Northern Ireland Electricity Networks

Greater Access to the Distribution Network in Northern Ireland

Recommendations Paper

December 2019

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1. EXECUTIVE SUMMARY

This document is the culmination of the 'Greater Access to the Distribution Network in Northern Ireland' consultation process that was initiated with a Call for Evidence (CfE) which closed in October 2018, and a related workshop held in September 2018. The CfE responses were used to develop a Consultation Document which opened in February 2019 and closed on 20th May 2019.

NIE Networks welcomes the level of engagement received from all sections of industry throughout this process. This engagement has provided NIE Networks with a very useful insight into stakeholder views across a broad range of related matters and has helped influence the Distribution System Operator (DSO) vision presented within this document.

1.1 Scene Setting

Climate change legislation, such as the EU's Renewable Energy Directive and subsequent Clean Energy Package, and the UK government's 'net zero by 2050' legislation is driving decarbonisation of the energy sector. This is forecast to create significant growth in technologies that will place increasing demands on the electricity network thereby requiring major changes in how the electricity industry manages and operates the network. Examples of such changes, many of which are already having an impact, are:

- Renewable generation continues to grow;
- Electric vehicle and heat pump uptake is accelerating;
- More and more consumers now have the ability to produce their own electricity;
- New technology is giving consumers more control over how they use electricity;
- Energy storage technology is rapidly improving and its use growing accordingly.

As a result, the demands on the electricity network are changing. The network which was designed to efficiently facilitate the flow of electrical energy towards the customer is now experiencing significant energy flows in the opposite direction. Distribution Network Operators (DNOs) have already started to play a more active role in the operation of the electricity system, performing new roles and functions. Technology has enabled this change away from a traditionally passive role of transporting electricity in one direction, i.e. from the transmission network to the end user, to that of playing a much more active role in network control and management.

This is the future direction of travel for operating a distribution network[1], and one that all network operators including NIE Networks must embrace. If managed effectively the shift will deliver real benefits, creating new opportunities for customers and placing downward pressure on electricity bills. It will enable the more intelligent management of the network through more active customer participation and for the network to act as a platform for the greater deployment of smart energy technologies as alternatives to conventional higher cost investments. However, this shift will not result in unfettered access to the distribution network for all customers. Whilst the DNO must be more flexible in how it manages and operates the distribution network, greater flexibility from customers will also be required.

NIE Networks is not alone on this journey and the Energy Networks Association (ENA)[2] through the Open Networks Project has started to consider what this evolution will entail, an evolution they call the transition from a DNO to a DSO. The Open Networks Project has developed a working definition of a DSO:

"A Distribution System Operator (DSO) securely operates and develops an active distribution system comprising networks, demand, generation and other flexible distributed energy resources (DERs). As a neutral facilitator of an open and accessible market it will enable competitive access to markets and the optimal use of DERs on distribution networks to deliver security, sustainability and affordability in the support of whole system optimisation. A DSO enables customers to be both producers and consumers; enabling customer access, customer choice and great customer service."

1.2 Purpose of document

This document summarises the responses received to both the original CfE[3] and the subsequent Consultation Document[4] on Greater Access to the Distribution Network in Northern Ireland. It then outlines NIE Networks' recommended approach to some more general issues around DSO transition, details specific recommendations for the implementation of the various DSO functions, and summarises the cost implications.

NIE Networks will engage with the Utility Regulator (UR) with the objective of progressing the proposed recommendations and to seek approval for the necessary funding that will be required.

[1] 33kV, 11kV, 6.6kV and 0.4kV Networks
[2] Energy Networks Association (ENA) is the voice of the networks, representing the transmission and distribution network operators for gas and electricity in the UK and Ireland.
[3] http://www.nienetworks.co.uk/documents/future_plans/greater-access-to-the-distribution-network-in-nort.aspx.
[4] https://www.nienetworks.co.uk/getmedia/c226929a-3d68-4c2e-b5ab-17195267fdba/Greater-Access-to-the-Distribution-Network-in-Northern-Ireland-Consultation.pdf.aspx

1.3 Summary of Respondents

NIE Networks would like to thank all stakeholders who submitted responses to NIE Networks' CfE and Consultation on Greater Access to the Distribution Network and attended the workshop in September 2018.

A total of 20 responses were received to the CfE, and an additional 10 responses were received to the Consultation. Respondents represented a good cross section of the industry, as illustrated in Figure 1. The majority of industry groups who responded to the Consultation also responded to the CfE; although there were fewer responses to the Consultation. Many of the Consultation questions were based around the Market Facilitator, Service Provider and Connections functions and the responses were representative of the groups that had most interest in these aspects.

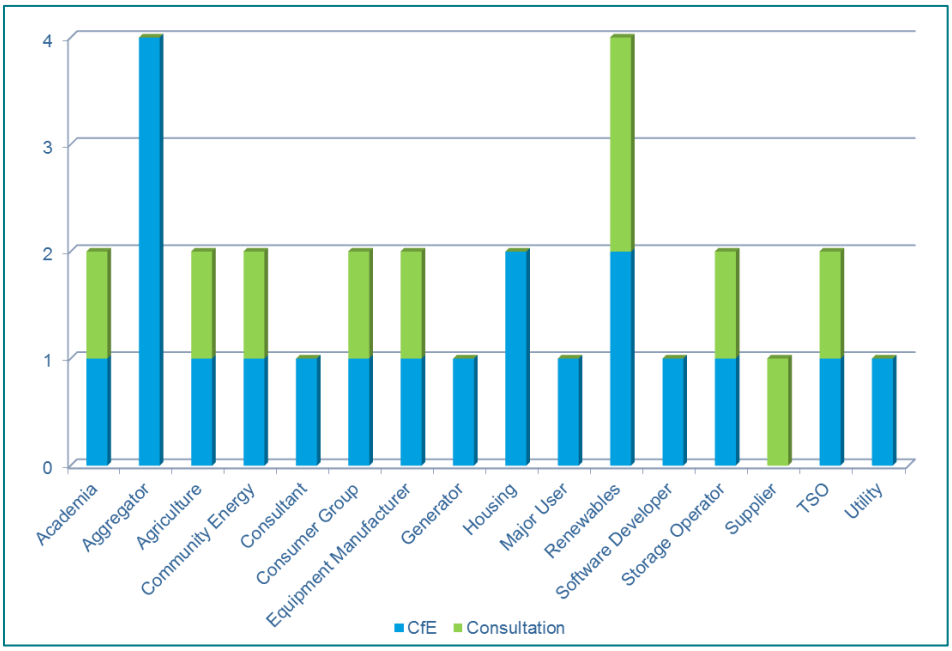

FIGURE 1

1.4 Key Themes

Respondents were broadly supportive of the proposals outlined in the CfE and generally concurred with the proposals outlined within the Consultation document and agreed that the evolution from a Distribution Network Operator (DNO) to a Distribution System Operator (DSO) is necessary to manage the increasing level of renewable generation and Low Carbon Technologies (LCTs) connected to the distribution network. Respondents also commended NIE Networks on the comprehensive approach to gather consumer views and encouraged increased activity in this area.

Key themes highlighted by respondents are outlined below. These are explored further in sections 3 and 4. It should be noted that this does not represent an exhaustive list and a more detailed summary of Consultation responses can be found in Appendix 1.

General Views

- Respondents broadly agreed that passive consumers are suitably protected by the DNO to DSO evolution. Of those that disagreed, one respondent advocated that passive consumers should be protected from the energy demands of active consumers. NIE Networks response to this point is that it is an inherent requirement of network design that consumers will not be adversely affected by the actions of another and that this will continue to be a requirement when operating a future more dynamic network. This respondent also promoted energy services for domestic consumers, which NIE Networks will be considering through the Demand Side Response (DSR) innovation project and this is a potential argument for expediting this type of solution. Another respondent flagged concerns around data availability, which NIE Networks will endeavour to facilitate where possible under current data protection and customer confidentiality laws, but believes that this requirement plays into the ongoing debate around smart meters.

Policy Inhibitors

- Respondents mostly agreed that there are currently no policy or regulatory inhibitors preventing the commencement of the DNO to DSO evolution.

- There were no responses disagreeing with the identified policy inhibitors that may become prevalent in the medium term and respondents echoed the inhibitors identified in the Consultation (tariff structure, price control mechanism & smart metering). There was strong support among respondents for an over arching review of energy policy and legislation in NI and one respondent commented that the price control framework may not facilitate the flexibility for NIE Networks to innovate during the price control period.

Market Facilitator

- Respondents agreed with the proposed architecture and running sequence of the Network Capacity Allocation Platform (NCAP), with one proposing minor constructive modifications which will be considered in the final version.

- The majority of respondents agreed with the phased approach regarding the delivery of the Nodal Controller solution.

- Regarding access rights, respondents to this question strongly preferred a mechanism that favours the least cost provider.

Service Provider

- The widest range of responses were received in answer to which Service Provider option should be adopted by NIE Networks. Figure 2 presents an overview of all responses to this question.

- Two respondents could see how the DSO as a Service Provider will benefit consumers but require more clarity on how NIE Networks will manage the risk of perception of conflicts of interest between being a neutral Market Facilitator and a Service Provider. One of these also sought clarity on how NIE Networks as a system Service Provider would not have a negative impact on existing Service Providers connected to the distribution network.

- Another respondent raised the point of a conflict of interest between NIE Networks remaining a neutral Market Facilitator if also providing system services and have therefore opted for maintaining the current process.

- One respondent did not agree with NIE Networks' assessment on the negative long term impact of the DSO as last call Service Provider and believe this is the most attractive option.

- Two respondents believe the DSO as first call Service Provider would be most financially beneficial to all customers, especially considering the concerns raised through the CfE on the need to protect vulnerable passive consumers.

- One respondent didn't agree with any option set out, whereas another believed the most appropriate option is dependent on network configuration and operation in different areas and therefore multiple approaches should be taken.

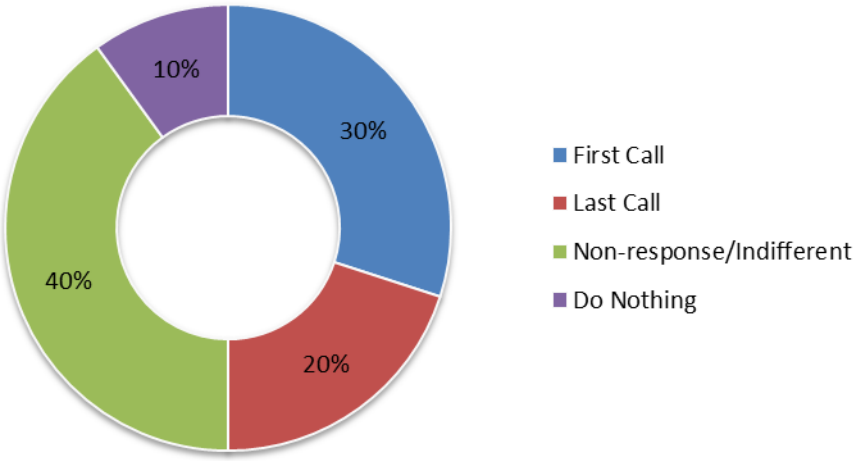

FIGURE 2

Congestion Management

- The majority of respondents were in agreement with NIE Networks' approach to congestion management. One respondent favoured conventional reinforcement, which remains a key part of the smart incremental strategy, but their response also indicated that DSR may be beneficial over time.

Connections

- Most respondents agreed with the proposed connections process for microgeneration and G99/NI 'fast track' connection applications.
- All respondents who answered the relevant question agreed that NIE Networks should consider providing an option for a flexible connection in the future. All respondents who were supportive agreed that as much information as possible should be made available relating to availability and curtailment.

Data Provision

- The responses received strongly supported the premise that the DSO/TSO requires increased data to efficiently develop and operate the system and that this data should be efficiently transferred between the TSO and DSO.

- The majority of respondents believed that greater customer metering functionality is required in Northern Ireland and a majority also believed that customers should have increased access to network data.

Network Management

- The majority of respondents agreed with investment to reduce generation constraints. The general consensus was that it would be to the ultimate benefit of customers in offering greater support to the system operation and may avoid higher generation and ancillary service costs. Suggested examples of how this could be achieved are: increased network visibility, active network management, real time rating and optimisation, use of storage, managed connections and meshing of networks.

Pricing (Charging)

- One respondent shared NIE Networks' concern that under a volume based DUoS tariff passive consumers may bear a higher proportion of the distribution network costs. They welcomed the proposal to undertake a review of the DUoS charging methodology and would like to engage with NIE Networks and UR to help inform the proposals.

Implementation

- Respondents generally agreed with the implementation timescales illustrated in the Consultation, however a recurring point raised was that NIE Networks should consider implementing activities in parallel instead of staggering, to speed up the process.

- One respondent highlighted the need for a focus on the whole system and believe a joint approach between NIE Networks and the TSO will be most beneficial. Other respondents also offered support and assistance to NIE Networks throughout this evolution to a DSO.

1.5 Recommended Approach

The transition to a DSO must be fair for everyone. NIE Networks is proposing working with the UR on future tariff reforms which will limit the impact of unintended consequences associated with this evolution and the decarbonisation of the energy sector on passive customers including vulnerable customers. The proposed network pricing reform is described in section 4.7. Furthermore, by delivering whole system optimisation through for example, providing additional services to the TSO and using smart and market-based solutions in conjunction with conventional reinforcement, NIE

Networks believes that this evolution will help minimise network costs for all customers including those passive and vulnerable customers.

NIE Networks agrees with stakeholders that there is a need for engagement with industry throughout this process. NIE Networks believes that to date this has been achieved through the CfE, associated workshop and the Consultation document. However, to ensure that industry engagement continues beyond this process and into the implementation of this DSO vision, NIE Networks recommends that the overall stakeholder engagement strategy associated with this evolution should be included within the scope of the existing Customer Engagement Advisory Panel[5] (CEAP). Separate sub groups will exist to ensure industry engagement associated with the specific aspects of this evolution e.g. the Connections Innovation Working Group (CIWG) which will consider options for flexible connections in constrained networks.

The evolution from a DNO to a DSO will necessitate an exponential increase in the IT and data requirements of the business to facilitate forecasting, monitoring and increased network transparency (e.g. real-time visibility of the LV network). NIE Networks agrees with respondents that as the IT and data requirements increase so does the cyber security risk. To mitigate this NIE Networks has comprehensive plans for cyber security and data protection strengthening measures. The implementation of these measures will also greatly enhance NIE Networks' position for compliance with NIS[6] and Data Protection Regulations. NIE Networks will continue to ensure that cyber security and data management considerations are of paramount importance in the development of solutions within the business.

NIE Networks agrees that, through the decentralisation of the electricity sector, the management of the system is becoming increasingly difficult and more complex. As part of the evolution from a DNO to a DSO, NIE Networks is seeking to ensure that distributed energy resources are managed in a coordinated way to deliver whole system benefits. This includes the development and implementation of the NCAP and nodal controller, as well as improvements in network management techniques.

Whilst NIE Networks recognises that there are variations of the network operator model as presented by some respondents, the model being proposed by NIE Networks is an extension of existing DNO processes and systems and does not require wholesale license and/or statutory regulation changes. This aligns with the current philosophy in the Republic of Ireland and the outcome of the ENA Open Networks Future Worlds Impact Assessment consultation[7] in GB which supported

[5] The Panel is made up of designated members of the Consumer Council for Northern Ireland, Department for the Economy, Utility Regulator and NIE Networks.
[6] Networks and Information Systems
[7] http://www.energynetworks.org/assets/files/Impact%20Assessment%20Consultation%20-%20ONP%20Response.pdf

'World B' in the short to medium term, which is the closest to current arrangements. For this reason the DNO to DSO evolution proposed by NIE Networks is considered as a low risk, least regrets approach. It should be noted however, that the adoption of the proposed evolution in the short to medium term does not preclude the transition to more radical models in the longer term if it is proved to be more efficient.

1.6 Implementation Plan & Cost Recovery

NIE Networks is adopting a least regrets approach to the evolution from a DNO to a DSO. This means that NIE Networks will be evolving their current systems and processes as opposed to investing in wholesale changes to enable the greater deployment of low carbon technologies. Whilst adopting a least regrets approach will minimise the funding requirement in the longer term, a need still exists for funding in order to enable the implementation of the DSO vision outlined in section 4.

Some of the enablers required to implement the various DSO functions already have associated funding allowances within the RP6[8] period e.g. funding for innovation trial projects, and the funding for some longer term proposals will be included in NIE Networks RP7[9] Business Plan. However, NIE Networks has identified a number of key enablers that cannot be delayed until RP7 if the proposed solutions are to be delivered in a timeline that is acceptable to industry and stakeholders and these will require additional funding to implement during RP6. These enablers include IT system upgrades, the installation of further network monitoring equipment and various substation alterations to facilitate a demand reduction in response to a system disturbance. The enabling funding to continue the timely transition to a network that will facilitate a low carbon future has been identified at £13.5m. The transition will not only benefit active customers through the facilitation of access to markets, but will also benefit all customers through minimising future network costs in the delivery of a low carbon economy. The transition will help improve the environment and air quality, by developing systems that support the growth of renewables and the switch to electric vehicles, facilitating the decarbonisation of the energy sector, a requirement now enshrined in legislation. Indeed, it is more widely recognised that the move to a smarter grid will not only help cut emissions but also enable possible savings estimated by the National Infrastructure Commission of up to £8 billion a year across the UK by 2030[10].

NIE Networks knows from extensive public engagement through this process that a broad range of stakeholders support the plan outlined in this document and the need to progress the enabling technologies. NIE Networks proposes engaging with the UR

[8] RP6 refers to NIE Networks' regulatory price control which covers the period 1 October 2017 to 31 March 2024
[9] RP7 refers to NIE Networks' regulatory price control which is due to commence on 1 April 2024
[10] https://www.gov.uk/government/news/a-smart-power-revolution-could-save-consumers-8-billion-a-year-adonis

to discuss an appropriate funding arrangement and will also propose further engagement prior to developing the RP7 business plan as it is anticipated that the further rollout of smart solutions will be necessary during RP7. It is expected that a future network will need greater flexibility in how it is to be operated and will require the development and utilisation of further innovative solutions to manage the anticipated future uncertainty. This is likely to incur additional operating costs and will necessitate consideration of potential incentive mechanisms and a future funding mechanism that encourages the correct investment solution (conventional/smart/market-based) irrespective of a capital verses a revenue decision, and also one that facilitates the trialling and early adoption of evolving innovative technologies.

2. INTRODUCTION

This document follows on from the NIE Networks' Call for Evidence[11] (CfE) on Greater Access to the Distribution Network in Northern Ireland which closed in October 2018 and the subsequent Consultation[12] document which closed in May 2019.

NIE Networks welcomes the level of engagement received from all sections of industry which has provided NIE Networks with a very helpful insight on stakeholder views across a broad range of related matters and has helped influence the Distribution System Operator (DSO) vision presented within this document.

2.1 Scene Setting

Climate change legislation, such as the EU's Renewable Energy Directive and subsequent Clean Energy Package, and the UK government's 'net zero by 2050' legislation is driving decarbonisation of the energy sector., This is forecast to create significant growth in technologies that will place increasing demands on the electricity network thereby requiring major changes in how the electricity industry manages and operates the network. Examples of such changes, many of which are already having an impact, are:

- Renewable generation continues to grow;
- Electric vehicle and heat pump uptake is accelerating;
- More and more consumers now have the ability to produce their own electricity;
- New technology is giving consumers more control over how they use electricity;
- Energy storage technology is rapidly improving and its use growing accordingly.

As a result, the demands on the electricity network are changing. The network, illustrated by the "old world" in Figure 3, which was designed to efficiently facilitate

[11] http://www.nienetworks.co.uk/documents/future_plans/greater-access-to-the-distribution-network-in-nort.aspx.

[12] https://www.nienetworks.co.uk/getmedia/c226929a-3d68-4c2e-b5ab-17195267fdba/Greater-Access-to-the-Distribution-Network-in-Northern-Ireland-Consultation.pdf.aspx

the flow of electrical energy towards the customer, is now experiencing significant energy flows in the opposite direction, illustrated by the “new world” in Figure 4. Distribution Network Operators (DNOs) have already started to play a more active role in the operation of the electricity system, performing new roles and functions. Technology has enabled this change away from a traditionally passive role of transporting electricity in one direction, i.e. from the transmission network to the end user, to that of playing a much more active role in network control and management.

