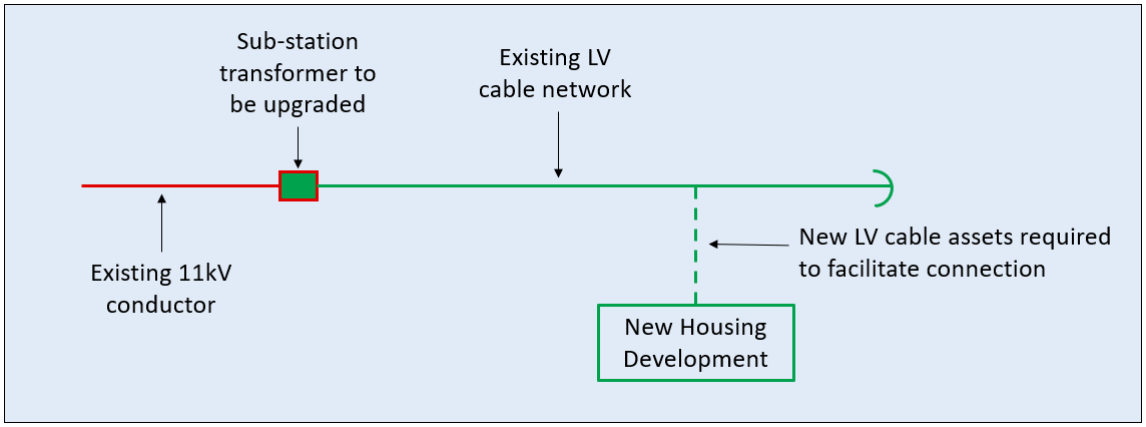
[19] Chargeable costs typically limited to reinforcement work on existing infrastructure at the connected voltage and/or one voltage level above.

[20] A fixed cost per connection to each dwelling based on an average of the actual housing development connection costs from the previous year.

[21] https://www.ofgem.gov.uk/publications/access-and-forward-looking-charges-significant-code-review-decision-and-direction

Example Project

As an example, consider a housing development for 10 new detached houses. Under the existing ADMD values the connected load for the new development would be 35kVA. Under the proposed ADMD figures the connected load for the new development would be 81kVA. To facilitate the new load the existing sub-station transformer requires upgrading and new low voltage cabling will be laid to the new houses.



Under Option 1 (Fully Chargeable) the connecting customer would pay for all costs associated with the reinforcement of the substation transformer. The customer would also pay for the new low voltage cabling to the new housing development.

Under option 2 (Subsidised reinforcement works) the customer would be charged for the new low voltage cabling. The costs associated with the substation transformer reinforcement would be subsidised.

9. Conclusions

The future growth in LCTs being connected to the network will continue to increase in the coming years and NIE Networks will play a pivotal role in ensuring the electricity network in Northern Ireland will be capable of meeting future demands. The change in customer load requirements as a result of the electrification of heat and transport means NIE Networks needs to revise how it designs new connections to ensure future networks are capable of providing a safe and reliable supply.

The increase in ADMD will be result in an overall reduction in investment for the general customer base as it builds in LCT capacity at the connection stage as opposed to retrospectively reinforcing the network when LCTs connect which is more costly and disruptive; however, there is no doubt implementing the ADMD changes proposed in this consultation will lead to increases in connection costs. NIE Networks supports the decarbonisation of heat and transport and is committed to ensuring the network is developed in such a way that new connections and infrastructure are capable of meeting future customer requirements.

NIE Networks has begun discussions around reviewing the current distribution connection charging regime. The aim is to conduct a full review with a view towards potentially moving to a shallower charging regime (funding option 2 in section 8) similar to that proposed by Ofgem's Access and Forward-Looking Charges minded-to consultation. Any review would be dependent on regulatory approval.