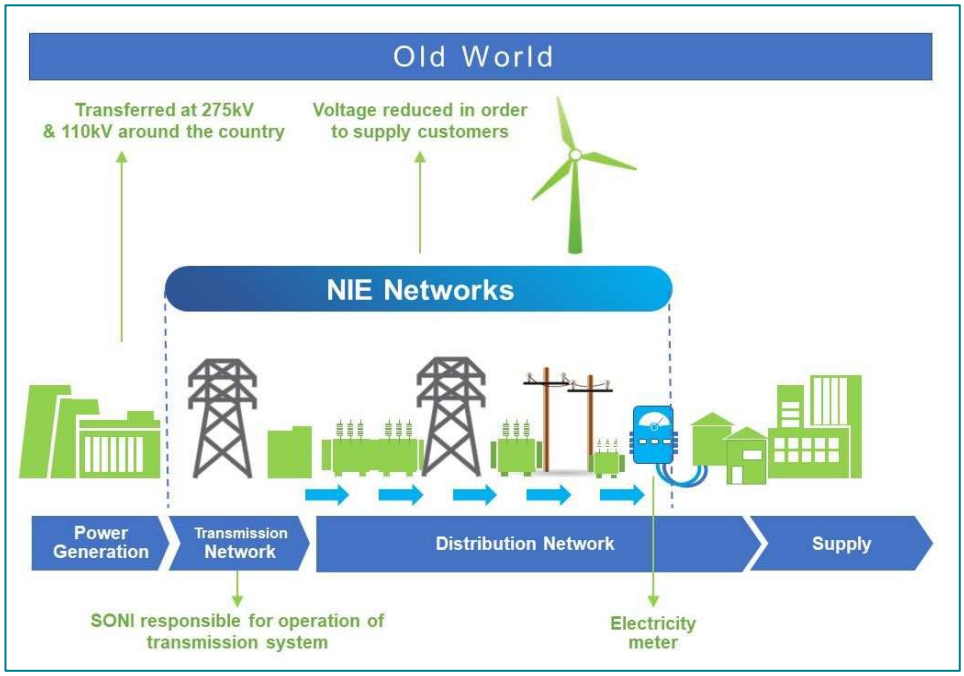

FIGURE 3

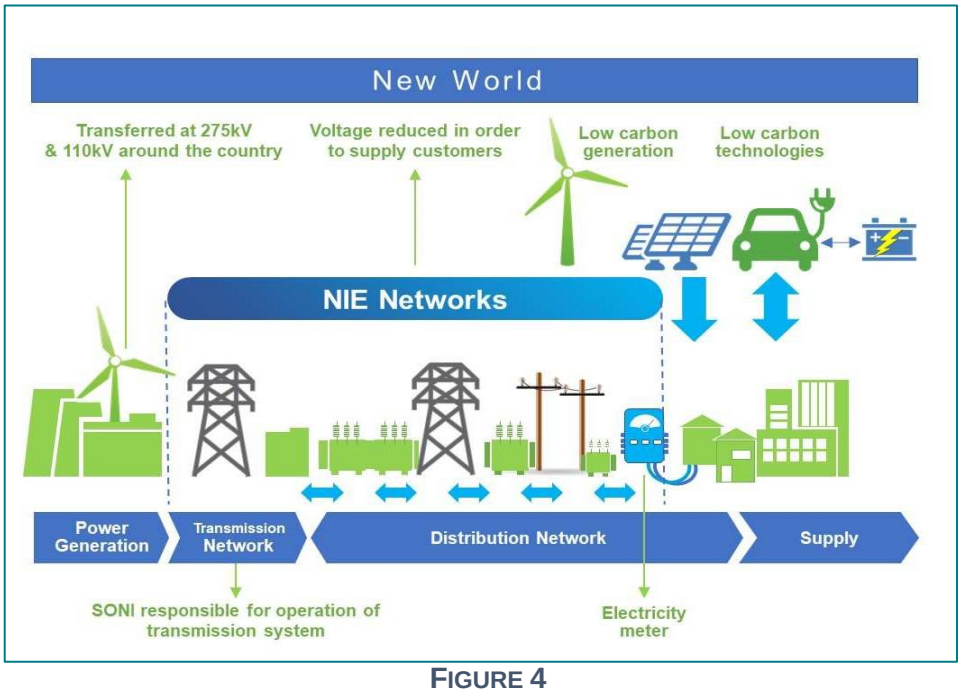

FIGURE 4

This is the future direction of travel for operating a distribution network[13], and one that all network operators including NIE Networks must embrace. If managed effectively the shift will deliver real benefits, creating new opportunities for customers and placing downward pressure on electricity bills. It will enable the more intelligent management of the network through increased active customer participation and for the network to act as a platform for the greater deployment of smart energy technologies as alternatives to conventional higher cost investments. However, this shift will not result in unfettered access to the distribution network for all customers. Whilst the DNO must be more flexible in how it manages and operates the distribution network, greater flexibility from customers will also be required.

The potential customer benefits are illustrated in Figure 5.

FIGURE 5

The first step is to define the required evolution of the network. Whilst the high level principle of the evolution is well understood within the industry, there is a wide range of activity that could fall within its definition, and understanding and mapping out what that role will entail is a vital prerequisite to delivering the evolution that will ultimately have real and tangible benefits for customers and for NIE Networks, as a business.

[13] 33kV, 11kV, 6.6kV and 0.4kV Networks

NIE Networks is not alone on this journey and the Energy Networks Association (ENA)[14] through the Open Networks Project has started to consider what this evolution will entail, an evolution they call the transition from a DNO to a DSO. The Open Networks Project has developed a working definition of a DSO.

"A Distribution System Operator (DSO) securely operates and develops an active distribution system comprising networks, demand, generation and other flexible distributed energy resources (DERs). As a neutral facilitator of an open and accessible market it will enable competitive access to markets and the optimal use of DERs on distribution networks to deliver security, sustainability and affordability in the support of whole system optimisation. A DSO enables customers to be both producers and consumers; enabling customer access, customer choice and great customer service."

2.2 Document Structure

This recommendations paper considers all the responses received to specific questions within the CfE and Consultation and also any general points raised by respondents and is structured as follows:

- **Section 3, General Responses**
  This section provides a summary of the respondents and addresses responses surrounding the general points regarding the evolution from a DNO to a DSO.
- **Section 4, DSO Vision**
  This section addresses responses surrounding the specific DSO functions and demonstrates how these responses have influenced the recommendations for each DSO function.
- **Section 5, Cost Recovery and Implementation Plan**
  This section provides a recommended implementation plan for the DSO functions and details the cost implications.
- **Appendix 1**
  In this section all non-confidential responses are published.

[14] Energy Networks Association (ENA) is the voice of the networks, representing the transmission and distribution network operators for gas and electricity in the UK and Ireland.

3. GENERAL RESPONSES

NIE Networks would like to thank all stakeholders who submitted responses to NIE Networks' CfE and Consultation on Greater Access to the Distribution Network and attended the workshop in September 2018.

This section will provide a summary of the respondents and an overview of the general responses received.

3.1 Summary of Respondents

A total of 20 responses were received to the CfE, and an additional 10 responses were received to the Consultation. Respondents represented a good cross section of the industry, as illustrated in Figure 6. The majority of industry groups who responded to the Consultation also responded to the CfE; although there were fewer responses to the Consultation than the CfE. Many of the Consultation questions were based around the Market Facilitator, Service Provider and Connections functions and the responses were representative of the groups that had most interest in these aspects.

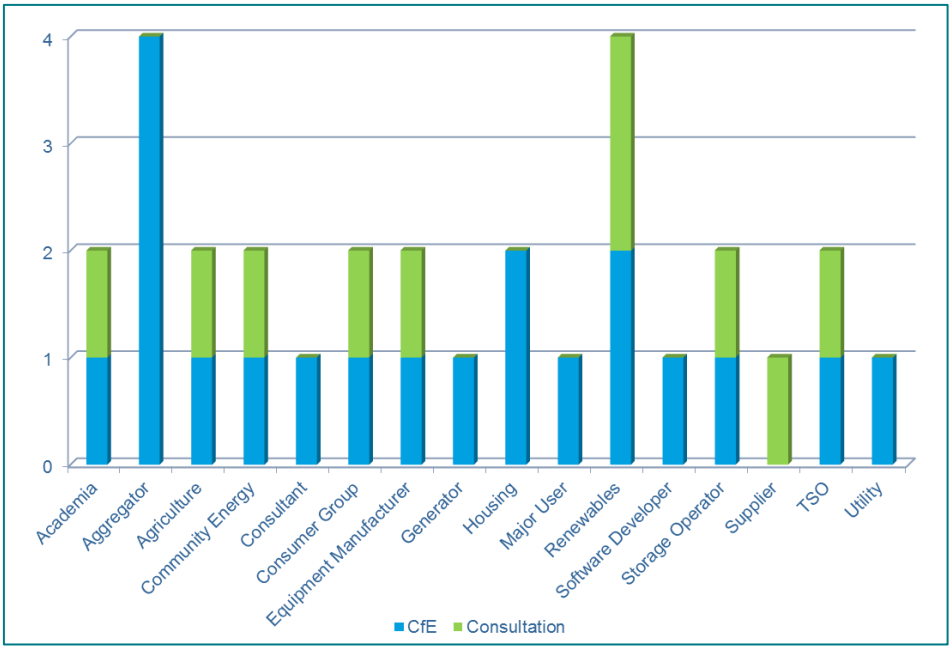

FIGURE 6

3.2 General Views

3.2.1 Call for Evidence Overview

In general, respondents were supportive of the proposals outlined within the CfE. Most respondents felt that the DSO evolution should help all customer groups, with some respondents suggesting that this evolution would result in a more efficient, resilient and optimised network providing customers with the opportunity to participate in the delivery of TSO and DSO services.

However, there were a number of important themes that were prevalent within the responses that require consideration:

- Protection for passive consumers, including vulnerable customers, and the importance that they are not left behind in this evolution.
- The need for engagement throughout this process.
- With the increased data flows, IT systems and communications it is imperative that cyber security risks are fully considered.
- Increased complexity at distribution level may make the management of the system increasingly difficult and increases the potential for unintended impacts if the DSO initiatives are not considered in a holistic manner.
- Additionally, more radical models for network operators were suggested.

3.2.2 Consultation Overview

The Consultation document asked specifically about protection for passive consumers in the DSO evolution and, as illustrated in Figure 7, respondents broadly agreed or did not disagree that passive consumers are suitably protected by the DNO to DSO evolution. There was a positive response from the majority of respondents to NIE Networks' stakeholder engagement including the CEAP forum as a measure to protect vulnerable customers. Various respondents made a number of proposals to protect vulnerable customers that were in line with NIE Networks proposals, in particular pricing reform.

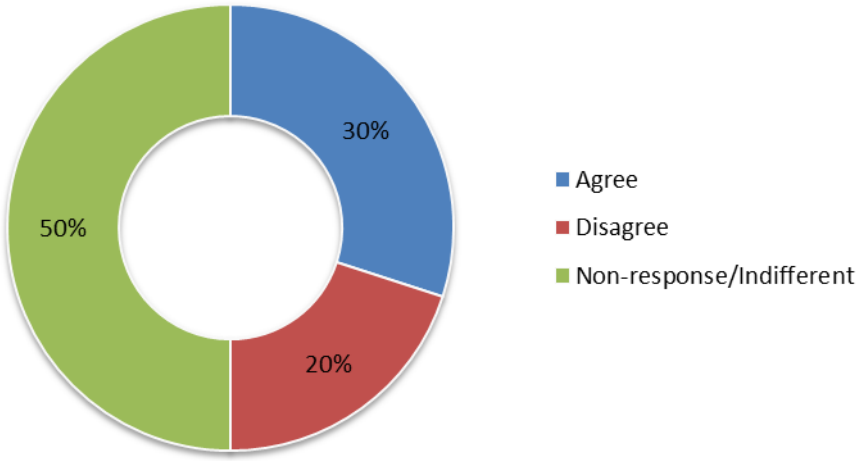

FIGURE 7 - DO YOU BELIEVE THAT PASSIVE CONSUMERS ARE SUITABLY PROTECTED BY THE DNO TO DSO EVOLUTION PROPOSED?

While only 20% of respondents disagreed that passive consumers were suitably protected, one respondent disagreed on the basis that passive consumers' security of supply should not be affected by more active consumers. They also stated that since passive consumers may be obliged to accept 'Smart' meters and have the opportunity to become more 'Active' over time, they should be given the opportunity in advance to monitor and tailor their consumption and estimate the effect on their bills. They also stated that passive consumers should be kept well informed of the opportunities in the Energy Transition and in being offered a broader range of home energy services. New types of energy services that protect the wellbeing of customers in fuel poverty should be trialled.

Another respondent stated that the determination of NIE Networks and ENA of passive consumers does not reflect sufficiently the multiple roles that domestic consumers will play in future, but did not provide additional detail. They also commented that the availability of data to and from consumers is not sufficiently recognised as a key driver of change. The protection of passive consumers in regard to data collection, usage, storage and sharing needs more attention in this process.

While not disagreeing with the protection of passive consumers, a third respondent highlighted continued concerns around cyber security.

3.2.3 Recommended Approach

NIE Networks agrees that all customers should benefit from this evolution and not just those customers with the technical and financial capability to purchase low

carbon technologies and participate in various markets. In acknowledgment of this NIE Networks is proposing a pricing reform to help limit the impact of unintended consequences associated with this evolution and the decarbonisation of the energy sector on passive customers including vulnerable customers. The proposed pricing reform is described in section 4.7. Furthermore, by delivering whole system optimisation through for example, providing additional services to the TSO, as outlined in section 4.2, and using smart and market based solutions in conjunction with conventional reinforcement, as outlined in section 4.3, NIE Networks believes that this evolution will help place downward pressure on electricity costs for all customers including those passive and vulnerable customers.

In response to the request that passive consumers should be protected from the energy demands of active consumers; it is an inherent requirement of network design that consumers will not be adversely affected by the actions of another. This respondent also promoted energy services for domestic consumers, which is being considered through the Demand Side Response (DSR) innovation project and is a potential argument for expediting this type of solution.

The availability of data to and from consumers is a key element in developing a future smart network. NIE Networks will continue to work with the Department for the Economy (DfE) to identify the potential network and open data benefits associated with greater customer metering functionality, allowing these to be fed into DfE's Cost Benefit Analysis (CBA) and subsequent decision.

NIE Networks agrees with stakeholders that there is a need for engagement with industry throughout this process. NIE Networks believes that to date this has been achieved through the CfE, the associated workshop and the Consultation document. However, to ensure that industry engagement continues beyond this consultation process and into the implementation of this DSO vision, NIE Networks recommends that the overall stakeholder engagement strategy associated with this evolution should be included within the scope of the existing CEAP. Separate sub groups will exist to ensure industry engagement associated with the specific aspects of this evolution e.g. Connections Innovation Working Group (CIWG).

The evolution from a DNO to a DSO will necessitate an exponential increase in the IT and data requirements of the business. NIE Networks agrees with respondents that as the IT and data requirements increase so does the cyber security risk. To mitigate this NIE Networks has comprehensive plans for cyber security and data protection strengthening measures. The implementation of these measures will also greatly enhance NIE Networks position for compliance with NIS[15] and Data

[15] Networks and Information Systems

Protection Regulations. NIE Networks will continue to ensure that cyber security and data management considerations are of paramount importance in the development of solutions within the business.

NIE Networks agrees that through the decentralisation of the electricity sector the management of the system is becoming increasingly difficult and more complex. As part of the evolution from a DNO to a DSO, NIE Networks is seeking to ensure that distributed energy resources are managed in a coordinated way delivering whole system benefits. NIE Networks will therefore continue to engage with the TSO in Northern Ireland throughout this process to ensure whole system benefits are delivered in an efficient and cost effective way.

Whilst NIE Networks recognises that there are variations of the network operator model as presented by some respondents, the model being proposed by NIE Networks is an extension of existing DNO processes and systems and does not require wholesale license and/or statutory regulation changes. This aligns with the current philosophy in the Republic of Ireland and the outcome of the ENA Open Networks Future Worlds Impact Assessment consultation[16] in GB which supported 'World B' in the short to medium term, which is the closest to current arrangements, For this reason the DNO to DSO evolution proposed by NIE Networks is considered as a low risk, least regrets approach. It should be noted however, that the adoption of the proposed evolution in the short to medium term does not preclude the transition to more radical models in the longer term if it is proved more efficient.

3.3 Customer Groups

3.3.1 Call for Evidence Overview

Within the CfE various customer groups describing broad behaviours in the new DSO world were introduced:

- System Service Provider
- Active Participant
- Passive Participant
- Passive Consumer

Respondents were asked which customer group they belong to and if they agree with the customer groups.

[16] http://www.energynetworks.org/assets/files/Impact%20Assessment%20Consultation%20-%20ONP%20Response.pdf

As illustrated in Figure 8, 35% of respondents agreed with the proposed customer groups, 50% either didn't respond or their response was indifferent with the remaining 15% disagreeing. Several respondents felt that customers could fall across several customer groups, especially within social housing where, for example, a bill payer or tenant may be perceived as a 'passive consumer' with regards to their interest or interaction with the electricity grid, however their home may have technologies such as solar panels or heat pumps installed, and so they could also be classed as 'passive participants'. Respondents also felt that customers could move between customer groups over time.

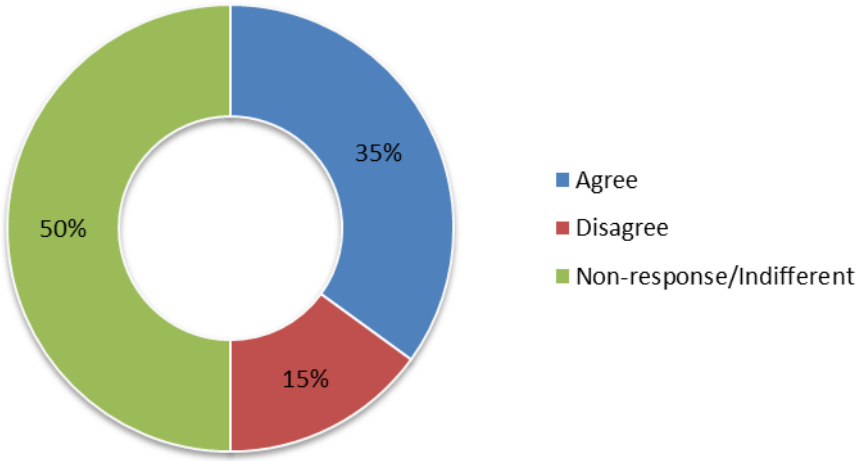

FIGURE 8 - DO YOU AGREE WITH THE CUSTOMER GROUPS AND DEFINITIONS SET OUT IN THIS PAPER (CFE)?

Figure 9 displays which customer groups respondents identified as, from which the following conclusions can be made:

- c77% of respondents did not believe that they fall specifically into one of the identified customer groups but rather operate across several customer groups. In general this corresponds to bodies or organisations that represent or whose membership is comprised of several customer groups.
- c8% of respondents identified as being solely a passive participant and only c38% of respondents believed that they had any identification or representation of the passive participant or passive consumer group.
- It can therefore be concluded that the views from customers which identify as being solely passive, which represents the majority of customers, may not be

as well represented as other customer groups. Whilst this may have been anticipated it should be acknowledged when reviewing the responses.

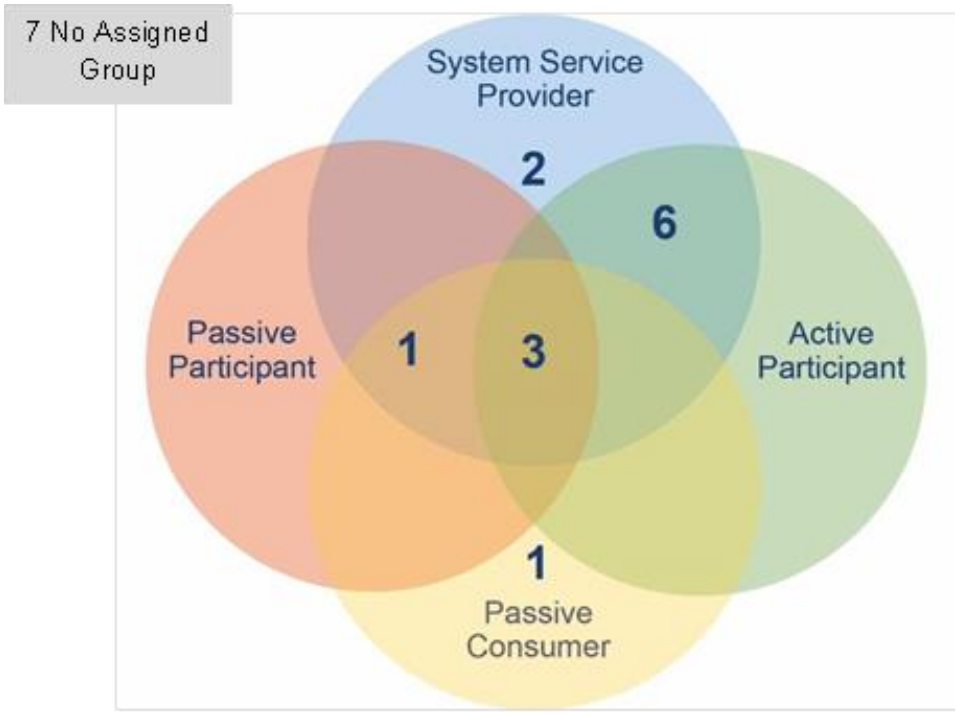

FIGURE 9

No further questions relating to customer groups were asked or comments received in the Consultation document.

3.3.2 Recommended Approach

The proposed customer groups have been developed by the Energy Networks Association's (ENA's) Open Networks Project to assess the experience of different types of customers through their customer journeys and assess the impact of the DSO functions on these groups. For clarity these groups are used to broadly categorise customer behaviours for modelling purposes only. NIE Networks acknowledges the comment that customers will move between customer groups over time and customers will continue to have choice in purchasing low carbon technologies and becoming more flexible with their demand.

Whilst acknowledging that bodies or organisations may have membership comprising of several customer groups, NIE Networks believes that customers can only fall into one group at any time. This view aligns with the ENA Open Networks interpretation.

Based on the fact that more respondents agreed than disagreed with the proposed customer groups and in order to maintain consistency across the UK and Ireland, NIE Networks recommends maintaining the existing customer groups. However, taking into consideration the respondents comments NIE Networks recommends that they remain under review to reflect changes to the industry and associated customers.

3.4 DSO Definition

3.4.1 Call for Evidence Overview

In conjunction with the ENA, a working definition for a DSO was proposed in the CfE:

"A Distribution System Operator (DSO) securely operates and develops an active distribution system comprising networks, demand, generation and other flexible distributed energy resources (DERs). As a neutral facilitator of an open and accessible market it will enable competitive access to markets and the optimal use of DERs on distribution networks to deliver security, sustainability and affordability in the support of whole system optimisation. A DSO enables customers to be both producers and consumers; enabling customer access, customer choice and great customer service."

Figure 10 displays the responses received regarding the DSO definition. 55% of respondents agreed with the proposed definition with a further 30% not providing an answer or providing an indifferent response. The remaining 15% of respondents disagreed suggesting amendments to the definition such as providing clarity on any changes to the future role of the TSO and ensuring that the DSO should not introduce unnecessary risk to the commercial operation of embedded generation or the whole system security of supply. A respondent also requested that further clarity is provided around what markets are referred to in the proposed definition.

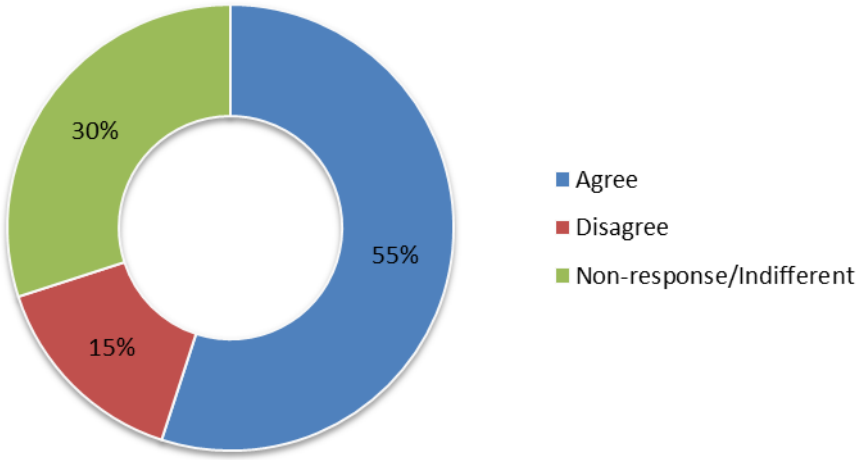

FIGURE 10 – IN THE NORTHERN IRELAND CONTEXT DO YOU AGREE WITH THE DSO DEFINITION?

No further questions relating to the DSO definition were asked or comments received in the Consultation document.

3.4.2 Recommended Approach

NIE Networks does not believe that the evolution from a DNO to a DSO will fundamentally change the role of the TSO, but rather evolve the existing roles and responsibilities of the DSO to help deliver whole system coordination and benefits. However, even if changes to the role of the TSO were expected, NIE Networks does not believe it to be appropriate for the role of the TSO or any changes to its role to be included within the DSO's definition.

Furthermore, NIE Networks believes that within the existing definition of a DSO there is sufficient emphasis placed on the commercial impact for all customers, making reference within the definition to "enabling competitive access to markets" and "affordability in support of whole system optimisation". Similarly, the existing definition does specifically make reference to the delivery of security in the context of whole system optimisation. NIE Networks therefore believes that the definition does not require any additional reference regarding the risk to the commercial operation of embedded generation or the security of supply. Finally, NIE Networks is conscious that there are various markets available which customers can participate in and furthermore in the future there are likely to be additional markets that customers can participate in, for example, local DSO markets. NIE Networks believes that, as a DSO, it will be responsible for facilitating access to all markets for distribution

connected customers and therefore believes that the use of the generic term "markets" within the definition is appropriate.

Based on the fact that only 15% of respondents disagreed with the proposed DSO definition and in order to maintain consistency across the UK and Ireland, NIE Networks recommends maintaining the existing DSO definition, but ensuring that it remains under review to reflect changes to the industry and associated customers.

3.5 DSO Functions

3.5.1 Call for Evidence Overview

In the Call for Evidence, 7 key future DSO functions were presented, shown below in Table 1. Respondents were given the opportunity to suggest any additional functions that should be included in the evolution to a DSO.

DSO Function	Description
Market Facilitator	Enabling DERs to participate in TSO markets whilst respecting distribution network integrity and maintaining a neutral market position.
Service Provider	Utilisation of network assets to provide services to help the TSO to balance the system.
Congestion Management	Enabling smart solutions and market based solutions to be deployed as alternatives to conventional reinforcement.
Connections	Providing customers with options in how they connect to the network and utilising innovation to connect customers in a heavily congested network.
Data Provision	Provision of detailed data between the TSO and DSO to enable more efficient system development and operation.
Network Management	Development of new tools and operational procedures to improve operational processes and efficiencies.
Charging	Charging reform to provide opportunities and appropriate incentives to both demand and generator network users.

TABLE 1

A significant number of respondents commented regarding the proposed DSO functions. Many respondents discussed functions which NIE Networks believes currently fall within the proposed functions outlined in Table 1. However, the following functions, identified by respondents represent proposed functions that do not explicitly fall under those in Table 1:

- Contingency planning for Low Carbon Technology (LCT) uptake.
- Community energy – to support the evolution and adoption of a range of new business models, including community energy models.
- Industry engagement, education and collaboration – e.g. grid edge parties and aggregators.

No further questions were asked or comments received relating to additional DSO functions outside of those identified in the Consultation document.

3.5.2 Recommended Approach

Whilst NIE Networks recognises the importance of the proposed additional functions, it feels that most are implicitly addressed within existing business processes or DSO functions as currently proposed:

Contingency Planning for LCT uptake

As part of its RP6 business plan submission NIE Networks performed contingency analysis for the uptake of low carbon technologies. Within this analysis a low, medium and high uptake scenarios were considered and the resulting impact on the network identified. NIE Networks continues to periodically perform contingency analysis on the uptake of LCTs. Since this function is already embedded within NIE Networks' Business as Usual (BaU) processes it is not considered necessary to include this function within the proposed DSO functions which represent new functions or functions which will be subject to significant change.

Community Energy

Under the congestion management function, NIE Networks will be considering the development of local network services. Such services will include Demand Side Response (DSR) and Energy Storage Services. Through this process, community energy schemes will have the opportunity to participate in local network services. The connection of such schemes to the distribution network may also enable communities to manage their energy consumption in the

most beneficial way, utilising generated energy to supply local demand and exporting any excess to the grid.

Industry Engagement, Education and Collaboration

NIE Networks fully agrees that cross industry engagement, education and collaboration is essential to the successful evolution from a DNO to a DSO. To date NIE Networks believes that this has been achieved through the CfE, associated workshop and the issuing of the Consultation document. However, to ensure that industry engagement continues beyond the consultation process and into the implementation of this DSO vision, NIE Networks recommends that the overall stakeholder engagement strategy associated with this evolution should be included within the scope of the existing CEAP. Separate sub groups will exist to ensure industry engagement associated with the specific aspects of this evolution e.g. Connections Innovation Working Group (CIWG). Other opportunities for engagement and collaboration will be presented during the delivery of the RP6 innovation projects. Whilst NIE Networks believes that engagement, collaboration and education are required across all the DSO functions it does not feel that this warrants a separate DSO function.

A common theme arising from the responses was the need for improved publicly available network data. In acknowledgement of this NIE Networks has amended the Data Provision definition from “Provision of detailed data between the TSO and DSO to enable more efficient system development and operation” to “Provision of detailed data between the TSO, DSO and customers and/or their agents to enable more efficient system development and operation”. This is discussed in more detail in section 4.5, where the provision of open network data is detailed.

The title of the ‘Charging’ function relating to funding of the network through the tariff structure has been amended to ‘Pricing’ to avoid any possible confusion with battery or electric vehicle charging.

3.6 Policy Inhibitors

3.6.1 Call for Evidence Overview

The CfE asked stakeholders if they believed that there were any policy inhibitors that may prevent or restrict NIE Networks evolving to a DSO.

Responses to this question included:

- An overarching review of the energy policy and legislation in Northern Ireland is required.
- A review of the Utility Regulator powers to enable more flexible policy-making.
- As the transition to DSO progresses it will be important for regulation to appropriately keep pace with the change.
- The existing RAB based revenue model for NIE Networks is outdated.

3.6.2 Consultation Overview

Stakeholders were asked if they agreed that there are currently no policy or regulatory inhibitors preventing the commencement of the DNO to DSO evolution.

As illustrated in Figure 11, respondents mostly agreed that there are currently no policy or regulatory inhibitors preventing the commencement of the DNO to DSO evolution.

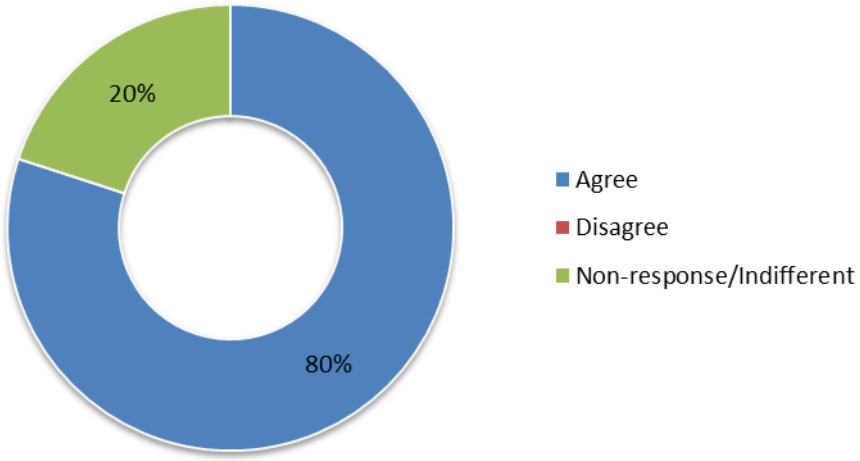

FIGURE 11 - DO YOU AGREE THAT THERE ARE CURRENTLY NO POLICY OR REGULATORY INHIBITORS PREVENTING THE COMMENCEMENT OF THE DNO TO DSO EVOLUTION?

One respondent stated that the DSO transition should ensure no direct impact on the TSO's ability to run an efficient, economic system, respecting their obligations. The respondent also encouraged engagement together with the UR in an effort to assess opportunities or constraints posed by the need to align with SEM, I-SEM Capacity Remuneration Mechanism and DS3.

Another respondent believes that DfE and UR should be responsible for any decision to introduce a DSO in the NI electricity market, ensuring any decision is compliant

with existing legislation, aligns with the aims and objectives of DfE energy strategy post 2020 and considers DSO/TSO models. Two respondents stated that an inhibiting factor was that current policy is not fit for purpose, or policy updates would not be implemented in a timely enough manner. They stated that current policy does not cater for the increased complexity of network operations, or the additional flexibility needed due to the increase in prosumers.

Building on this, stakeholders were asked if they agreed with the identified policy inhibitors that may become prevalent in the medium term.

As illustrated in Figure 12 there were no responses disagreeing with the identified policy inhibitors and respondents echoed the inhibitors identified in the Consultation (tariff structure, price control mechanism and greater customer metering functionality).

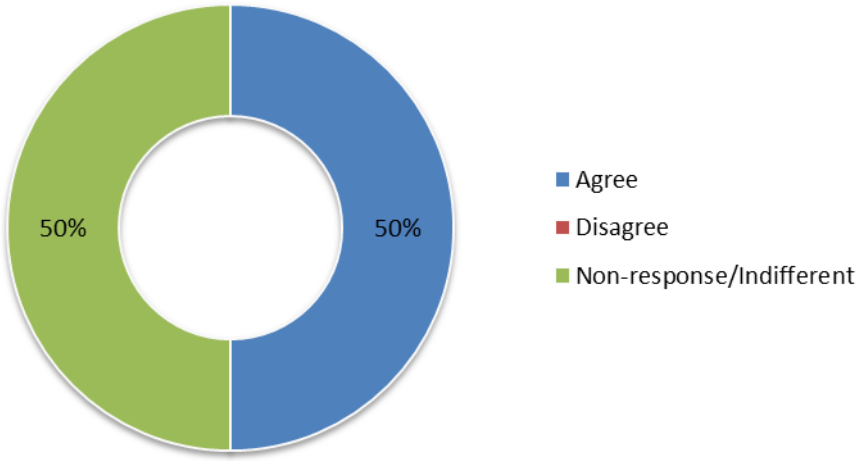

FIGURE 12 - DO YOU AGREE WITH THE IDENTIFIED POLICY INHIBITORS THAT MAY BECOME PREVALENT IN THE MEDIUM TERM?

3.6.3 Recommended Approach

Whilst the development of energy policy and review of the Utility Regulator powers are outside the role of NIE Networks, it does not believe that there are currently any policy inhibitors or regulatory barriers which prevent the commencement of the DNO to DSO evolution. This “Recommendations Paper” will allow the UR to determine whether the introduction of a DSO is in the interest of the NI customer. NIE Networks recognises the importance of TSO/DSO co-ordination and will continue to engage with the TSO to ensure that the whole system is considered throughout the evolution process.

NIE Networks acknowledges that a number of inhibitors exist that may become prevalent over the medium term which will require consideration, for example:

- The current tariff structure may not be fit for purpose as the growth of LCTs increases. NIE Networks recommends a UR led pricing review which will allow input from the necessary stakeholders addressing respondents' concerns on this point, and ultimately leading to pricing reform. This is discussed further in section 4.7.

- The price control mechanism will have to evolve to ensure the DSO evolution progresses in a manner that is symmetrical to customers and investors. NIE Networks has discussed this issue with the UR and will consider it further when determining the RP7 regulatory framework. A future framework must ensure that funding mechanisms are in place to provide for the most effective solution to address network issues and a more flexible approach to innovation funding to facilitate trialling and adoption of emerging technologies.

- As data becomes increasingly beneficial, it may be necessary for a policy decision on the roll out of greater customer metering functionality to provide the DSO with network data to inform investment decision making and operate the network in an efficient manner. This is discussed further in section 4.5.

NIE Networks will continue to engage with the relevant parties to ensure that any future inhibitors are identified and managed to help unlock customer benefits.

4. DSO VISION

4.1 Market Facilitator

This DSO function is concerned with how the distribution system can facilitate distribution customers participating in electricity markets, for example the DS3 System Services market or local flexibility markets. Whilst it is anticipated that the principles underpinning this DSO function can be introduced across the various existing and future markets, the DS3 System Services market is specifically considered in this section.

Within the DS3 System Services market there are up to 14 services available in Northern Ireland which can be delivered by customers through reducing demand, increasing generation or adjusting reactive power in response to system events or on receipt of a dispatch signal.

However, as the majority of these services will ultimately be provided by customers connected to the distribution network, the collective response of these customers can cause violations on the distribution network. If not properly managed this could have a detrimental impact on the safety, security and quality of supply for all customers.

Network violations can be in the form of:

- Thermal Overloads
- Voltage Rise
- Voltage Step
- Protection Issues
- Reactive Power Issues

It is therefore important that NIE Networks is able to facilitate the provision of these services from distribution connected customers whilst maintaining the safety, security and quality of supply for all customers.

It should be noted that neither this function nor the entire DNO to DSO evolution will result in firm access for the delivery of System Services. This function will require flexibility from customers seeking to participate in System Service markets to enable them to offer services when the network can accommodate them but also to inhibit the delivery of their services when the network cannot accommodate them.

For the purposes of discussion the function of Market Facilitator has been divided into Active and Reactive Power.

4.1.1 Active Power

Currently the TSO is responsible for contracting and dispatching DERs, usually via an aggregator[17], for participation in balancing and system service markets, while NIE Networks issues instruction sets to customers seeking to participate in DS3 system services. These instruction sets provide customers an operational window in which they can reduce demand in order to avoid the violations set out in 4.1. These are developed through a manual, time intensive desktop process and take a conservative approach based on the annual worst case scenario. It is the responsibility of the individual demand site (IDS) to ensure that they do not offer or provide system services outside of their designated instruction set. This process provides access for customers in constrained parts of the network where otherwise that customer's participation may compromise the safety, security and quality of supply for all customers.

4.1.1.1 Call for Evidence Overview

In the CfE, stakeholders were asked: ***"Do you think NIE Networks should develop more dynamic instruction sets based on real time power flows, voltages and network topology, potentially providing system service participants with greater access to the network for the provision of system services and protecting the network from sudden changes?"***

Respondents strongly agreed that NIE Networks should develop more dynamic instruction sets. Figure 13 displays the responses received, where 70% of respondents agreed with the development of more dynamic instruction sets, with some suggesting that the use of dynamic instruction sets will enable greater levels of network utilisation and more efficient operation of the grid. The remaining 30% did not respond to the question. Whilst the majority of respondents agreed with the proposal, a number of important considerations were suggested:

- NIE Networks may need to invest in its SCADA system, allowing load flows on the LV Network to be analysed in real time.
- Consideration should be given to the provision of these instruction sets in real time, as timelines will need to be aligned with the wholesale market design and timeframes to help limit any unintended consequences.

[17] Aggregators are third party intermediaries specialising in coordinating or aggregating DERs response from individual consumers to better meet industry requirements.

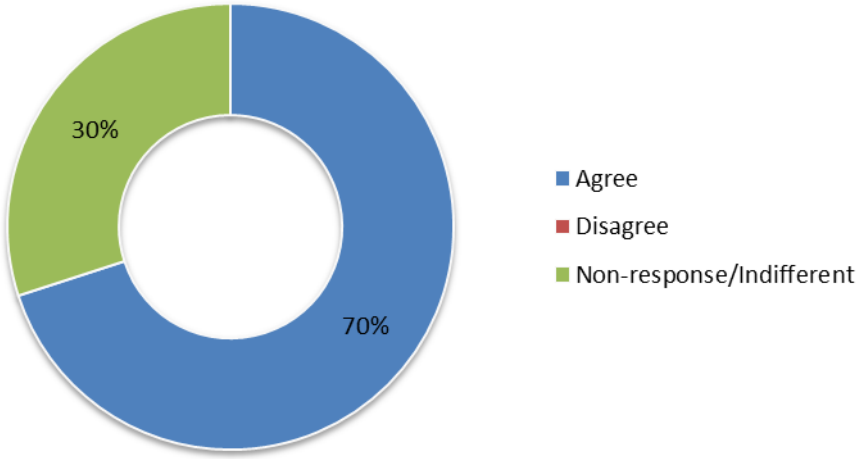

FIGURE 13 – DO YOU THINK NIE NETWORKS SHOULD DEVELOP MORE DYNAMIC INSTRUCTION SETS BASED ON REAL TIME POWER FLOWS, VOLTAGES AND NETWORK TOPOLOGY, POTENTIALLY PROVIDING SYSTEM SERVICE PARTICIPANTS WITH GREATER ACCESS TO THE NETWORK FOR THE PROVISION OF SYSTEM SERVICES AND PROTECTING THE NETWORK FROM SUDDEN CHANGES?

4.1.1.2 Consultation Overview

Based on the affirmative responses received from the CfE, NIE Networks outlined proposals to modify the current instruction set process. This modified process would seek to provide "network capacity" to Service Providers closer to real time as opposed to a conservative yearly process. This could be achieved through the development of a Network Capacity Allocation Platform (NCAP) which could publish network capacity based on real time power flows and network topology.

The Consultation set out a proposed architecture for the NCAP (shown below in Figure 14) and a proposed running sequence (Figure 15). It also outlined possible Principles of Access (PoA) options:

- LIFO
- Cost[18]
- Equal Division
- Round Robin

[18] Premised on the evolution of the existing tariff based System Services Market to a price based market.

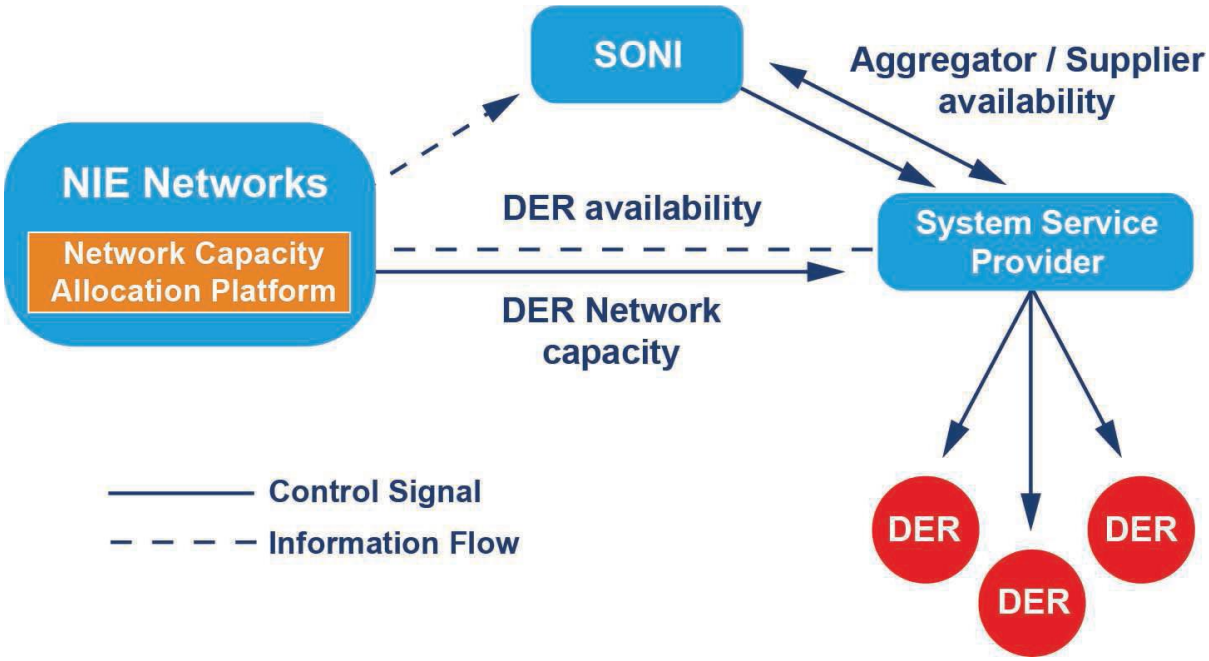

FIGURE 14

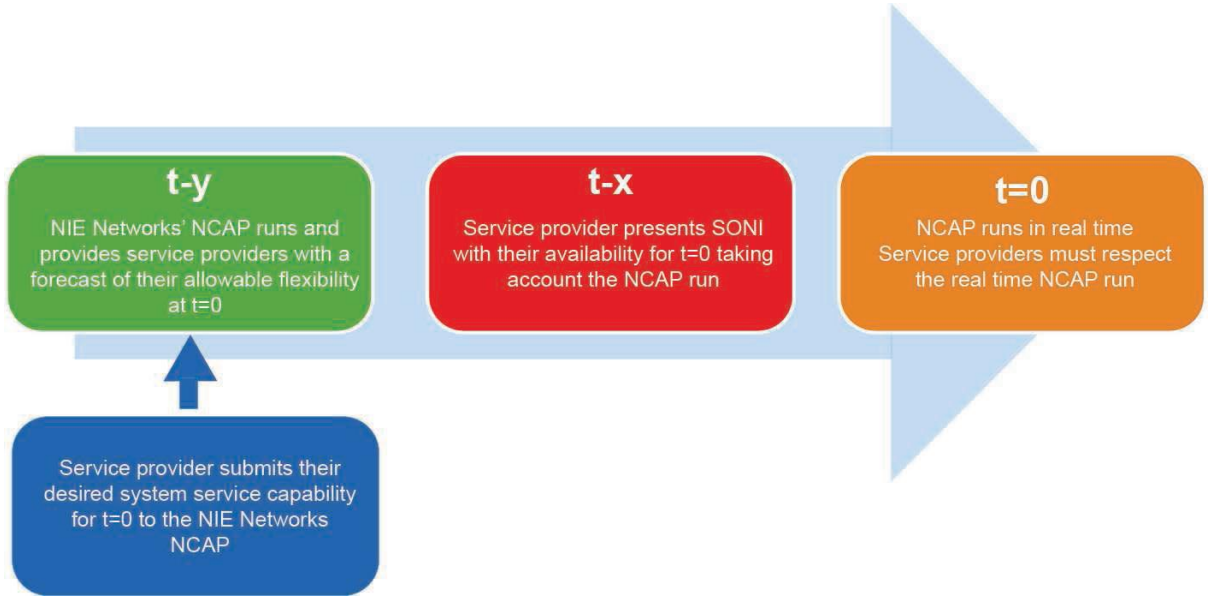

FIGURE 15

NIE Networks asked three questions on Active Power in the Consultation.