10. Consultation questions

1. Do you agree the existing design criteria for connections needs to be revised to reflect the additional demand required by the Northern Ireland electricity network to meet net zero (carbon) targets?
2. Do you agree with the approach described in Section 3 to derive a new ADMD to be applied to new connections design in Northern Ireland? – If not, please explain your reasons.
3. Do you agree with the new ADMD values presented in Section 3? - If not, please explain your reasons.
4. Do you have any objections to the proposed increase in ADMD value to facilitate the future connection of LCTs? – If so, please provide details.
5. Do you have any objections to the implementation of 3 phase service cables to domestic premises as the standard in Northern Ireland? – If so, please provide details.
6. Based on the funding options presented in Section 8 which would you be likely to support
   - **Fully chargeable** – 100% of costs associated with new infrastructure and reinforcement of existing assets paid by the connecting customer.
   - **Subsidised reinforcement works** – assets required to facilitate the connection will be 100% chargeable to the connecting customer but the reinforcement of existing assets will be subsidised.
7. Are there further options you feel NIE Networks should consider? – Please provide details.
8. Do you agree that moving to a 'shallower' charging regime, as outlined in Section 8 to implement Option 2, would accommodate the future growth of LCT's in Northern Ireland while developing a safe and reliable network in the fairest possible way? - Please explain the reason for your answer if different from the reasoning presented in Section 8.

11. Next steps

NIE Networks invite interested parties to respond to this consultation. Responses should be sent electronically to *Consultation.Response@nienetworks.co.uk* by 3pm on 25th July 2022. Respondents who wish that their response remain confidential should highlight this when submitting the response. NIE Networks may share responses with Utility Regulator. Respondents should be aware that as the Utility Regulator is a public body and non-ministerial government department, the Utility Regulator is required to comply with the Freedom of Information Act (FOIA)21 .

During the consultation period, should any stakeholder have any specific queries on any aspect of this document, or on the proposed changes to the standards, they should contact the email address set out above.

NIE Networks intends to collate all responses received to this consultation as part of its report to the Utility Regulator. Following the end of this consultation period NIE Networks will, in accordance with its Distribution Licence send a report on the outcome of its review to the Regulator detailing;

- The proposed revisions to the Distribution System Security and Planning Standards which NIE Networks proposes to make; and
- Any written representations or objections from any electricity undertakings (including any proposals for revisions to the document that were not accepted in the course of the review) arising during the consultation process and subsequently maintained.

Following the end of the consultation period and the discussions to be held with the Utility Regulator, revisions to NIE Networks ADMD applied to the design of new connections will be finalised and published on the NIE Networks website once approval has been received by the Regulator.

12. Appendices

APPENDIX 1

Site Maximum Demand formula;

$$Site\ Maximum\ Demand = ADMD_T + 11kVA$$

Where:

- $ADMD_T$ is the total ADMD within the site.

The total ADMD $(ADMD_T)$ can be calculated by multiplying the number of each house type by the relevant ADMD.

The Total After Diversity Maximum Demand can be calculated using the following formula:

$$ADMD_T = \left(N_a \times ADMD_a\right) + \left(N_b \times ADMD_b\right) +_{.....} + \left(N_z \times ADMD_z\right)$$

Where:

- $ADMD_T$ is the total ADMD within the site.
- N_i is the number of i houses of each type.
- $ADMD_i$ is the ADMD of the corresponding house type *i*.

For example, if 10 Detached houses with an ADMD of 7 kVA and 20 Semi Detached Houses with an ADMD of 6.5 kVA the total ADMD would be:

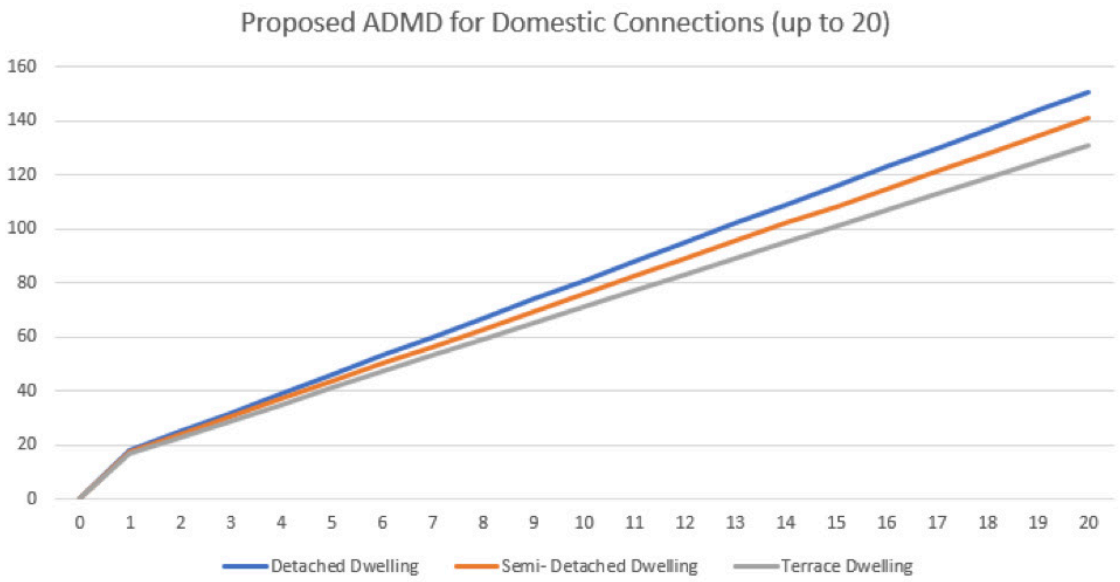
$$ADMD_T = (10 \times 7) + \left(20 \times 6.5\right) = 70 + 130 = 200\ kVA$$