- In Q4 NIE Networks asked: ***"Do you agree with the proposed architecture for the Network Capacity Allocation Platform [Figure 14]? If not, please provide an explanation."***

- NIE Networks asked in Q5: ***"Do you agree with the proposed running sequence of the NCAP [Figure 15]? If not, please provide an explanation."***

- In Q6 NIE Networks asked: ***"Which, if any, PoA arrangement do you believe should be used in the Network Capacity Allocation Platform? Please provide rationale."***

In response to Q4, 30% of respondents agreed with the proposed architecture of the Network Capacity Allocation Platform with the remaining 70% of respondents providing an indifferent or no response, as shown in Figure 16.

One respondent highlighted a need to align the NCAP architecture with current SEM and EU principles on capacity allocation.

One respondent requested further clarity from NIE Networks on how it plans to interact with SONI, while another respondent identified a need to establish a working group with the appropriate stakeholders.

Another respondent agreed with the overall architecture but proposed additional information relating to data paths.

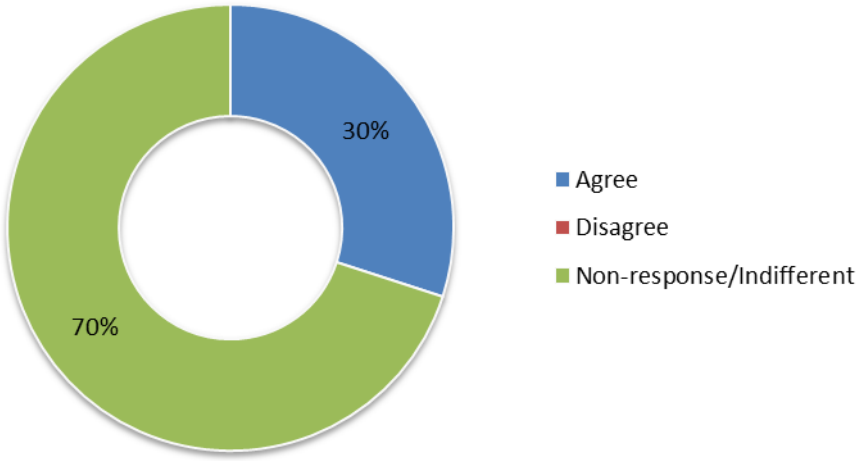

FIGURE 16 – DO YOU AGREE WITH THE PROPOSED ARCHITECTURE FOR THE NETWORK CAPACITY ALLOCATION PLATFORM?

Of those who responded to Q5, there was broad agreement with the running sequence of the NCAP. One respondent stated a need for the NCAP running sequence to be aligned with wholesale market design and timeframes to avoid adverse consequences. They also highlighted issues around real time changes in capacity resulting non-delivery penalties for Service Providers and supply issues.

Another respondent advocated a least regrets approach and adopting best practice determined in GB is an appropriate way forward.

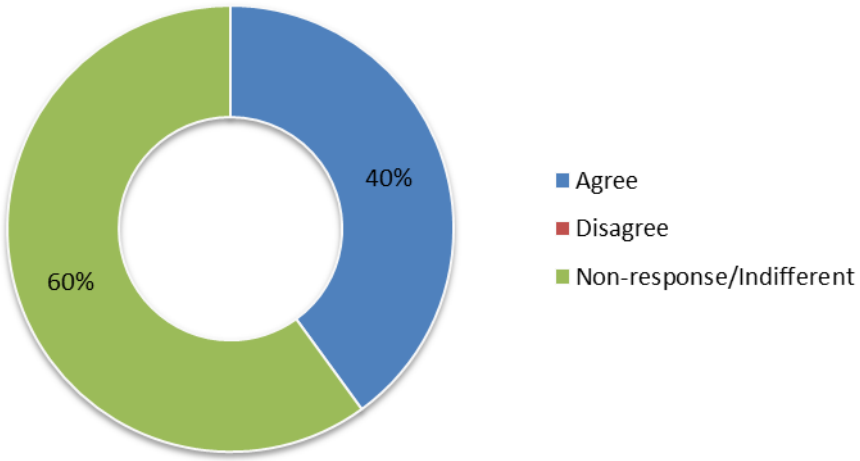

FIGURE 17 – DO YOU AGREE WITH THE PROPOSED RUNNING SEQUENCE OF THE NCAP?

In response to Q6, of those respondents who selected a PoA, a Cost based PoA had the most support.

One respondent did not select a PoA but did indicate support for the most economic solution. They also commented that with tariff structure for service provision under DS3 as an example, it may not be possible to choose providers on a Cost basis. Another respondent indicated that whilst they favoured a Cost based PoA there is a risk of monopolisation and other forms of pricing/market manipulation so an element of fairness should be applied as a break to a purely cost driven market.

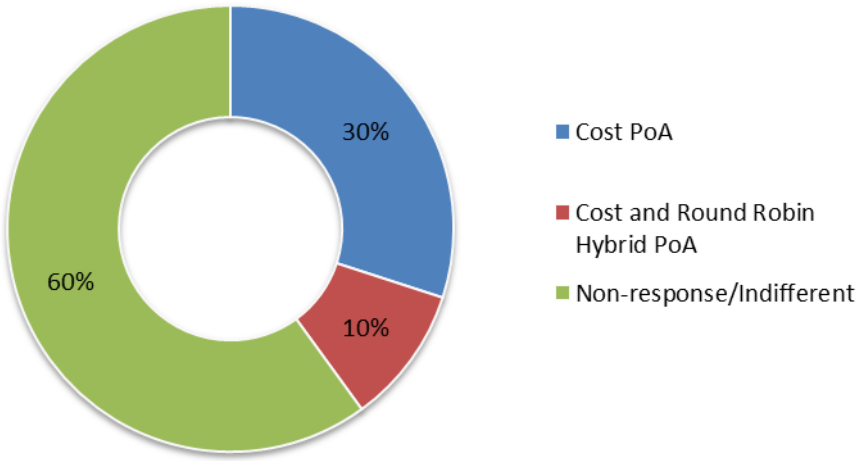

FIGURE 18 – WHICH, IF ANY, POA ARRANGEMENT DO YOU BELIEVE SHOULD BE USED IN THE NETWORK CAPACITY ALLOCATION PLATFORM?

4.1.1.3 Recommended Approach

NIE Networks' recommended approach is to proceed with the development of the NCAP to allow real time network access for system services providers.

The NCAP will determine the allowable volume of system services on the local networks before a network violation occurs. If a violation occurs, the NCAP allocates capacity to the Service Providers in an agreed manner. The NCAP will be refreshed periodically to reflect any load flow changes or network topology changes and will be published on a suitable interface.

It is anticipated that the NCAP will enable Service Providers greater access to the distribution system to provide system services whilst importantly ensuring that the safety, security and quality of supply isn't adversely impacted for all customers. Whilst this process will require development on the NIE Networks' side it will also require development on the Service Provider's side to respect the NCAP. In this process SONI remains responsible for procuring and dispatching Service Providers, by either dispatching directly or through a supplier/aggregator. NIE Networks ensures that the distribution system remains safe and secure through the NCAP.

NIE Networks plans to continue to engage with SONI on the development of the NCAP to ensure the capability of NCAP is usable by the TSO, and will also ensure that the proposed architecture and running sequence are fully detailed and understood by all relevant stakeholders prior to implementation.

As suggested by a CfE respondent, it is important that timelines are aligned with the existing market to help limit any unintended consequences. To mitigate this risk, NIE Networks is proposing that the NCAP provides a forecasted network capacity which

can be used by Service Providers for declaration of availability to the market. Importantly the NCAP will also run in real time to ensure that network topology changes or forecasting errors are taken account of; the real time NCAP run must always be respected by Service Providers. This approach ensures that more often than not the capability declared to the market will equal the capability available in real time and therefore will not have a material impact on the market.

NIE Networks agrees that, for some services, a Cost based approach for allocating capacity is not suitable and that an alternative PoA will be necessary until such times as the market is Cost reflective. Where Cost is unavailable, NIE Networks is minded to propose retaining a LIFO PoA as it is likely to be relatively less complex to implement and reflects current capacity allocation arrangements closest following a least-regrets philosophy. This LIFO PoA would be maintained until such times as markets become Cost reflective. Regarding the suggestion of a combination of Cost PoA and Round Robin PoA from a respondent, NIE Networks believes that this is a novel idea that could be considered in future but would be complex to implement and not in-keeping with a least-regrets philosophy.

NIE Networks agrees with the relevant respondent that when LV connected customers begin to participate in system services in larger volumes then increased visibility of the LV network will be required. This is discussed in more detail in section 4.5, Data Provision.

The implementation of NCAP will require upgrades to existing NIE Networks operational IT systems (see section 5 for funding options) and once integrated into Business as Usual (BaU) will require additional operational cost allowances to manage and operate (in RP7). To ensure accurate capacity allocation, the NCAP is underpinned by the availability of network data relating to demand and generation at multiple voltage levels; this is considered further in Section 4.5.

4.1.2 Reactive Power

Reactive power on the distribution network has the potential to significantly influence voltage and voltage stability. Unlike active power, NIE Networks solely controls reactive power on the distribution network. This ensures that voltage remains within acceptable limits, system stability is maintained and remedial action is taken swiftly to resolve any issues. The instruction set process cannot be employed for reactive power system services as it does not provide co-ordinated reactive power management, does not prevent dynamic instability and does not allow fast remedial action to be taken if required.

To address this, NIE Networks is developing a Nodal Controller solution. The Nodal Controller, if deployed successfully, will coordinate the reactive power from DERs to deliver the required reactive power at a TSO/DSO interface whilst respecting the voltage and thermal capabilities of the network. Figure 19 displays a high level architecture of the proposed Nodal Controller.

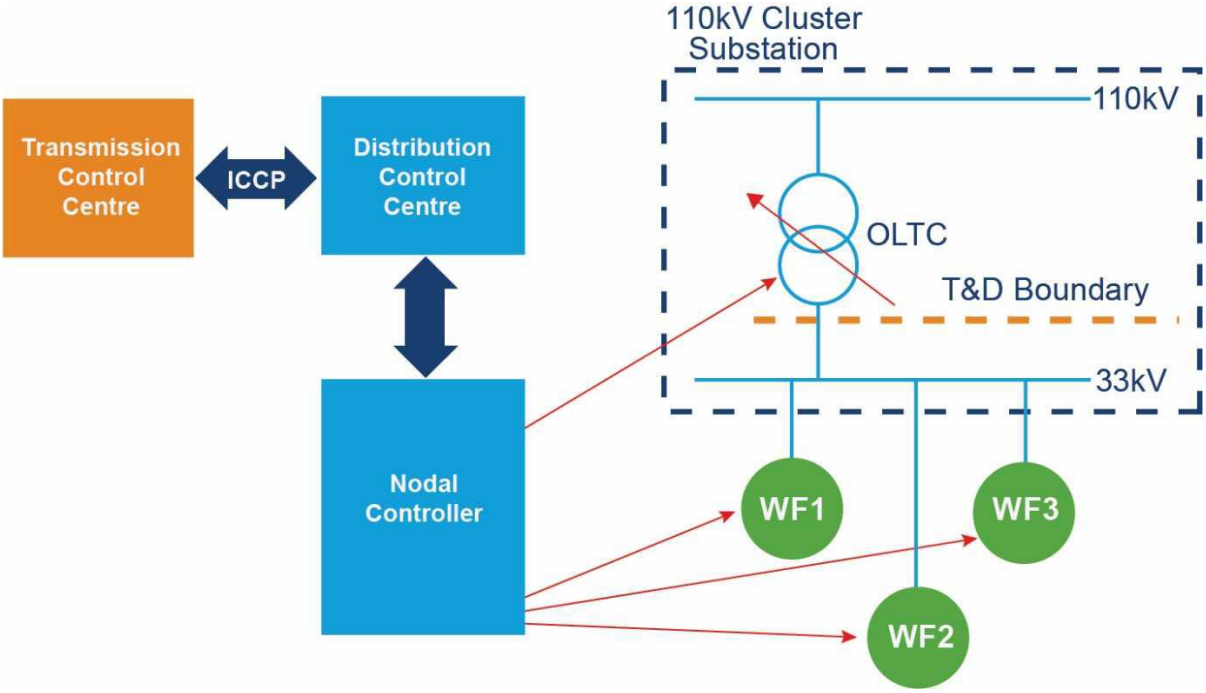

FIGURE 19

4.1.2.1 Call for Evidence Overview

In the call for evidence, NIE Networks asked: ***"Do you agree that NIE Networks should develop a technical solution to enable customers to participate in reactive power system services?"***

As illustrated in Figure 20, 70% of the respondents agreed with the proposal of using a Nodal Controller solution with the remaining 30% either not responding or providing a response that neither agreed nor disagreed with the proposal. General comments suggested that the Nodal Controller appears to be a robust solution, allowing all customers to have an equal chance of participating in the delivery of reactive power system services. Whilst not disagreeing with the development of a Nodal Controller, a respondent suggested that the proposal is not the only method available to enable customers to participate in reactive power system services.

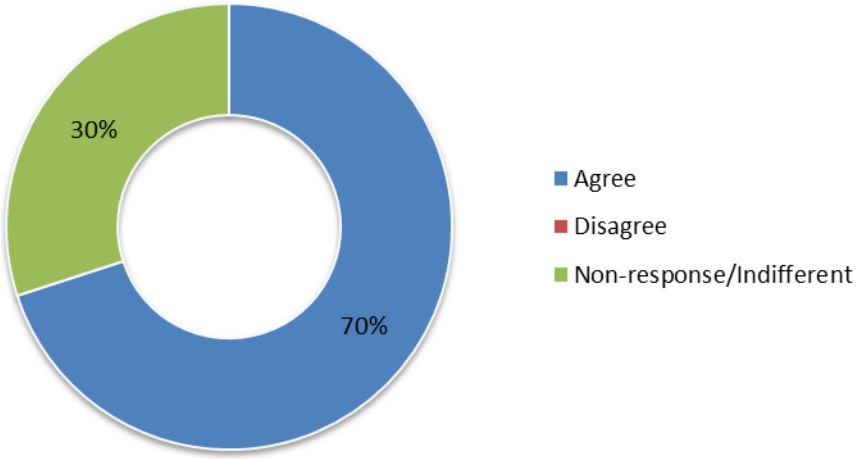

FIGURE 20 – DO YOU AGREE THAT NIE NETWORKS SHOULD DEVELOP A TECHNICAL SOLUTION TO ENABLE CUSTOMERS TO PARTICIPATE IN REACTIVE POWER SYSTEM SERVICES?

4.1.2.2 Consultation Overview

When conducting market research for potential solutions to facilitate access to the system services reactive power market NIE Networks identified two key projects:

- ESB Networks' Nodal Controller
- UKPN and National Grid's Power Potential Project[19]

Both of these projects have the same use case as NIE Networks, particularly the ESB Networks' Nodal Controller project. Based on this market research NIE Networks felt that it would be prudent to deploy a similar technological solution to that used by ESB Networks and UKPN.

NIE Networks proposed that it would continue to develop the Nodal Controller solution noting that this does not preclude NIE Networks from considering evolving technologies in the future. A phased approach to the Nodal Controller roll out was outlined in the Consultation document encompassing a trial, followed by roll out to cluster substations subject to various conditions, and subsequent, further roll out to Bulk Supply Points[20].

NIE Networks asked stakeholders in the Consultation: ***"Do you agree with the phased approach regarding the delivery of the Nodal Controller solution? If not please provide rationale."***

[19] http://innovation.ukpowernetworks.co.uk/innovation/en/Projects/tier-2-projects/power-potential/
[20] 110/33kV substations with demand customers connected. These substations will, in many cases, also have generators connected.

All respondents were supportive of the Nodal Controller solution and the phased approach regarding its delivery. Whilst one respondent, echoed by another, recognised the need for a phased approach they sought deployment as quickly as possible highlighting that, if a similar approach to that already trialled by ESBN is adopted, a further year of testing by NIE Networks should not be required. They also advocated a review of Connections Design Policy and network assumptions citing ESBN's policy, which specifies reactive power capability, as good practice.

One respondent sought co-ordination between DSO and TSO to determine optimal whole system solutions and highlighted a reduced need for steady state reactive power due to BSP power factor improvements. They also sought to be involved in Nodal Controller design, control arrangements and operating principles and to work with NIE Networks to propose a funding mechanism for the Nodal Controller, and similar enabling technologies, to the UR. They identified a funding mechanism as a key barrier to enabling widespread Nodal Controller deployment.

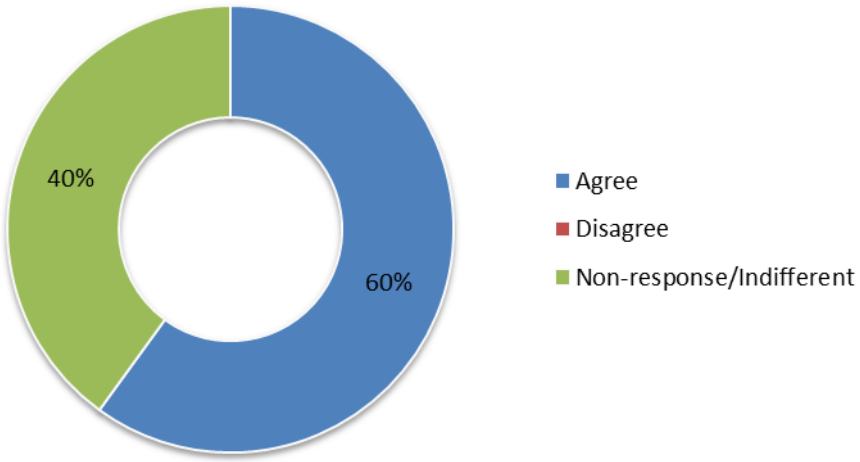

FIGURE 21 – DO YOU AGREE WITH THE PHASED APPROACH REGARDING THE DELIVERY OF THE NODAL CONTROLLER SOLUTION?

4.1.2.3 Recommended Approach

Based on the positive Consultation responses, NIE Networks' recommended approach is to continue the development of the Nodal Controller on the basis of the phased approach outlined in the Consultation and below:

1) NIE Networks will trial the Nodal Controller at one cluster substation over a period of one year (Phase 1). This is the minimum time required to assess the operation of the Nodal Controller over all operational conditions on the NIE Networks system.

2) If Phase 1 is deemed successful and subject to conditions “a” and “b” set out below, NIE Networks will roll out the Nodal Controller solution at the remaining cluster substations (Phase 2).

   a) A positive cost benefit analysis for the delivery of reactive power at each substation is produced by NIE Networks and SONI.

   b) Subject to further industry consultation and regulatory approval, an approach covering the upfront and ongoing operational costs of the wider roll out of the Nodal Controller is agreed.

3) After the delivery of Phase 2 and subject to the continued need for the procurement of additional reactive power and conditions “a” and “b” above being met, NIE Networks will roll out the Nodal Controller solution[21] at other Bulk Supply Points (Phase 3).

Throughout this process NIE Networks will continue engagement with SONI on the functionality and deployment opportunities of the Nodal Controller.

4.2 Service Provider

NIE Networks has a history of providing services to the TSO, when required during critical events, often referred to as High Impact Low Probability (HILP) events, to support the security of the system. These services are provided in a very infrequent basis and include:

- Load Shedding
- Voltage Reduction to offer system wide demand response

It should be noted that these services are only utilised in system critical events as they impact on the security and quality of supply of customers. Load shedding results in customers losing supply and would not be acceptable for more frequent events. However, there is the potential for the electricity network to offer other solutions, through the flexing of its existing assets, to further support the TSO in system balancing. These services could be utilised by the TSO on a more frequent basis for Low Impact High Probability (LIHP) events to help maintain system stability and could also reduce energy bills. If developed and managed correctly by the DSO these services can be delivered without compromising the security or quality of supply for customers. Examples of such services are shown in Table 2.

[21] May be subject to a trial to prove functionality at Bulk Supply Point.

Service	Frequency Response		Voltage Control
Delivery Method	Operation of circuit breakers to reduce voltage and therefore reduce demand (Fast Frequency Response)	Operation of tap changers to reduce/increase substation voltage and therefore reduce/increase demand (Slower Response)	Stagger transformer tap positions to support reactive power management

TABLE 2

The potential for the distribution network to offer services to the TSO has been trialled by Electricity North West Limited (ENWL) in GB through their Customer Load Active System Services (CLASS[22]) project. Using the same technologies as described in Table 2 the CLASS project is being used to support the system by providing Voltage and Frequency services through National Grid's STOR[23] market. Importantly, the CLASS project has demonstrated that these services can be provided without compromising the customer's security or quality of supply if managed correctly by the DSO.

4.2.1 Call for Evidence Overview

The CfE asked: ***"NIE Networks has existing assets on the network which potentially have the capability of providing additional services to the TSO. Should NIE Networks be allowed to provide cost effective solutions to the TSO in balancing the network to help reduce customer bills for all customer types?"***

The responses to this question were split with 35% suggesting that NIE Networks should use their assets to provide additional services to the TSO, 30% disagreeing and the remaining 35% neither agreeing nor disagreeing or not providing a response. Some respondents in agreement with the proposal suggested that this is a good use of innovation. In general, respondents disagreeing suggested that a potential conflict of interest may exist between the role of neutral Market Facilitator (section 4.1) and Service Provider and that NIE Networks' assets should not be given preference over other solutions. Other respondents suggested that the assets have been paid for by the consumer and not for the benefit of the DSO to become a Service Provider.

[22] https://www.enwl.co.uk/class
[23] https://www.nationalgrideso.com/balancing-services/reserve-services/short-term-operating-reserve-stor

When assessing the response to this question it is important to understand the make up of the customer groups that responded in agreement and in disagreement. A much larger percentage of active participants and Service Providers disagreed with NIE Networks offering these services compared to passive consumers and passive participants; in fact no passive consumers or passive participants disagreed with NIE Networks offering these services. Conversely, almost 30% of the respondents that agreed with NIE Networks offering these services were passive consumers. Consequently, from this analysis it could be generalised that active customers are more likely to disagree with NIE Networks offering services to help balance the system at lower cost, whereas passive customers are more likely to agree with NIE Networks offering services to help balance the system at lower cost.

4.2.2 Consultation Overview

To consider this issue further, NIE Networks identified 4 potential variants of the Service Provider function, shown in Table 3, and assessed each against a list of criteria.

Option	Description
1	Maintain the current process
2	DSO as Service Provider (full market participant)
3	DSO as First Call Service Provider
4	DSO as Last Call Service Provider

TABLE 3

In the Consultation, NIE Networks asked: ***"Which Service Provider option do you feel should be adopted by NIE Networks? Please provide rationale for your selection."***

This question produced the widest range of responses from the Consultation. Figure 22 gives an overview of all responses to this question. Two respondents recognised how the DSO as a Service Provider would benefit consumers but requested more clarity on how NIE Networks will manage the risk of perception of conflicts of interest between being a neutral Market Facilitator and a Service Provider. They also sought clarity on how NIE Networks as a Service Provider would not have a negative impact on existing Service Providers connected to the distribution network. Another respondent also raised the point of a conflict of interest between NIE Networks remaining a neutral Market Facilitator if also providing system services and therefore opted for maintaining the current process. One respondent didn't agree with NIE Networks assessment on the negative long term impact of the DSO as Last Call Service Provider in the Consultation and identified this as the most attractive option.

Two further respondents believe that a DSO as a First Call Service Provider would be most financially beneficial to all customers, especially considering the concerns raised through the Call for Evidence on the need to protect vulnerable and passive consumers. One respondent did not agree with any option set out, whereas another believed the option is dependant on network configuration and operation in different areas and therefore multiple geographically specific approaches should be taken.

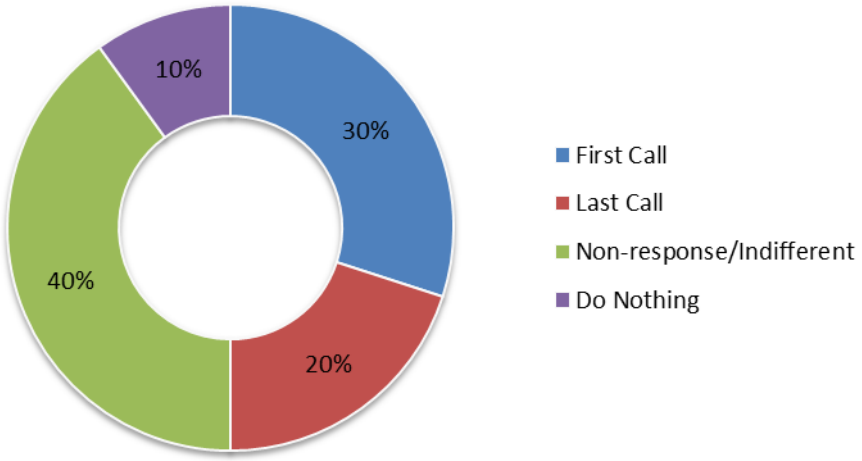

FIGURE 22 – WHICH SERVICE PROVIDER OPTION DO YOU FEEL SHOULD BE ADOPTED BY NIE NETWORKS?

From Figure 22 the following observations can be made regarding respondents' views on NIE Networks providing services to the TSO:

- At least 50% of respondents believed NIE Networks should be a Service Provider in some form with only 10% of respondents responding that NIE Networks should not use its assets to provide services in any mechanism.
- No respondents suggested that NIE Networks should operate as a Service Provider (full market participant) in the short term[24].
- NIE Networks operating as a Last Call provider was marginally the favoured option with 30% of respondents supporting it and 20% supporting First Call provider.
- 100% of the respondents that favoured either a Last Call provider or Do Nothing option either currently are, or could potentially become, Service Providers. This is in line with the Call for Evidence responses outlined in section 4.2.1.

[24] One respondent suggested NIE Networks operating as a Service Provider could be a longer term option.

4.2.3 Recommended Approach

NIE Networks agrees with the response that *"if there is potential within NIE Networks existing assets to provide cost efficient solutions to the TSO in balancing the network, this should be explored. However, NIE Networks should not be given preference over other solutions if they are available and offer a better outcome for customers".*

Intuitively, NIE Networks believes that the flexing of assets to provide additional services to the TSO to meet the system needs at lower cost should be encouraged. This represents an extension of the existing processes of offering services during HILP events and helps deliver more efficient whole system optimisation as per the DSO definition. Utilising existing assets is also likely to have a lower carbon contribution than building new assets or utilising existing diesel generators. However, as pointed out by some respondents there are important questions to consider particularly regarding how the DSO remains a neutral Market Facilitator whilst utilising network assets to provide services to the TSO.

NIE Networks remains neutral on its position regarding how services offered by the existing network assets can be deployed but does recommend that the decision be based on the most efficient use of the assets for the benefit of the wider customer base. Based on the responses to the consultation process, a practical approach, and one that NIE Networks would be agreeable to would be to adopt a First Call or Last Call Service Provider position in the short term, with the exact mechanism as to how this is achieved subject to further detailed discussions with the UR. In the future, once sufficient operational experience has been established and examples of service provision become more prevalent in other jurisdictions, NIE Networks in conjunction with relevant stakeholders and the UR may reconsider this position. Any change would likely be subject to a positive cost benefit analysis.

NIE Networks is engaged on a regular basis with the ENA Open Networks project and will be mindful of the ongoing work around conflicts of interest and unintended consequences related to the DSO transition, ensuring that the key theme of neutral Market Facilitator is not compromised. This will involve openness and transparency across all network functions, including Connections, to remove any perception of bias towards network-based solutions.

IT system upgrades are required to facilitate the provision of system services from the distribution network, and the cost implications are outlined in section 5. An incentive mechanism would also be required to cover the ongoing costs of delivering system services, managing the risk involved in delivering these services, and to encourage the optimum service delivery from existing assets to ensure maximum value. It is anticipated that the implementation of IT upgrades and trialling of the functionality could be completed within RP6 if the appropriate funding is allocated and that an incentive mechanism would be proposed through the RP7 business plan.

Additional operational costs to manage the provision of system services would also be considered in the RP7 business plan.

Fast frequency response services require the installation of additional protection and control equipment on the distribution network as well as event monitors to record the response and communicate this information back to the TSO. The costs associated with carrying out these works at all compatible primary substations are outlined in section 5.

Implementing tap stagger for voltage control requires modern voltage control relays. These are being installed at various sites under existing RP6 allowances, allowing further trialling of this functionality, with the view that further relays could be installed at suitable sites in the early part of RP7, although initial indications are that this is less beneficial and as such of a lesser priority than frequency response services.

4.3 Congestion Management

As demand and generation customers connect to the electricity network the capacity of the network for further connections diminishes until no further capacity remains, at which point network reinforcement is triggered, at additional cost, enabling additional demand and/or generation to connect. There are various forms of constraints on the network including:

- Thermal
- Voltage
- Fault level
- Power quality

NIE Networks is responsible for planning investment on the distribution system to ensure that future demand and generation growth can be accommodated without compromising the safety, security and quality of supply to existing customers.

Since local demand is projected to increase significantly due to the electrification of heat (Heat Pumps) and transport (Electric Vehicles) it is vital that NIE Networks has the appropriate processes in place for managing this.

There are two investment philosophies that can be adopted, namely: **conventional reinforcement** and **smart incremental reinforcement.**

A conventional reinforcement strategy deploys traditional solutions such as building new lines and substations, installing larger transformers and increasing the cross sectional area of overhead lines and cables.

Whilst these solutions tend to be capital intensive they have long asset lives, provide high levels of security of supply and release significant headroom, as demonstrated in Figure 23 below.

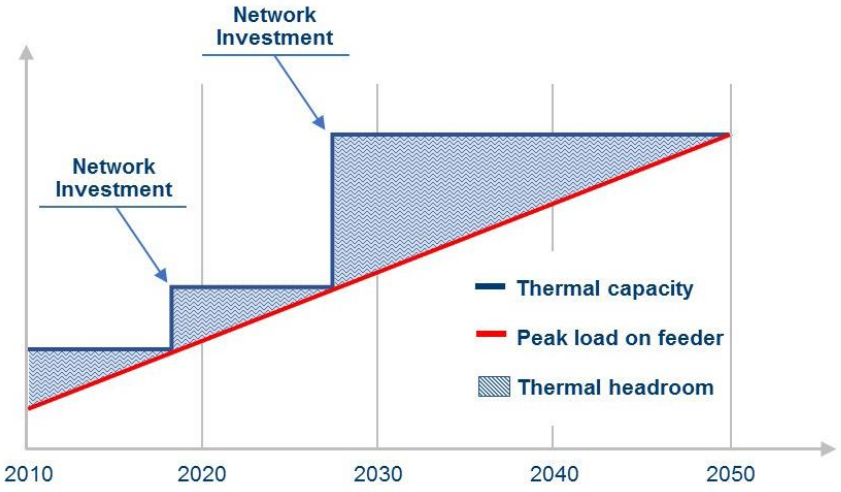

FIGURE 23

A smart incremental strategy continues to deploy traditional solutions but, where appropriate, it also deploys smart (network flexibility) and market-based (customer flexibility) solutions. Smart and market-based solutions refer to new technological and/or commercial solutions that, in most cases, have not yet been fully developed or widely deployed. Even technologies which are well understood and have been trialled are considered to be smart in this framework, since they have not yet been widely deployed. These solutions can operate on the network-side, generation-side or customer-side of the distribution system. Examples of smart solutions include dynamic network reconfiguration, dynamic thermal ratings and enhanced automatic voltage control. Market-based solutions may be utilised by issuing a Request for Tender (RfT) and contracting with third parties in a competitive manner to solve network congestion problems in specific locations. This may be in the form of, for example, energy storage, Demand Side Response (DSR), Vehicle to Grid (V2G) technology and may enable the development of Peer to Peer (P2P) energy trading. The main benefit of smart solutions is that they can be used to defer capital expenditure on the network and therefore deliver financial benefits to the general customer base.

A smart incremental investment strategy will not solely deploy smart solutions. Instead conventional solutions will still be widely used, but where appropriate and where financial benefit can be derived, smart solutions will be deployed.

Figure 24 displays a forecast of the difference in discounted Total Expenditure (TOTEX) between a smart incremental investment strategy and a conventional, or Business as Usual (BaU) strategy for future regulatory periods. From Figure 24 it can be seen that there are significant financial benefits which can be passed on to customers over subsequent regulatory periods by selecting the smart incremental strategy compared to the conventional strategy.

Although the savings are notable, smart or market-based solutions do not provide the same level of security of supply that conventional reinforcement provides. For example a solution which requires customers to offer DSR does not offer the same level of security as installing larger transformers.

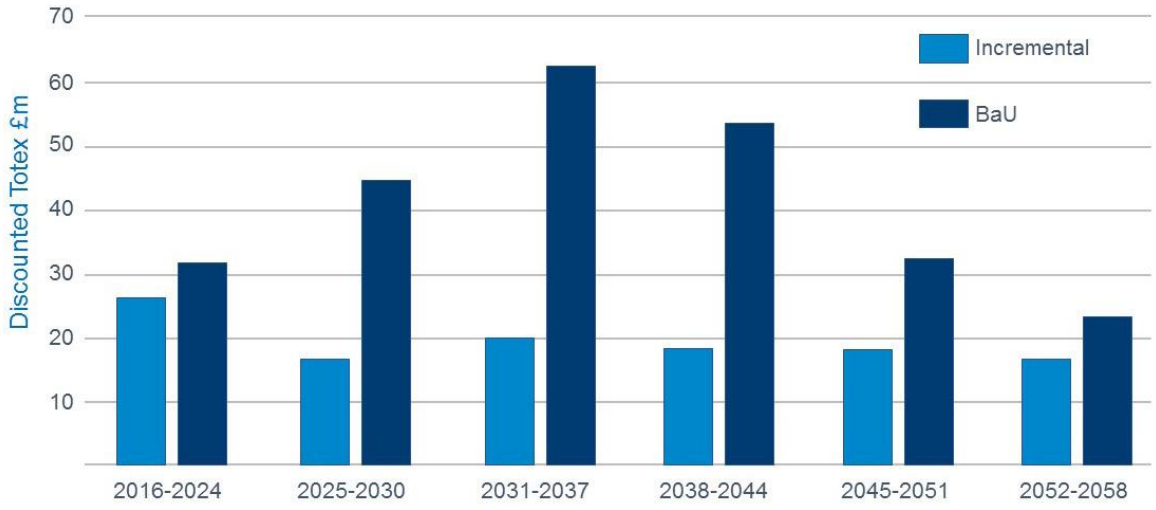

FIGURE 24

4.3.1 Call for Evidence Overview

NIE Networks asked stakeholders in the CfE: ***"Should NIE Networks continue to invest conventionally to maintain a high level of network resilience and security but at a higher cost or should they adopt and integrate smart solutions to reduce network costs and deliver the network security through a more dynamic approach to operating the network?"***

Respondents strongly supported the adoption of smart solutions to reduce network costs and deliver network security through a more dynamic approach. 85% of respondents supported the idea while 15% didn't respond or had an indifferent response. Many respondents suggested that NIE Networks should adopt smart solutions in the short term however conventional reinforcement still needs to be made to ensure longer term capacity. Other respondents concluded that the use of "smart solutions" could help stimulate the electricity market, as measured by enhanced reliability and lower costs for customers. A respondent commented that there is a range of smart, innovative technologies which can be deployed within the conventional Business as Usual approach which can bring potential cost savings as the technology is mature and has been successfully deployed by other DNOs. Finally, respondents stated that if NIE Networks adopts this approach, it should be undertaken in a transparent manner, with on-going engagement with stakeholders.

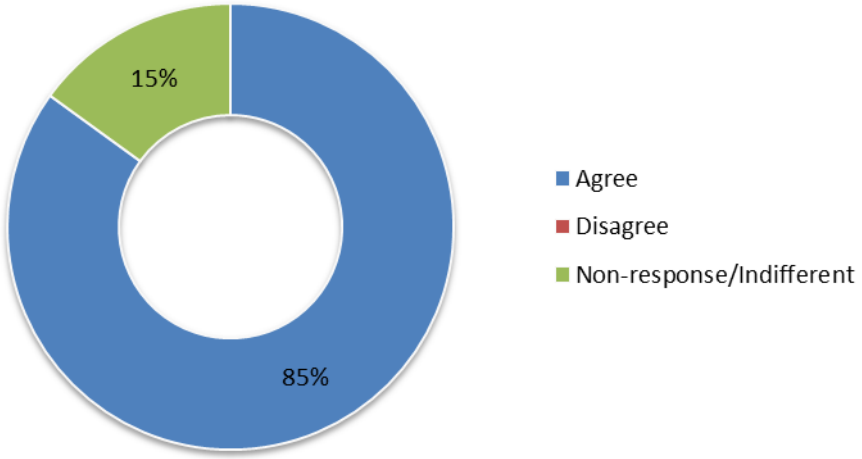

FIGURE 25 – SHOULD NIE NETWORKS CONTINUE TO INVEST CONVENTIONALLY TO MAINTAIN A HIGH LEVEL OF NETWORK RESILIENCE AND SECURITY BUT AT A HIGHER COST OR SHOULD THEY ADOPT AND INTEGRATE SMART SOLUTIONS TO REDUCE NETWORK COSTS AND DELIVER THE NETWORK SECURITY THROUGH A MORE DYNAMIC APPROACH TO OPERATING THE NETWORK?

4.3.2 Consultation Overview

In GB a significant number of new and innovative solutions have been trialled and some are being integrated into BaU. However, it should be noted that solutions being integrated into BaU in London may not be appropriate in the Scottish Highlands due to the differences in distribution network topologies. Similarly, the differences prevalent in NI, some of which are outlined below, necessitate that NIE Networks must trial and integrate innovative solutions into standard business processes before these solutions can be deployed on a wide spread basis. This will give the confidence that the solutions will continue to perform as required to ensure ongoing compliance with statutory and license obligations.

- Higher penetration of distributed generation.
- More rural network with different voltage levels.
- Different electricity market and regulation.

NIE Networks secured funding for 6 Innovation Integration Projects to implement a fast follower approach to successful innovation projects trialled in GB. These 6 innovation projects will be trialled by NIE Networks within RP6 and, if successful, rolled out into BaU. NIE Networks is also working with industry and academia on a number of other innovation projects.

When suitably trialled and if successfully integrated into BaU, NIE Networks will have at its disposal conventional reinforcement, DSO smart solutions and market-based

solutions to choose from. The proposed approach for determining which solution should be selected is outlined in Figure 26.

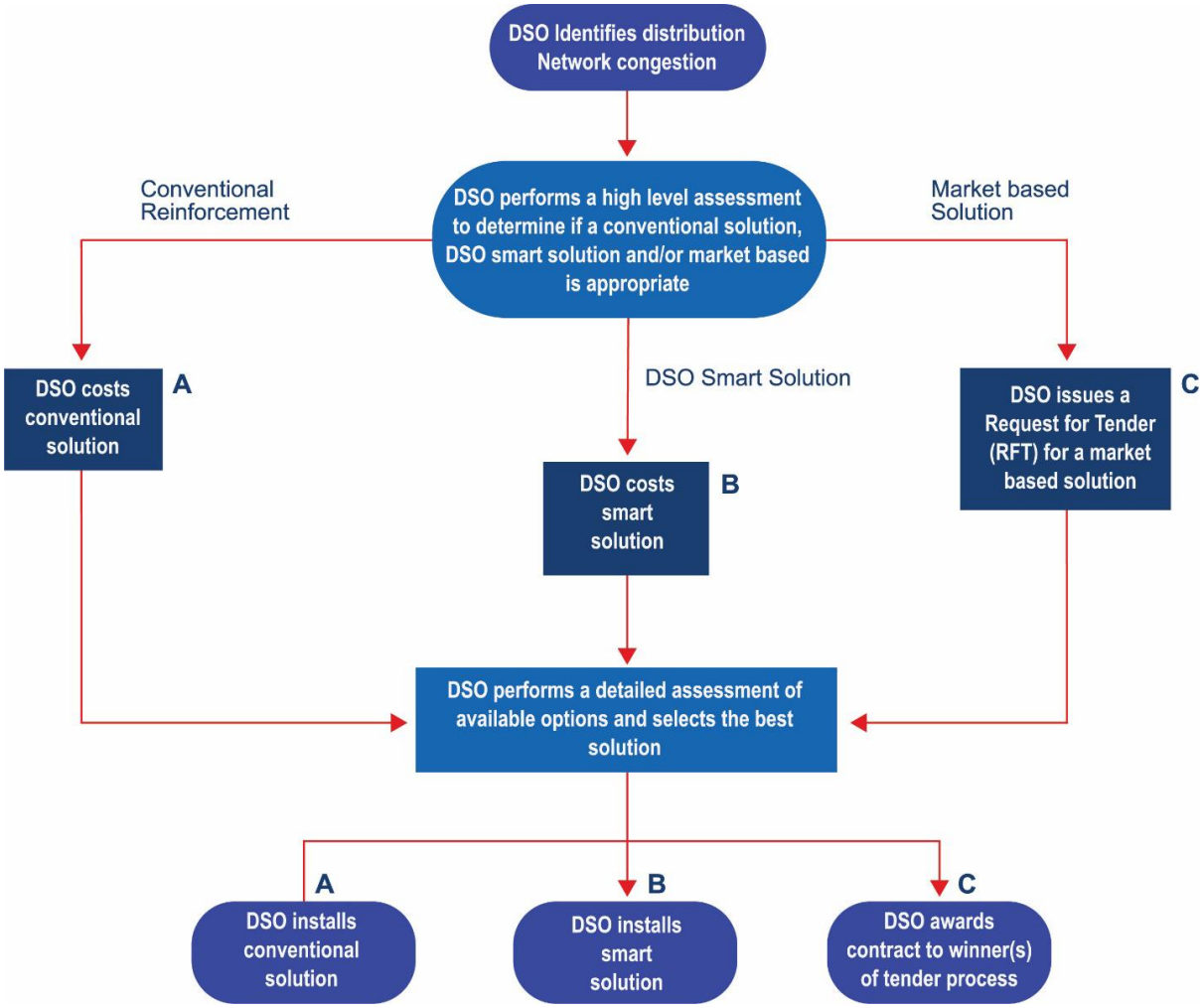

FIGURE 26

NIE Networks asked stakeholders in the Consultation: ***"Do you agree with the proposed approach, outlined in Figure 26, for managing congestion on the electricity network? If not, please provide rationale."***

The majority of respondents supported the proposed approach to congestion management.

There were two areas of clarification sought 1) around the assessment and cost benefit analysis to determine the optimum solution identifying a need for transparency and information and 2) additional information on the market-based solution i.e. procurement and remuneration mechanism. One response indicated strong support for continued conventional reinforcement to reach future renewable energy targets. One respondent did not explicitly agree or disagree stating that any network investment decisions should consider the whole system, the cumulative

impact on the transmission system and ensure that solutions would not negatively impact the TSO's requirements or responsibilities.

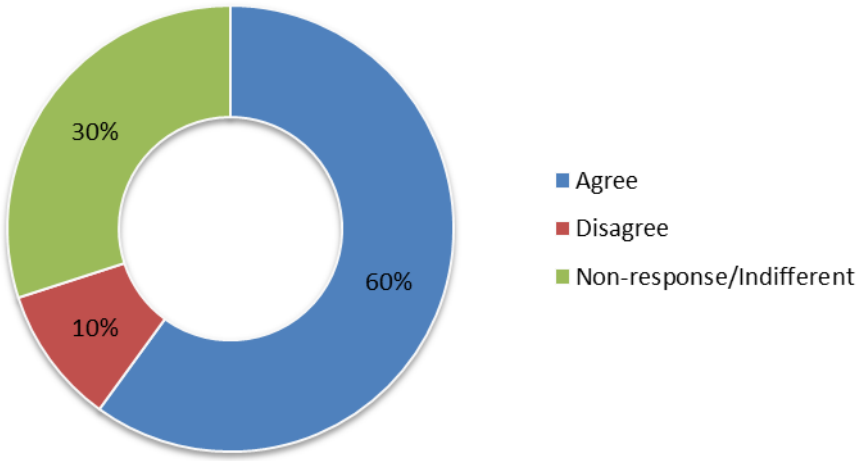

FIGURE 27 – DO YOU AGREE WITH THE PROPOSED APPROACH, OUTLINED FOR MANAGING CONGESTION ON THE ELECTRICITY NETWORK?

4.3.3 Recommended Approach

Given the majority support for the approach outlined in the Consultation, NIE Networks recommends that a "smart incremental" investment approach should be adopted. With regards to some respondents' comments, this investment approach will still require significant conventional reinforcement: in general, smart or market-based solutions will be installed to defer traditional reinforcement, not eliminate it. This is demonstrated below in Figure 28 which shows the predicted conventional, smart and enabler intervention mix out to 2060 for a central LCT uptake scenario[25].