Therefore:

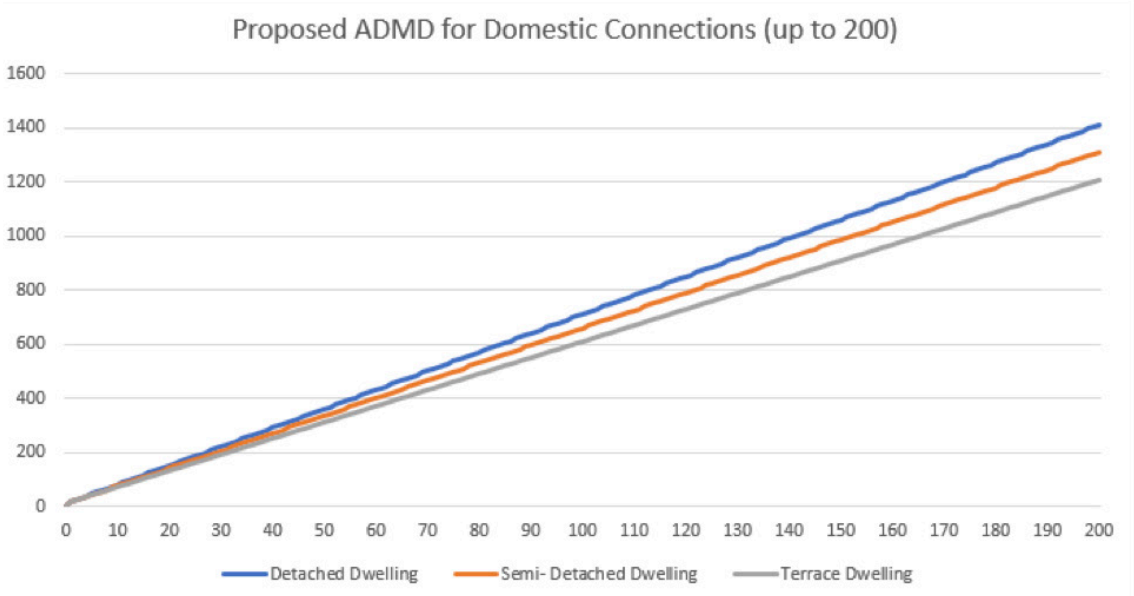
$$Site\ Maximum\ Demand = ADMD_T + 11kVA$$

$$= 200kVA + 11\ kVA = 211\ kVA$$

Graph 4 and Graph 5 on the following page illustrate the site maximum demand for each house type by applying the above formula for up to 20 houses (Graph 4) and then for up to 200 houses (Graph 5).



*Graph 4: Proposed Site Maximum Demand for quantities of up to **20** houses of each house type.*



*Graph 5: Proposed Site Maximum Demand for quantities of up to **200** houses of each house type.*

APPENDIX 2

Examples

Example 1 - A site with 10 detached houses:

ADMD will be calculated as 10x7kVA = 70kVA. The addition of the 11 kVA allowance per site = 81 kVA

Example 2 - A site with 10 detached houses and 10 semi-detached houses:

ADMD will be calculated as (10x7kVA) + (10x6.5kVA) = 135kVA. The addition of the 11 kVA allowance per site = 146 kVA.

Example 3 - A site with 1 detached house:

ADMD will be calculated as 1x7kVA = 7 kVA. The addition of the 11 kVA allowance per site = 18 kVA.

Example 4 - A site with 2 detached houses:

ADMD will be calculated as 2x7kVA = 14 kVA. The addition of the 11 kVA allowance per site = 25 kVA.

Example 5 - A site with 6 semi detached houses and 10 terraced houses:

ADMD will be calculated as (6x6.5kVA) + (10x6kVA) = 99kVA. The addition of the 11 kVA allowance per site = 110 kVA.

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