[25] https://www.nienetworks.co.uk/getmedia/e4547f2d-ee5f-40ac-b970-9ea2ed6d0dad/Development-of-the-Transform-Model-for-NIE-Networks-v3_1.pdf.aspx

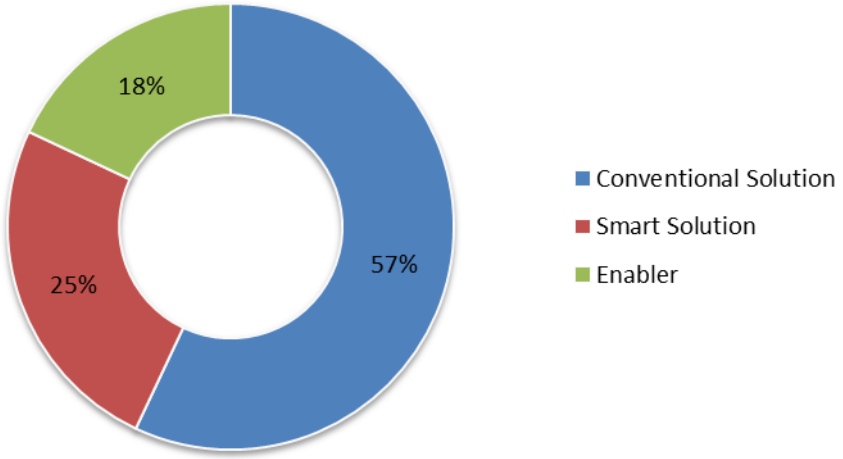

FIGURE 28

NIE Networks will continue to progress its 6 Innovation Integration Projects (funding already agreed) and, if successful, transition these to BaU readiness towards the end of RP6, with a view to wider roll out in RP7. As suggested by one respondent, NIE Networks will ensure that the Innovation Integration Projects are undertaken in a transparent manner with ongoing engagement with stakeholders both online and in relevant forums. It is proposed that the overall stakeholder engagement strategy associated with this evolution will be included within the scope of the existing CEAP, discussed in section 3.

When determining the RP7 regulatory framework, consideration needs to be given to a future funding mechanism that encourages the correct investment solution (conventional/smart/market-based) irrespective of a capital verses revenue decision. A robust framework for evaluating conventional, smart and market-based solutions will need to be established considering the overall costs, risks and benefits of each option. The decision taken will need to be transparent, non-discriminatory and well justified to ensure stakeholder confidence in the process.

One key advantage of smart and market-based solutions is that they will generally be significantly less disruptive than conventional reinforcement in that they will not involve extensive overhead line upgrades or underground cable replacements. They also tend to be more flexible as they can be 'lifted and shifted' to different parts of the network depending on specific needs. In some cases they may provide an interim solution for a short period of time to enable analysis of actual versus forecast load growth.

When implementing market-based solutions, NIE Networks will be mindful of the interplay between TSO and DSO markets and consider how best this can be integrated. To ensure that higher market liquidity is achieved whilst having separate

system services and congestion management markets it is important that service stacking is possible. Service stacking refers to the concept that an individual DER can participate in multiple markets, in this case the system services market and the congestion management market. The RP6 innovation projects will assess the best mechanism for enabling service stacking as it is recognised that it may not be financially viable for a market participant to avail of a single revenue stream and that revenue stacking may be necessary to enable Service Providers to be available in constrained areas.

The procurement of market-based solutions, now more commonly referred to as 'Flexibility', including settlement, dispatch and establishing commercial agreements will be conducted in an open, accessible manner with sufficient information available to allow market participants to make informed decisions. NIE Networks will be cognisant of the extensive work being done in this area in GB through the ENA Open Networks project where developments have been considered so significant that a stand alone Flexibility Services work stream has been established. This work stream is developing best practice relating to the visibility, procurement, dispatch and reporting of customer flexibility and ensuring a level playing field for all stakeholders.

The wider roll out of smart and market-based solutions in RP7 will be dependant on allowances to ensure a suitable telecommunications infrastructure is in place and sufficient operating costs for managing the smart solutions. Both of these elements will be considered as part of NIE Networks' RP7 business plan. Suitable telecommunications will be a key requirement for many of the smart solutions and NIE Networks intends to appoint telecoms consultants as part of the RP6 Innovation Integration Projects to review the options and requirements for BaU integration of smart solutions as well as a wider review of NIE Network's telecommunications strategy.

Most smart and market-based solutions are likely to require IT upgrades to integrate with existing control systems. It is intended that the upgrades proposed in sections 4.1 and 4.2 would be sufficient for this, ensuring an efficient use of costs, and a single IT platform for operational purposes.

4.4 Connections

With c1.8GW of generation committed to connect to the NIE Networks' transmission and distribution system, there is limited unused capacity for future generation to connect in the absence of investment. As Northern Ireland has already achieved Government targets for energy consumption from renewable sources, it is now becoming more difficult to justify further proactive network investment for renewable generation. Consequently, NIE Networks and SONI invited stakeholders to explore how further generation could be connected in the future, for example, by adopting more innovative approaches rather than traditional network investment. This

invitation was carried out by the issuing of a joint CfE[26] in October 2017. The stakeholders' response to this CfE provided NIE Networks and SONI with a very helpful insight on stakeholder views across a broad range of related matters including the technical, commercial, process and information sharing arrangements that they believe would be central to moving forward with further connection of generation in Northern Ireland. This insight allowed NIE Networks and SONI to issue a joint consultation[27] in January 2018 with options on a way forward. Such options were:

- Potential Prioritisation of DS3 System Services
- Hybrid Working Group
- The formation of a Connection Innovation Working Group to look at both the commercial and technical matter relating to:
    - Zero Firm Access Quantity (FAQ) offers with no Associated Transmission Reinforcement (ATR)
    - Active Network Management Connections

The Next Steps paper was published in June 2018 and outlined the terms of reference for the Connection Innovation Working Group which is made up of NIE Networks, SONI, Stakeholders, UR and Department for the Economy (DfE).

As Microgeneration is connected mainly on a 'fit and inform' basis, it has not been included in the consultation on "Connecting Further Generation in NI". For this reason a number of questions were asked in the 'Greater Access' CfE and Consultation.

Under Engineering Recommendation G98/NI (previously G83/1) a single generator with an energy source of 16A/phase or less can connect to the low voltage network if the DNO is advised of the intention to use the source in parallel with the network before, or at the time of commissioning. In this case the customer is not required to apply and receive a connection offer prior to connection to the network. In the case of projects where the proposal is to install multiple generators with energy sources of 16A/phase or less in a number of customer installations in a 'close geographic region', the installer is required to discuss the project with NIE Networks at the earliest opportunity. NIE Networks will then assess the impact that these connections may have on the network and specify conditions for connection. The process currently used by NIE Networks is displayed in Figure 29.

[26] http://www.nienetworks.co.uk/documents/final-cfe-soni_nie-networks.aspx
[27] http://www.nienetworks.co.uk/getattachment/Connections/Generation-connections/Generation-Consultation/NI-Gen-Connections-Consultation.pdf.aspx

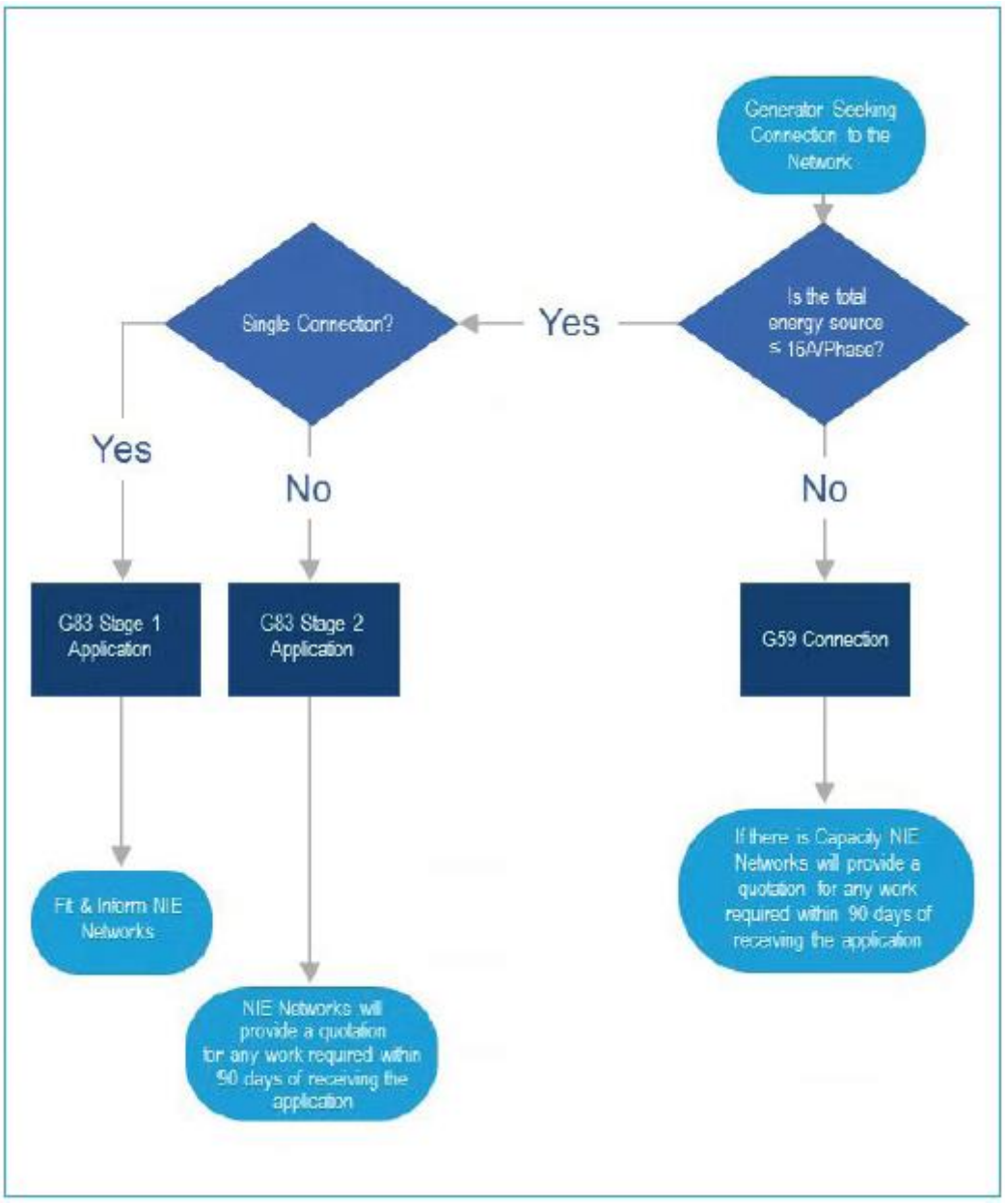

FIGURE 29

4.4.1 Call for Evidence Overview

NIE Networks asked stakeholders in the CfE: ***"Do you believe that installations where a total energy source >16A/phase connects behind a single inverter rated at 16A/ phase, should be allowed to connect under an Engineering Recommendation G83/1 arrangement on a 'fit and inform' basis?"***

Of those respondents that either agreed or disagreed, the majority agreed with the proposal. Overall 15% disagreed with 45% not responding or neither agreeing nor disagreeing. Comments included *"small domestic generating installations, rated smaller than the size of the supply should be treated under a more streamlined*

application process". Other respondents acknowledged that whilst a strict interpretation of ESQCR would appear to prevent these installations from connecting under a fit and inform basis, they consider that because the inverter is rated at 16 A/phase there is an argument that the source of energy from the AC electrical networks perspective is the inverter. They therefore argue installations such as these should be allowed to connect under a fit and inform basis. One respondent suggested that they would like to see the "fit and inform" limit being increased from 3.68kW to 8kW.

Conversely a small number of respondents raised concerns with the proposals. One respondent suggested that the fit and inform process may lead to an unintended consequence of promoting a "sell it quick and move on" attitude, instead they suggest that the process should follow an approach of 'Prove it, Fit it, Share it'. Another respondent suggested that the further connection of generation on a fit and inform basis may adversely impact the quality of the information provided to SONI in regard to zero export generation connected to the system.

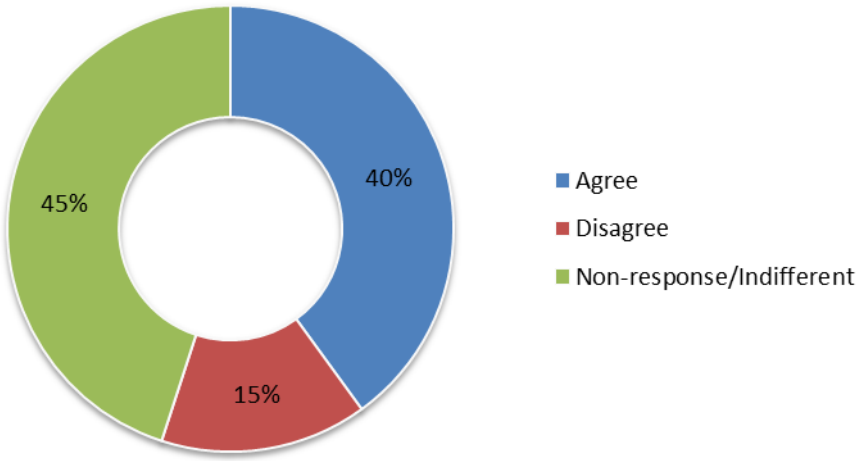

FIGURE 30 – DO YOU BELIEVE THAT INSTALLATIONS, WHERE A TOTAL ENERGY SOURCE > 16A/PHASE CONNECTS BEHIND A SINGLE INVERTER RATED AT 16A/PHASE, SHOULD BE ALLOWED TO CONNECT UNDER AN ENGINEERING RECOMMENDATION G83/1 ARRANGEMENT ON A 'FIT AND INFORM' BASIS?

NIE Networks also asked stakeholders in the CfE: ***"Do you believe that installations similar to that illustrated, if fitted with a G100 export limiting device should be allowed to connect on an Engineering Recommendation G59 "fast track" process? In this case customers would still be required to contact NIE Networks to receive permission to connect; however, due to the reduced likelihood of considerable grid impact NIE Networks would be able to expedite any network assessment and revert to the customer, informing them that they can or cannot connect to the network in reduced timescales."***

Whilst the majority of respondents agreed with NIE Networks' proposal some concerns were raised, for example one respondent suggested that the G59 fast track process may compromise the quality of network analysis carried out by SONI. Other respondents suggested that the G100 process may result in a slower connection process with additional connection costs. One respondent warned against risks of battery storage by an overly 'laissez faire' approach from the DNO.

Finally, although not specifically asked within the CfE, respondents also suggested that the DSO should accommodate connections with Non-Firm Access.

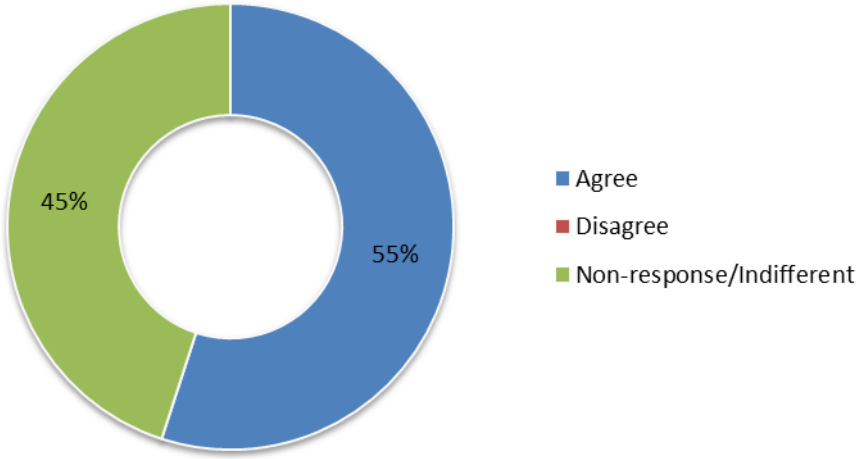

FIGURE 31 – DO YOU BELIEVE THAT INSTALLATIONS SIMILAR TO THAT ILLUSTRATED , IF FITTED WITH A G100 EXPORT LIMITING DEVICE SHOULD BE ALLOWED TO CONNECT ON AN ENGINEERING RECOMMENDATION G59 "FAST TRACK" PROCESS?

4.4.2 Consultation Overview

4.4.2.1 Microgeneration

NIE Networks outlined the view that the proposed changes to the microgeneration connections policy are favourable and therefore should be progressed in a timely fashion to reduce the risk of large numbers of unauthorised connections. A proposed connections process was detailed (see Figure 32) and the following question was asked:

- ***"Do you agree with the proposed connections process for micro generation and G99 fast track? If not, please provide rationale."***

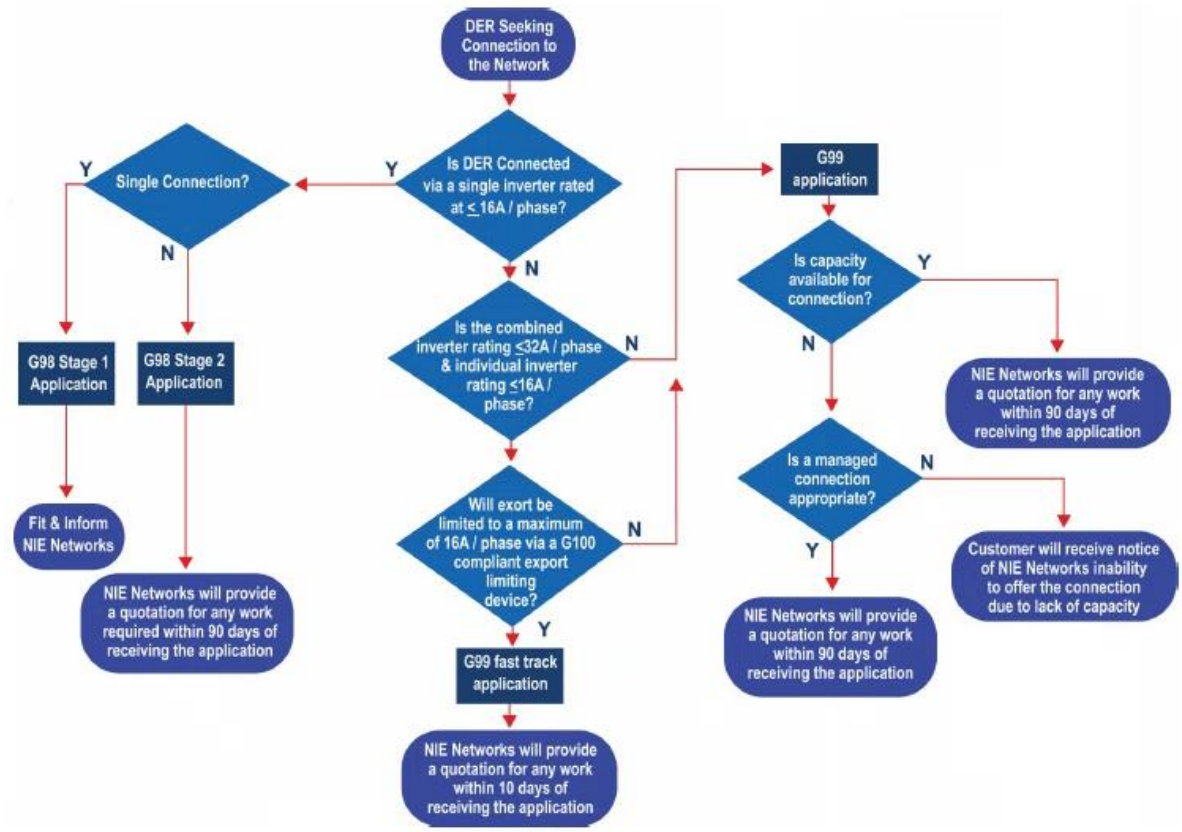

FIGURE 32

There was broad support for the proposed micro generation changes and G99/NI 'fast track' connections process acknowledging this is a key enabler for continued decarbonisation. One respondent indicated support for charging reform in part as a consequence of modifying the connections process.

One respondent raised a number of concerns such as the quality and timeliness of information available through a fit and inform scheme citing a reduction in the quality of network analysis, fault level information, demand forecasting and that a co-ordinated solution should be sought. Another respondent proposed that this question is related to the ongoing Connection Policy discussion and a joint forum was the most appropriate mechanism to address this.

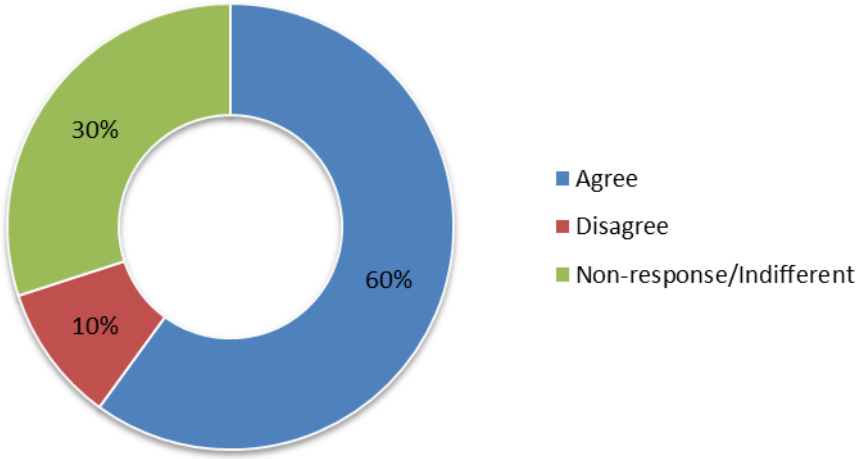

FIGURE 33 – DO YOU AGREE WITH THE PROPOSED CONNECTIONS PROCESS FOR MICRO GENERATION AND G99 FAST TRACK?

4.4.2.2 Flexible Connections

NIE Networks is currently chairing a joint Connections Innovation Working Group (CIWG) with SONI. This group has been developed through a consultation process and will consider flexible[28] type connections for generation within areas with transmission constraints. This group comprises of experts from industry, UR and DfE.

As part of the DSO workshop held in September 2018 the potential of introducing a flexible connections option to all applicants based on timed or active network management was discussed. In general, this was well received by attendees whilst appreciating that this may not suit all customers. It is important to note that a potential flexible connections offer will require the customer to be flexible within the terms of the offer.

[28] The ENA definition of flexible connections is as follows:

Flexible Connections are connection arrangements whereby a customer's export or import is managed (often through real-time control) based upon contracted and agreed principles of availability of capacity. Timed Connections and connections utilising Active Network Management arrangements are examples of Flexible Connections.

Occasionally, Flexible Connections are also referred to as Managed Connections.

The need for network access to be managed may arise through capacity limitations which are local or remote from the Connection Point. For example, a Flexible Connection might comprise a Firm local connection, but with a constraint being present deeper in the network. Flexible Connections are offered to customers so that Reinforcement can be avoided or deferred.

NIE Networks asked the following question in the Consultation:

- ***"Do you believe that NIE Networks should consider providing an option for a flexible connection in the future? If so, do you have a preferred method of flexibility to be implemented? How much detail do you require in relation to hours of constraint and connection offer lifetime?"***

Excluding one respondent who did not give a definitive response, of those who responded, all were supportive of NIEN offering flexible connections in future. One respondent stated that whilst they were supportive of flexible connections, they see them as a short term solution whilst additional network reinforcement is performed. All respondents who were supportive agreed that as much information as possible should be made available relating to availability and curtailment. A respondent proposed NIE Networks consult on the arrangements for flexible connections highlighting a concern that existing connections were not impacted by non-firm connections.

Another respondent indicated that they believed that this should be addressed in a joint venture and that any decision did not negatively impact the whole system or the TSO's responsibilities. They also referenced a new approach to SCADA in their response indicating that the current infrastructure would not be adequate for future levels of embedded generation.

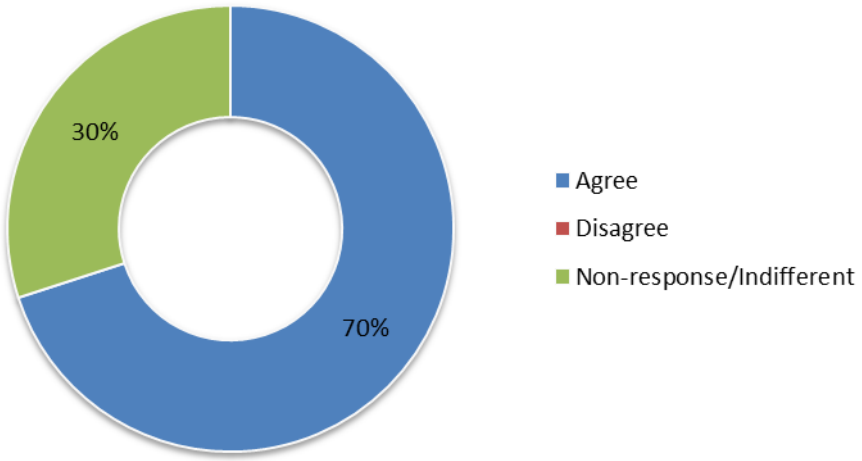

FIGURE 34 – DO YOU BELIEVE THAT NIE NETWORKS SHOULD CONSIDER PROVIDING AN OPTION FOR A FLEXIBLE CONNECTION IN THE FUTURE?

4.4.3 Recommended Approach

4.4.3.1 Microgeneration

Based on the broad support in the responses received it is NIE Networks' recommendation that the proposed changes to the microgeneration connections policy are favourable and therefore should be implemented from January 2020 to reduce the risk of large numbers of unauthorised connections. With the arrival of the ENTSO-e European codes, NIE Networks has updated its various documents, including G83/1 and G59/1/NI. Following suit with GB, NIE Networks has adopted replacement documents called G98/NI and G99/NI respectively. As allowed for in G98/NI the inverter rating will be used as opposed to total energy source, and additionally as allowed for within G99/NI NIE Networks will introduce a fast track option whereby if suitable installations up to 32A/phase are G100 compliant then the NIE Networks' network assessment would be performed in reduced timescales.

NIE Networks agrees with respondents that the quality of information on connected generation is essential to ensuring system security; however NIE Networks believes that by not adopting a new connections policy for microgeneration they will be operating against the desire of the majority of customers, will hinder the decarbonisation of the energy sector, particularly at domestic level, and will ultimately lead to poor data and increased cost for customers. The rationale for such is discussed below:

- NIE Networks strongly believes that the best way to acquire data from connecting microgeneration is by facilitating access to the network through efficient network connection policies. Whilst the existing connection policies have enabled significant volumes of microgeneration to connect to the network, industry has made it clear to NIE Networks that the connection policy for microgeneration is not fit for current requirements and will form a financial barrier to the deployment of domestic battery storage. In order to mitigate the risk of customers connecting such technologies outside of existing connection policy and not informing NIE Networks, NIE Networks believes that facilitating access to the network through efficient network connection policies will increase the likelihood of the customers informing NIE Networks that they have indeed connected such technologies. This will then allow NIE Networks to pass the aggregated volume of connected generation at each Transmission/Distribution boundary through to SONI on a monthly basis as per the current arrangement. Facilitating access to the network through efficient network connection policies will also help mitigate the risk of unregulated connection of generation without suitable G100 limiting control devices.

- If the proposed change to connection policy is not progressed, then this will present significant barriers to the connection of domestic energy efficiency schemes such as a PV and battery combination, through the requirement to

install a stand alone protection relay and be subject to potentially long generation connection queues. This will ultimately result in a barrier to the decarbonisation of the energy sector. Contrary to one respondent's comment the deployment of the solutions outlined will significantly reduce the connection times for such schemes.

- Moreover, if the proposed change to connection policy is not progressed then this will mean that NI is out of line with all other parts of the UK. Consequently, customers in NI will have to pay more and wait longer to fit the same equipment as they would in GB. Alignment with GB ensures that NIE Networks can utilise the well established ENA type tested verification report register. Utilising this register will ensure that only proven technology can connect to the network alleviating some respondents concerns that the process should follow an approach of 'Prove it, Fit it, Share it'.

- Similarly, NIE Networks does not believe that the "fit and inform" limit should be increased from the existing 3.68kW (16A/phase) level. By doing so would be in breach of ESQCR and would be out of step with GB. NIE Networks believes that the proposed amendments to this process will remove any blockers to the development of the microgeneration market whilst ensuring that the safety, security and quality of supply for all customers are unaffected.

4.4.3.2 Flexible Connections

As there were no responses disagreeing with flexible connections, NIE Networks will continue to progress flexible generation connections (driven by renewable energy targets) through the Connections Innovation Working Group (CIWG). NIE Networks will also consider the implications of introducing flexible demand connections, including the possible links with charging reform noting that in GB deep reinforcement costs are socialised. NIE Networks will continue to engage with SONI where the issue is a transmission constraint and will also work with EirGrid through the Flextech initiative.

The costs of flexible connections will be fully chargeable to the connecting customer, and the customer will be required to be flexible in the operation of their site. Flexible connections are likely to be managed in terms of capacity allocation in a similar manner to the NCAP and so will also require the IT system upgrades outlined in section 4.1.1.3. They will also incur some additional ongoing management and operational costs, to be considered in the RP7 business plan.

4.5 Data Provision

As the volume of DERs connecting to the distribution network increases the need to have greater data and visibility of the network becomes more important, which is necessary to ensure the efficient development and operation of both the distribution and transmission system. Currently there is real time visibility through SCADA down

to 6.6kV circuit level; however, below these levels there is extremely limited real time data.

Four potential areas where the increased provision of data may be required between the TSO, DSO and customer to allow for the efficient development and operation of the electricity system include:

- Future data – data provided ahead of time
- Real time data – data provided in real time
- Past data – data provided after an event
- Publicly available data – open electricity system data

4.5.1 Call for Evidence Overview

CfE respondents strongly supported the view that the DSO/TSO requires increased data to efficiently develop and operate the system and that this data should be efficiently transferred between the TSO and DSO as illustrated in Figure 35 and Figure 36. Some respondents suggested:

- Higher levels of visibility on networks would allow for a reduction of curtailments, release new capacity for new generators and allow customers to make more informed business decisions. In general the use of information is likely to benefit customers and the DSO via the increased efficient operation of the system.
- Higher levels of visibility are required of the networks down to the LV network at much shorter control cycles closer to real time.
- It is necessary to understand what data is required, in what location and with what granularity.
- The boundary between TSO and DSO should not represent a barrier to data flow.
- Instead of transferring all the actual; raw data from the DSO to TSO, there should be process efficiency and it may be useful for automatic reports or processed information to be exchanged only.
- Sharing of forecasting tools across DSO-TSO to align power flows and avoid any unnecessary curtailment.

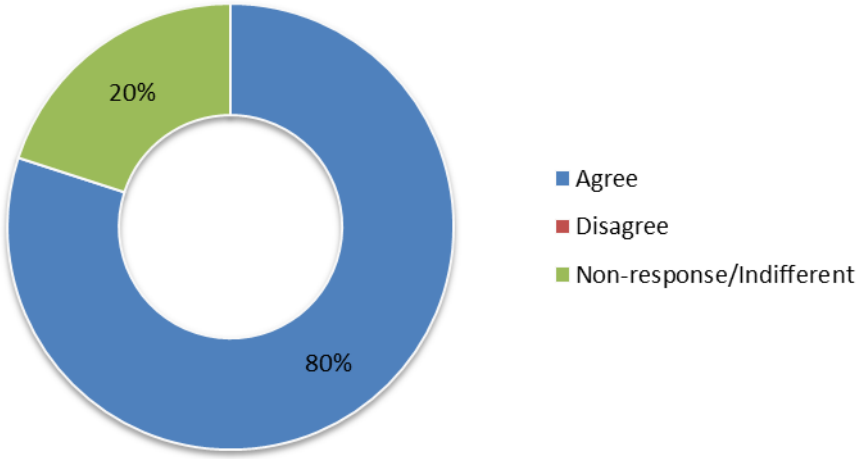

FIGURE 35 – DO YOU AGREE THAT THE DSO/TSO REQUIRES INCREASED DATA TO EFFICIENTLY DEVELOP AND OPERATE THE SYSTEM TO HELP REDUCE NETWORK OPERATING COSTS AND FACILITATE GREATER ACCESS TO THE NETWORK FOR EXISTING AND FUTURE CUSTOMERS?

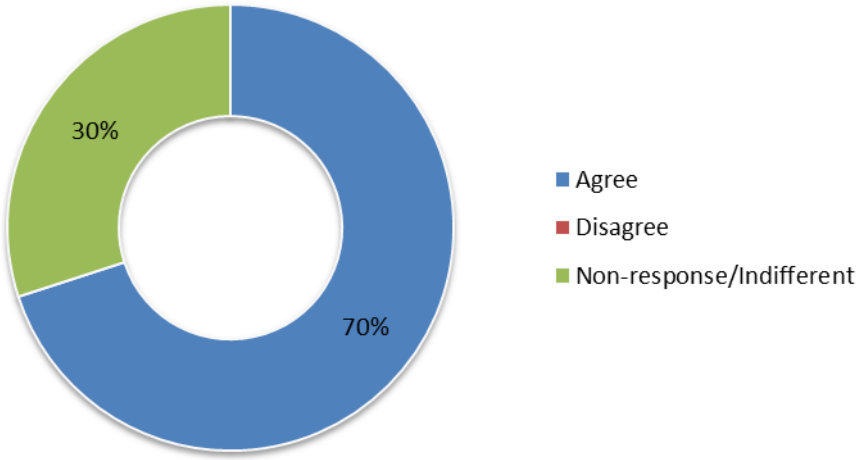

FIGURE 36 – DO YOU AGREE THAT TO ACHIEVE THIS, INCREASED LEVELS OF DATA NEED TO BE MADE AVAILABLE IN THE AREAS IDENTIFIED AND BE EFFICIENTLY TRANSFERRED BETWEEN THE TSO AND DSO?

65% of respondents believed that greater customer metering functionality is required in Northern Ireland with the remaining respondents giving an indifferent or non-response. Some respondents suggested that:

- The current metering arrangements are too simplistic while the scale of the NI market is too great to operate using quarterly meter readings.

- NIE Networks needs to explore the possibility of upgrading all meters to online versions.

- Although greater metering functionality could be advantageous, the cost of such metering should not be placed on the customer, either directly or in system charges.

70% of respondents believed that customers should have increased access to network data, while 5% disagreed with no explanation and the remaining 25% did not respond or issued an indifferent response. Respondents suggested:

- This data in association with smart metering will give customers the information required to manage their electrical load and play a vital part in the overall management of grid capacity.

- The development of markets for flexibility and consumer owned DERs depend on access to data.

- Information and data should be shared so that those wanting to connect load or generation can make informed choices early in their design; thus removing the possibility of paying a fee to be told there is no capacity available.

4.5.2 Consultation Overview

No specific questions were asked in the Consultation so the recommended approach is in line with that outlined in the Consultation.

4.5.3 Recommended Approach

It should be emphasised that this section refers to provision of additional data and not existing data or processes. Based on the responses from the CfE which strongly supported making more data publicly available, NIE Networks has included an additional key data area: Publicly available data. The definition of this function has also been changed to reflect this. Previously this function was defined as “Provision of detailed data between the TSO and DSO to enable more efficient system development and operation”. NIE Networks now proposes that this definition is changed to **“Provision of detailed data between the TSO, DSO and customer to enable more efficient system development and operation”.** NIE Networks will continue to engage with SONI in defining the data transfer requirements between the DSO and TSO with a view to inclusion within the DNO/TSO Transmission Interface Arrangements (TIA).

The key data provision areas are described below:

Future data

As the license holder for frequency management SONI has the responsibility for near time forecasting of demand and generation on the NI electricity system. Historically in the centralised electricity network forecasting has been very accurate; however, in the ever increasing decentralisation of the electricity network, with high levels of generators and control mechanisms such as managed generation connections this is and will become increasingly more difficult.

As owners of the real time distribution network model the most appropriate and efficient solution is for NIE Networks to develop near time forecasting functionality for the distribution system and present this information to SONI at Transmission and Distribution boundaries to enable more accurate whole system forecasting. By feeding weather forecast information and customer profile data into the Network Management System, it can be developed to deliver forecasting functionality and can take account of planned network outages and the real time status of the network. This approach aligns with respondent's suggestions of "sharing of forecasting tools across the DSO and TSO". This will require various IT system upgrades to ensure that sites with complex demand or generation profiles are accurately captured and to facilitate the forecasting capability. The cost implications are outlined in section 5. Ultimately, the accuracy of the forecasting will be dependant on the quality of customer profiling which relies heavily on data. Greater customer metering functionality would provide an abundance of this data. NIE Networks will continue to work with the Department for Economy (DfE) to supply the potential network benefits associated with greater customer metering functionality, allowing these to be fed into DfE's Cost Benefit Analysis (CBA) and subsequent decision.

Real Time data

As described in future data, real time generation data is provided to SONI on a site specific basis for generators greater than 5MW. However, to ensure the efficient balancing of the system SONI is seeking visibility of generators less than 5MW. This view was corroborated by the Ministerial Energy & Manufacturing Advisory Group Report (EMAG) recommendation[29]:

"New distributed renewable (e.g. solar) projects over a certain threshold should be smart metered so that they are visible to the system operator, reducing demand forecast uncertainty and facilitating more efficient system operation."

Whilst there is currently limited real time visibility of generators less than 5MW, NIE Networks is rolling out a programme of SCADA to all generators greater than 200kW. This data is currently fed back to the NIE Networks control room. In

[29] https://www.economy-ni.gov.uk/sites/default/files/publications/deti/EMAG%20Report%20March%202016%20-%20submitted%20to%20DETI_0.pdf

accordance with the System Operator Network Code[30], NIE Networks believes that the aggregation of this data, as opposed to the provision of site specific data to the TSO, provides an efficient method of data delivery between the DSO and TSO and aligns with respondents comments that “Instead of transferring all the actual; raw data from the DSO to TSO, there should be process efficiency and it may be useful for automatic reports or processed information to be exchanged only”.

NIE Networks agrees that higher levels of visibility are required of networks down to LV. Moving into the next regulatory period it will be necessary for NIE Networks to ensure that suitable allowances are included to increase visibility on constrained sections of the LV network, but prior to a wider rollout at this stage, NIE Networks believes it is prudent to commence a limited trial to identify suitable devices and any barriers to implementation. NIE Networks also believes that it is essential to upgrade operational IT systems to include LV modelling capability within RP6 to allow the increased data from the LV network to be utilised effectively. Costs for these works are included in section 5.

Respondents also suggested that it is necessary to understand what data and where data is required. As NIE Networks begins to increase visibility of the LV network, the roll out of this visibility will be prioritised at locations based on need. For example locations with a higher connection of LCTs might be targeted first. The data required at LV will be similar to the data currently retrieved on the HV network where parameters such as MW, MVAr, Voltage, Current, etc. are retrieved. In addition to this data being very valuable for the purposes of network planning, it can also be utilised to detect potential faults, particularly on underground cables. Identifying and repairing faults before they become permanent mitigates against the cost and inconvenience of supply interruptions for customers.

Past data

NIE Networks currently fits disturbance recorders at all generation sites directly connected to the HV network for the purpose of diagnostic and performance monitoring of generation. The existing RP6 programme also includes 51 additional or replacement disturbance recorders on the network. All the new recorders have been located at sites where reverse power flow may occur due to high volumes of distributed generation. NIE Networks is also working with SONI regarding remote access to recorders at large scale generation sites. The recommended approach is to continue with these ongoing works; however the further roll out of disturbance recorders for the provision of system services (section 4.2) will provide additional data.

[30] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32017R1485

Publicly Available data

Based on feedback from the CfE NIE Networks has included a fourth key data area considering the provision of 'open data' for public use. This will include:

Improved capacity maps for both demand and generation down to primary substation level, to improve customer investment decisions. These were released in November 2019 and will be updated annually, but in future will require increased resources to update more frequently and to provide capacity information at lower voltage levels. This will be considered in the RP7 business plan.

As described in section 4.3, Congestion Management, NIE Networks is trialling innovation projects, some of which are seeking to develop market based solutions for network congestion. If successful, NIE Networks will be procuring flexibility solutions from industry to help manage network congestion, such as, but not limited to demand side response and energy storage services. In these scenarios, NIE Networks will be making the real time data for network congestion available to enable future market based solutions to manage network congestion in real time. NIE Networks will ensure that the provision of further network information does not have the unintended consequence of giving third parties an unfair market advantage, for example providing parties with visibility of emerging constraints could potentially provide them with the ability to trigger those constraints which they are then paid to resolve.

NIE Networks, through involvement in the ENA, is cognisant of the work of the Energy Data Task Force (EDTF) and will be mindful of the recommendations in relation to data openness, accessibility and visibility while also bearing in mind cyber security and data protection obligations. One of the 5 key recommendations in the EDTF report is the digitalisation of the energy system and NIE Networks believes that transitioning to a DSO is a key factor in this.

4.6 Network Management

When planning an outage, generation is sometimes required to be constrained when the system is abnormal. In general, generation is only connected and charged for a Normal System Operation (NSO) connection and therefore may have to be constrained under Abnormal System Operation (ANSO) feeding arrangements. Consequently, NIE Networks' control engineers will reduce the output from generators, if required, by sending SCADA signals or by instructing operational staff to disconnect generation from the system. When determining the level of constraints to apply, generally conservative assumptions are used, for example, when paralleling between two Bulk Supply Points (BSPs)[31] it is current practice to ensure that there is zero reverse power flow at both substations prior to carrying out the

[31] 110/33kV substation.

parallel. In reality it may be appropriate to allow a level of reverse power flow without causing any network violations.

4.6.1 Call for Evidence Overview

NIE Networks asked in the CfE: ***"Should NIE Networks invest in technologies to enable generation constraints on the distribution network to be reduced?"***

65% of respondents agreed with investment to reduce generation constraints with 5% disagreeing with no reasoning. The general consensus from the CfE was that it would be to the ultimate benefit of customers in offering greater support to the system operation and may avoid higher generation and ancillary service costs. Suggested examples of how this could be achieved are: increased network visibility, active network management, real time rating and optimisation, use of storage, managed connection and meshing of networks.

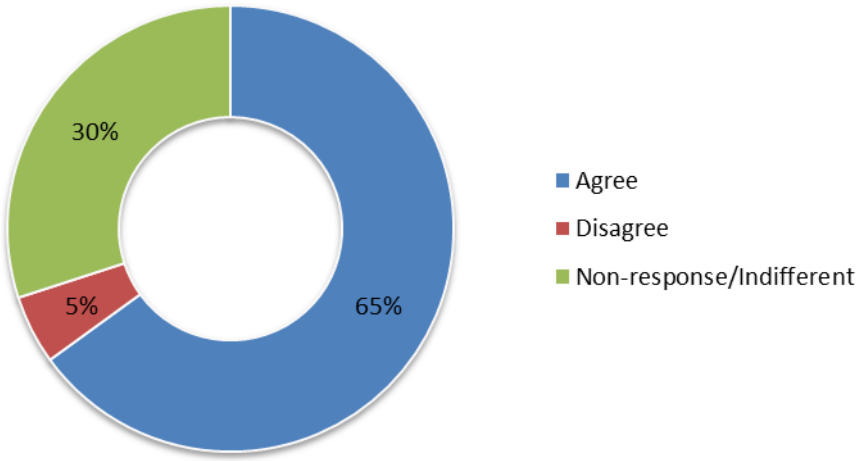

FIGURE 37 – SHOULD NIE NETWORKS INVEST IN TECHNOLOGIES TO ENABLE GENERATION CONSTRAINTS ON THE DISTRIBUTION NETWORK TO BE REDUCED?

4.6.2 Consultation Overview

No specific questions were asked in the Consultation so the recommended approach is in line with that outlined in the Consultation.

4.6.3 Recommended Approach

Based on the feedback from the CfE and in order to appropriately manage the day-to-day operation of the distribution system with high levels of DERs connected to it NIE Networks believes that there are several key network management changes that are required relating to the following areas:

1. Outage Planning

2. Generation Constraints

3. Network Performance

In order to ensure that NIE Networks continues to deliver quality service to customers NIE Networks believes that its Network Management System (NMS) will require significant development. Ultimately, NIE Networks plans to extend the area of NMS control to the LV network, where the vast volume of LCTs will be connecting, and in doing so will be able to manage higher levels of micro generation and customer demand from Electric Vehicles and heating. Currently, only the HV network is centrally controlled by NIE Networks' control centre. NIE Networks will therefore work with its NMS provider to ensure that it is fit for purpose as NIE Networks evolves from a DNO to a DSO.

NIE Networks will continue to develop NMS to facilitate improved outage planning, reduced generation constraints, improved network performance, mobile functionality and LV modelling functionality on a system with high levels of distributed energy resources. This will ensure that NIE Networks will have full visibility of constraints in real-time as well as the ability to look ahead to proactively mitigate potential problems. Having access to the right information, at the right time to the right people in the office or field will result in better informed decisions and greater efficiency of network operation. It is also important that the Distribution NMS provides the necessary near time and real time information through the Inter Control-Centre Communications Protocol (ICCP) link for the TSO's efficient operation of the transmission system and NIE Networks will continue to engage with SONI in developing this solution. The cost implications of upgrading the NMS IT system are outlined in section 5.

4.7 Pricing

Distribution Use of System (DUoS) tariffs are designed to recover the distribution network costs from the end users based on how they contribute to the network costs. As customers generate more of their own electricity locally but still want to remain connected to the distribution network for continuity of supply reasons and to avail of system services, the current DUoS tariffs will need to change from primarily a volumetric approach to a more capacity charging approach to benefit all customer types. The emergence of new technologies and the growth in DG is changing how and when the distribution network is used and will influence the effectiveness of NIE Networks' DUoS tariffs.

Factors which may impact on network pricing include:

- Reduced usage will increase network charges for all customer types unless capacity charging is introduced.

- The increasing connection of generation to the distribution network instead of the transmission network is changing the direction and volume of energy flows on the network.

- How and when customers want to use the network is changing as customers are connecting DG to reduce their network usage, while some want to store electricity and use it during peak times.

- The connection of new technologies such as heat pumps and electric vehicles has the potential to cause system peaks and network constraints.

Set against this, the emergence of smart technologies and innovative business models offer opportunities to adjust supply and demand at times and places where there are network constraints. This can defer or reduce the network reinforcement which might be needed. NIE Networks' tariffs may need to change to facilitate these opportunities and provide the appropriate incentives to both demand and generator network users.

Current Pricing Arrangements

Currently NIE Networks' DUoS charges are set annually to recover regulated Distribution Allowances using cost reflective principles. DUoS charges provide network users with signals about the costs they confer on the distribution network in terms of investment and operation. The price signals should incentivise network users to make decisions on how and when they use the network to achieve the most economically efficient outcome. If customers change their behaviours in response to the price signals, this will ultimately reduce future network costs for all users.

NIE Networks' DUoS tariffs are primarily volume based with approximately 74% of distribution revenue recovered from unit (kWh based) charges. As customers generate more of their own electricity locally but still want to remain connected to the network for continuity of supply and to avail of system services, a higher proportion of network costs will be recovered from customers who are less willing or unable to reduce their electricity usage (passive consumers). In general, this will be domestic and small business customers and will include customers in vulnerable situations.

Potential Changes to Pricing Arrangements

The Utility Regulator has recognised in their forward work plan that a charging review is required. In anticipation of this charging review some areas that could be considered include:

- **Options for tariff groups and new DUoS tariff** – DuoS tariffs are currently assigned to end users based on voltage, size of user etc. Network costs allocated to the tariff group are based on the "average" user in the tariff group.

With the introduction of new technologies, the customers in a tariff group may have a range of network usage patterns.

Different price structures and tariffs may be introduced to recognise common modes of behaviour, such as PV users, or user flexibility such as customers who participate in Demand Side Response. Different charges or rebates could also be considered to encourage generators to connect close to local load and flex their export to meet local demand. Matching generation to demand on the same part of the distribution network would reduce power flows and potentially future network reinforcement cost, however the benefits of such an arrangement is highly dependent on the reliability of customer demand.

- **Rebalancing DUoS charges** – when network users install alternative energy sources their electricity consumption generally reduces. As a consequence a higher proportion of past network investment costs will be claimed from the remaining network users through unit charges. Rebalancing network costs by reducing the proportion recovered from unit charges and increasing the proportion recovered from fixed charges, such as capacity or standing charges, could provide a fairer and more appropriate allocation of costs.

- **New technologies and Time of Use pricing** – suitable access and smart charging arrangements for new technologies such as electric vehicles, heat pumps and storage are required. If these technologies were to cluster at certain parts of the network they could drive network reinforcement. More time of use DUoS charges could provide cost signals to reduce the need to reinforce the network. While all customers with MICs greater than 70kVA have time of use prices, less than 30% of small business users and less than 5% of domestic customers are on time of use DUoS tariffs.

Moving forward, DUoS charging structures may need to include the newer types of costs, such as expenditure on smart grid assets and flexible services. Careful consideration is required on how these costs should be mapped to the tariff components as this will impact the proportion of costs recovered from each user group and individual network user.

4.7.1 Call for Evidence Overview

Stakeholders were asked:

- ***"Do you believe the existing tariffs are fit for purpose, or do they need amendment to deliver benefit to all customer types?"***

As shown in Figure 38 the majority of respondents (65%) agreed that going forward NIE Networks' tariffs should be amended to make the most out of new technology and deliver benefits. Only one response stated that they considered the existing tariffs fit for purpose and do not need to be amended.

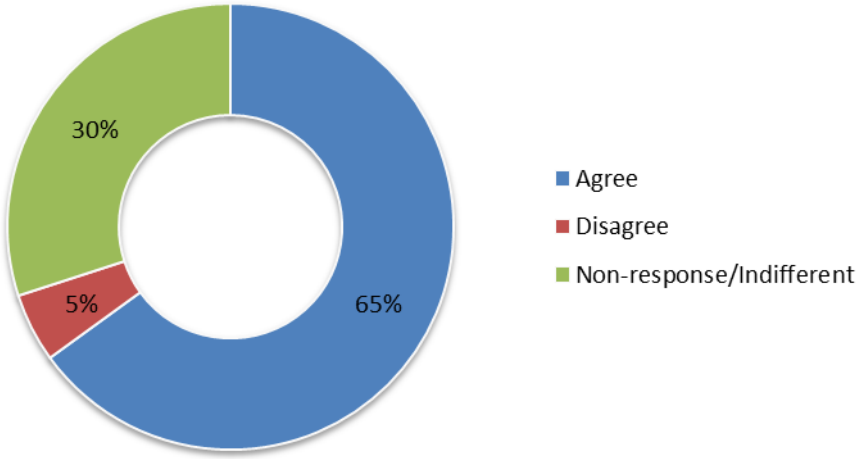

FIGURE 38 – DO YOU BELIEVE THE EXISTING TARIFFS ARE FIT FOR PURPOSE, OR DO THEY NEED AMENDMENT TO DELIVER BENEFITS TO ALL CUSTOMER TYPES?

Additionally the CfE asked:

- ***"Do you believe the areas of potential change are correct? Are there other areas of change that should be considered? If so, please set out in detail."***

Of the 20 responses received, 15% were content that the changes proposed in the CfE were correct. 45% were generally positive about the changes proposed but provided suggestions of additional changes that should be considered, these are discussed below. 5% (one response) stated that the proposed changes were not correct but didn't provide any reasoning or other suggestions. Some respondents raised concerns and points that they believe NIE Networks needs to consider when developing changes to pricing arrangements.

In general, the respondents acknowledged that the way the electricity network is being used is changing and a review of tariffs is required to provide greater incentives for customer flexibility and network management. It was noted that the change in tariffs needs to be managed to support customers who are willing to adopt LCTs, manage their energy use and provide system and local services; however, those customers who are not participating in this way, and particularly vulnerable customers, need to be protected against unfairly high costs.

Several respondents mentioned the desire for tariffs to be transparent and fair. Some concerns were raised that if tariffs become overly complex it could result in uncertainty and could discourage investment in renewables.

There were also some specific suggestions made in the responses such as:

- A stepped down tariff to reward generators for lowering their usage through investment in renewables and batteries.
- Fractional tariffs for domestic customers, e.g. with normal consumption via a normal supplier, but with a variable and interruptible heating tariff linked to market prices and grid conditions.
- Tariffs to encourage users to operate heat pumps and charge electric vehicles at night to reduce the load during evening peak times.
- Tariffs based on utilised assets, rather than just energy delivered to encourage generators to connect in areas where demand is higher.
- Smart grid technology where “time-of-use” price is enabled to address mismatches between electric vehicle load and renewable generation.

4.7.2 Consultation Overview

There were no specific questions in this area in the Consultation, however one respondent reiterated their concern that under a volume based DUoS tariff passive consumers may bear a higher proportion of the distribution network costs. They welcome the proposal to undertake a review of the DUoS charging methodology.

4.7.3 Recommended Approach

NIE Networks proposes to undertake a comprehensive review of the DUoS charging methodology and subsequently feed into the proposed UR tariff reform review. This review will include detailed analysis of the allocation of costs to customer groups and types of charges and will take account of the potential change in costs incurred by NIE Networks with the evolution to DSO. NIE Networks’ DUoS charging methodology was introduced in 1992 based on the DUoS charging model used by GB DNOs at that time. While NIE Networks has introduced a number of new DUoS tariffs to facilitate flexibility and customer choice, the fundamental principles for the allocation of costs to customer groups and types of DUoS charges has remained unchanged.

NIE Networks also proposes to consider GB DNO’s current charging arrangements and ongoing charging reforms for comparable and compatible solutions. In GB, similar to NI, the distribution network costs are recovered through two types of charges: ‘forward-looking’ charges designed to incentivise the efficient use of the network, and ‘residual’ charges which are top-up charges set to ensure that total allowed revenues are recovered. The GB charging reform has been ongoing for some time and includes various charging projects led by Ofgem.

Given that the responses to the proposals in the CfE were generally positive NIE Networks proposes to focus on developing options for the three areas of charging

reform set out in the CfE. These areas for reform have been considered by the DNO's in GB:

- **Rebalance DUoS Charges** – reduce the proportion of costs recovered from volume based unit charges and increase the proportion recovered from fixed charges (i.e. capacity or standing charges), to provide a fairer and more appropriate cost recovery from all customers.

- **New Tariff Groups or Charging Arrangements** – develop new cost reflective tariffs or charging arrangements to recognise common modes of behaviour, with price incentives for LCT and flexible users, and charging arrangements to encourage generators to site close to customer demand.

- **Time of Use Pricing** – this area of reform has two parts:

    - Encourage a higher uptake in Economy 7 tariffs by small business and domestic customers in general; and

    - Develop appropriate time of use charging arrangements for new technologies.

NIE Networks will also consider the balance of costs between customer groups when developing options as it will be important to encourage the uptake of new technologies, but it will also be important to protect other customers, including vulnerable customers, who are less able to adopt new technologies.

Greater metering functionality is required to facilitate some new tariffs and appropriate time of use pricing to maximise customer benefit. Such changes in metering functionality will require consultation with electricity suppliers as well as discussion with DfE and the Utility Regulator in respect of wider metering strategy and price control impacts. Additional funding is required to cover costs during RP6 (likely commencing in 2020) to:

- Identify issues with NIE Networks' current methodology in its ability to provide fair and cost reflective charges to meet the expansion of LCTs and the transition to DSO.

- Propose alternative options for DUoS charging methodology with impact assessment of customer bills.

- Develop a model for proposed DUoS charging methodology.

5. COST RECOVERY AND IMPLEMENTATION PLAN

NIE Networks is adopting a least regrets approach to the evolution from a DNO to a DSO. This means that NIE Networks will be evolving their current systems and processes as opposed to investing in wholesale changes. Whilst adopting a least regrets approach will minimise the funding requirement, a need will still exist for funding in order to implement the DSO vision as outlined in section 4. The enabling funding to continue the timely transition to a network that will facilitate a low carbon future has been identified at £13.5m.

5.1 Funding Requirements

Some of the identified DSO enablers already have associated funding allowances within the RP6[32] period, including the Nodal Controller trial, specific Innovation Integration Projects and the rollout of SCADA to small-scale generation sites (funded by generators).

Other enablers required for the implementation of the various DSO functions identified throughout Section 4 have no existing funding mechanism and as such additional funding is required during the RP6 period to enable these to progress. NIE Networks believes that if these enablers are not trialled and in place by the end of RP6, they will then have to be deferred to the next regulatory period commencing in April 2024 and are therefore unlikely to be available as Business as Usual (BaU) until at least 2026/27 and possibly beyond. NIE Networks believes that this would not be acceptable to stakeholders and the industry. It would result in a network that was not sufficiently developed or flexible enough to be able to meet the demands of a decarbonising economy and would leave too little time to implement solutions to facilitate achieving future decarbonisation targets set for Northern Ireland.

Some DSO functionality, such as a large scale rollout of LV monitoring, can be deferred until the RP7[33] business plan. Other DSO functionality which is established during the remainder of the RP6 regulatory period will require the recovery of BaU operating costs in RP7, although it should be noted that if implementation of these functions accelerate and they become BaU prior to the end of RP6 then NIE Networks may need to agree additional operational costs in this period with the UR. Additionally, suitable mechanisms will need to be agreed for the RP7 period to allow NIE Networks to manage the balance of risk when operating the network in alternative ways to facilitate wider customer benefits, and to encourage the optimum service delivery from existing assets to ensure maximum value. Ultimately, when determining the RP7 regulatory framework, consideration needs to be given to a

[32] RP6 refers to NIE Networks' regulatory price control which covers the period 1 October 2017 to 31 March 2024
[33] RP7 refers to NIE Networks' regulatory price control which is due to commence on 1 April 2024

future funding mechanism that encourages the correct investment solution (conventional/smart/market-based) irrespective of a capital verses revenue decision, and also one that facilitates the trialling and early adoption of evolving innovative technologies. NIE Networks intends to engage further with the UR on these issues.

A list of the expected enablers to deliver the DSO vision outlined in Section 4 is shown below in Table 4 along with the planned funding mechanism category.

DSO Function		Enabler		Funding plan
Market Facilitator	Active Power	Network Capacity Allocation Platform	Tech development, trial & BaU roll out	Additional RP6 allowance
	Reactive Power	Nodal Controller	Tech development and trial	Existing RP6 allowance
			BaU roll out	Additional RP6 allowance (subject to further consultation)
Service Provider		Tech development, trial and BaU roll out		Additional RP6 allowance
Congestion Management		Smart and market-based solution trials		Existing RP6 allowance
		BaU roll out		RP7 business plan
Connections		Fast-track process		Existing RP6 allowance
		Flexible connections		Additional RP6 allowance

Data Provision	Future	Forecasting functionality development and BaU roll out	Additional RP6 allowance
	Real-time	SCADA roll out to SSG	Existing RP6 allowance
		Increased visibility of LV network	Additional RP6 allowance – trial sites RP7 business plan – further rollout
	Past	Disturbance recorder data	Additional RP6 allowance (required for Service Provider functionality)
	Publically available	Network capacity maps	Existing RP6 allowance
		Network data to enable market based solutions	Existing RP6 allowance
Network Management		Tech development, trial and BaU roll out	Additional RP6 allowance
Pricing (Charging)		Charging reform development and implementation	Additional RP6 allowance

TABLE 4

Table 5 summarises the anticipated costs for the functions identified as requiring additional funding during RP6 in Table 4. It should be noted that some cost elements enable multiple functions e.g. upgrades to key IT systems will enable the NCAP, facilitate system service provision and streamline network management.

Funding requirement	Cost
IT/software upgrades	£3.51m
Service provision infrastructure	£3.60m

HV monitoring	£3.95m
LV monitoring	£0.54m
Sub-total	**£11.6m**
Further nodal controller roll out (subject to further consultation)	£1.40m
Review & development of DUoS Charging Methodology (subject to scope review by UR)	£0.50m
Total	**£13.5m**

TABLE 5

If the proposals outlined in this paper are supported by the UR then a suitable mechanism needs to be agreed to facilitate the additional funding outlined in Table 5 required during RP6. NIE Networks plans to continue engagement with the UR in January 2020 to agree potential funding mechanisms and any associated licence implications in order to progress the timely transition.

5.2 Justification and Benefits

Throughout the consultation process, customers have requested that the various DSO functions are progressed in a timely manner. The DSO transition will not only benefit active customers through the facilitation of access to markets, but will also benefit all customers through minimising future network costs in the delivery of a low carbon economy. The transition will help improve the environment and air quality, by developing systems that support the growth of renewables and the switch to electric vehicles, facilitating the decarbonisation of the energy sector, a requirement now enshrined in legislation.

The proposed Network Capacity Allocation Platform will facilitate greater access initially for up to 19MW of Demand Side Units (DSUs) by analysing distribution network capacity dynamically in place of the existing conservative fixed process. Active customers can extract maximum value from their assets through accessing a range of markets. It is envisioned that by transitioning to a DSO, NIE Networks will also facilitate additional organisations acting in various markets, opening up competition and reducing the cost implications of these markets for all customers.

Provision of system services from the distribution network will have the benefit of increasing system security, and utilising existing assets to provide these services is likely to be the most economic means of providing these services. The DS3 system

services market will be worth up to €235m in 2020[34] and so even a modest contribution from NIE Networks has the potential to return significant savings for customers.

Utilising smart technologies and market-based solutions to facilitate the connection of Low Carbon Technologies will defer costly conventional reinforcement by maximising the utilisation of existing electrical and communication networks.

Streamlining the connection process for micro generation and storage will make it easier for further renewable generation to connect, with the added benefit for storage systems of decreased network losses as the energy generated is utilised on site. Flexible connections will enable the connection of further renewable generation customers at a lower cost and/or significantly earlier than traditional reinforcement would allow. The facilitation of further renewable connections also improves network utilisation.

In terms of data provision, providing enhanced forecasting data to the TSO is likely to reduce system balancing costs, again benefitting all customers. Greater visibility and accessibility of real-time data can also better inform investment decisions for both NIE Networks and stakeholders. Improving network management will reduce generation constraints, producing an overall financial benefit for the wider customer base.

Finally, a full review of the network pricing structure is designed to ensure that costs are recovered in a fair manner across all customer groups.

5.3 Timelines

The Consultation indicated that the delivery of DSO functionality will not be a step change as the development of each function will happen over various durations, and asked stakeholders if they agreed with the indicative implementation timescales illustrated in the document.

5.3.1 Consultation Overview

Whilst respondents generally agreed with NIE Networks' proposed timelines (see Figure 39) there were multiple requests to expedite the transition from DNO to DSO and the associated activities. A recurring point raised was that NIE Networks should consider implementing activities in parallel instead of staggering, to speed up the process.

[34] https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-14-108%20DS3%20System%20Services%20Decision%20Paper.pdf

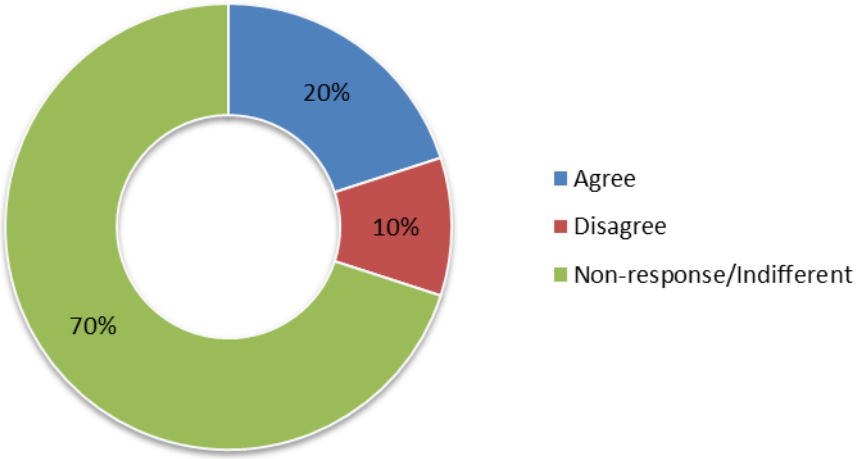

FIGURE 39 - DO YOU AGREE WITH THE INDICATIVE IMPLEMENTATION TIMESCALES

Various respondents highlighted an enhanced decarbonisation target and requested that the timescales be re-evaluated against this. There was also support for reducing the timescales, fast tracking aspects of the DSO transition and carrying out activities in parallel. One respondent wished to see the G99/NI 'fast track' process implemented as soon as reasonably possible.

One respondent raised a concern that the timeframe for transition was very challenging and, with the TSO also undergoing change, joint planning was required. They also queried why the pricing reform was marked as commencing in 2025 citing earlier implementation will allow customers time to respond. Another respondent, while supportive of the sequence, indicated that they felt some milestones appeared in an illogical manner.

5.3.2 Recommended Approach

NIE Networks agrees that a number of DSO activities could and will be developed in parallel. Projects with funding already allocated in RP6 including the nodal controller trial and the innovation projects will continue to be progressed, and subject to the additional funding being approved by the Utility Regulator, NIE Networks will commence work on the various other DSO functions as soon as possible. Project teams with the relevant expertise will be assembled for each individual work package to ensure timely progress is made on all elements. NIE Networks believes that it is essential to deliver real benefits before 2024 and that it is important to have trialled new DSO functions operationally to facilitate and inform an appropriate regulatory framework for RP7. Progressing the key enablers identified in this paper will ensure that action is taken now to deliver tangible change for all stakeholders, as they have requested in their engagement with this process.

Some DSO functionality has been identified as lower priority and thus deferred until the RP7 period and as such delivery of these aspects, including the large scale rollout of LV monitoring, will be post 2024.

Estimated implementation timescales have been identified for key DSO enablers and these are shown in Table 6. The various different elements have different levels of complexity and interdependency related to IT system development, telecommunications, integration with existing systems and external factors such as markets and government policy. As such some elements will take a number of years to implement and the timescales identified may be subject to change due to factors outside the control of NIE Networks.

The range and complexity of NIE Networks' proposed charging reforms will require sufficient time to develop options and assess their impact on customers. It is anticipated that the charging reforms could be developed in RP6 with a view to implementing the reforms in RP7. However, introducing some reforms earlier may be considered to maximise customer benefit if agreed with the UR.

DSO function	Enabler	Target Implementation[35]
Connections	Fast track	Q1 2020
Market Facilitator	NCAP	2021
Market Facilitator	Nodal controller deployment	2021
Data Provision	Forecasting functionality	2021
Data Provision	LV network monitoring	Trials 2022 Rollout 2024 & beyond
Service Provider	Service Provider functionality	2023
Congestion Management	Market based solutions for congestion management	2024
Pricing	Pricing reform	2025

TABLE 6

[35] Implementation dates are subject to agreement with UR on the appropriate funding mechanism

6. APPENDIX 1

All non-confidential Consultation responses can be found at the following location:

https://www.nienetworks.co.uk/future-networks