Consultation on NIE Networks Providing Distribution Generation Offers with Non Firm Market Access

(For applicants 5MW and above)

Consultation Paper

20th December 2019

Contents

1 Executive Summary

This consultation paper seeks to gain feedback from industry on the NIE Networks proposal to change existing connection offer policy by providing distribution offers with non-firm market access to generators 5MW and above.

The introduction of non-firm connection offers would be a significant change to the existing approach referred to as the Alternative Connection Application and Offer Process (ACAOP)[1] which was developed through consultation with industry and stakeholders and implemented in 2016 to manage an influx of applications to connect to the distribution system. This influx occurred following a decision to remove planning permission as a prerequisite to apply for connection to the distribution system. Applications to connect to the transmission system were unaffected and there was no equivalent influx to connect to the transmission system as planning permission remained a prerequisite for applications (and later a milestone for offer acceptance).

The ACAOP resulted in NIE Networks issuing distribution connection offers on a firm basis to those connection applications which did not drive the need for further transmission system reinforcement. Offers were also made for connection at Cluster sites. A position has now been reached under the ACAOP that, while some residual capacity remains in the east of Northern Ireland and at cluster sites, NIE Networks will increasingly have to issue refusals to connect.

The Strategic Energy Framework[2] provided direction on energy policy for the ten year period up to 2020. In particular the Electricity (RES-E) target of 40% has been an important consideration within the ACAOP and in particular with respect to network investment driven by renewable generation. Connection of any further renewable generation will have an impact on curtailment and constraints in the absence of further investment in the transmission system and further delivery of the DS3 programme.

The Connections Innovation Working Group (CIWG) was established in 2018 to discuss the potential implications of connecting further generation to the distribution system on a non-firm basis. To support this discussion analysis was produced which sets out the potential impact on constraints and curtailment of connecting further generation with an assumed level of network reinforcements delivered[3]. CIWG members provided feedback suggesting [1] an appetite remains amongst industry to pursue connection to the distribution system in the anticipation of further ambitious RES targets and [2] there is a need to consider options for what connection arrangements might be appropriate.

[1] https://www.nienetworks.co.uk/documents/generation/alternative-connection-application-and-offer-p-(1).aspx
[2] https://www.economy-ni.gov.uk/publications/energy-strategic-framework-northern-ireland
[3] http://www.soni.ltd.uk/media/documents/Operations/SONI%20Northern%20Ireland%20Constraints%20May%202016.pdf

In this paper NIE Networks and SONI are seeking feedback on next steps for the connection offer process for distribution connections.

2 Introduction

The ACAOP process was implemented in June 2016 following consultation with industry. This process was identified as the best approach to efficiently manage the influx of over 1600 MW generation applications to connect to the distribution system that occurred following the removal of planning permission as a prerequisite to apply for connection applications to the distribution system. There was no equivalent influx of applications to connect to the transmission system as planning permission remained a prerequisite for applications (and later a milestone for offer acceptance).

The RES-E target of 40% has been an important consideration within the ACAOP and in particular with respect to network investment driven by renewable generation. NIE Networks and SONI recognised the need to support industry in meeting the RES-E target while also considering efficient network utilisation. As such the ACAOP was designed to allow for offers for connections to the distribution system on the current firm basis where there was both transmission and distribution system capacity available without the requirement for further reinforcement on the transmission system. The diagram below in Figure 1 summarises with an example, the key criteria to be met under the ACAOP process to obtain a distribution offer. In this example a connection offer would be issued to Applicant 1 but would not be issued to Applicant 2, as there is no remaining firm access to the transmission capacity.

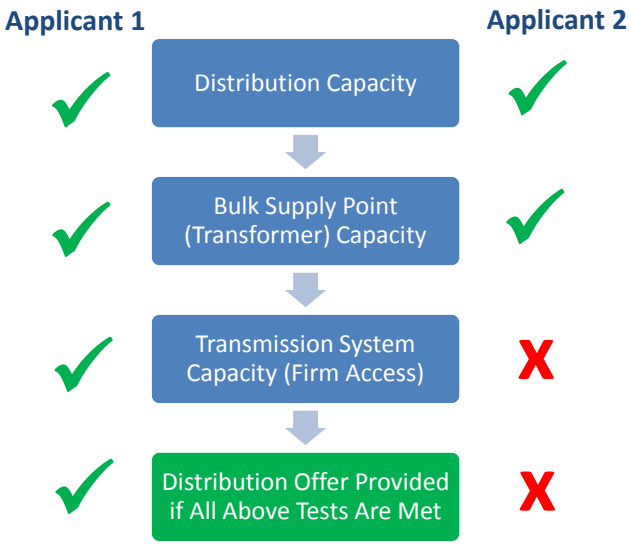


Figure 1 Current ACAOP Distribution Capacity Assessment Process

With the majority of this firm transmission capacity having now been assigned[4] the continuation of this current approach will result in NIE Networks increasingly being unable to issue further distribution export offers on a firm basis.

In anticipation of further progressive RES-E policy and recognising the need for stakeholders to support changes to the ACAOP approach, NIE Networks and SONI have continued to engage with industry. This consultative approach has included seeking industry responses to the call for evidence (October 2017)[5], consultation (January 2018)[6], next steps paper (June 2018)[7] and most recently engagement through the Connections Innovation Working Group (CIWG). Through these mechanisms industry has provided consistent feedback that there is still an appetite for generation connections on the distribution system in the anticipation of RES-E policy being extended beyond 40% which requires and exploration of options as to how this might be achieved.

In September 2019 the Department for the Economy (DfE) published statistics for the period ending 30 June 2019 showing the target of achieving 40% of electricity generated from renewable sources in Northern Ireland by 2020 having been met and surpassed with 44% having been attained. Ahead of this achievement DfE appointed external consultants to carry out research on the future of renewables in Northern Ireland including the potential for a new renewable electricity target. This work is an important step for the Department in considering its approach to facilitating growth in renewable electricity generation going forward. The results will form part of a wider NI Energy Strategy which will be consulted on in the latter half of 2020. It is likely that this new NI energy strategy and implementation policy will require a shift in the approach taken to both network investment decisions and connections applications. In parallel, SONI has developed Tomorrow's Energy Scenarios Northern Ireland 2019[8], which provides an insight to the important contribution of RES-E generation in tackling climate change through decarbonisation.

Against this background, this consultation paper provides industry with an opportunity to engage in exploring the mechanisms that might be implemented to maintain momentum in further decarbonising Northern Ireland, by asking in particular whether applicants should be able to avail of distribution offers which provide non-firm market access. The implication of this approach has already been subject to extensive discussion and analysis by the Connections Innovation Working Group.

Connections Innovation Working Group

The aim of the CIWG is to find solutions that facilitate the connection of further Distributed Energy Resources (DER - Generation & Storage) in Northern Ireland, which are technically and commercially feasible for both the Network and System Operators and for the DER developers/operators of both new and existing projects. The first objective of this working group was to look at whether NIE Networks should issue offers (with non-firm market access) rather than issuing refusals in an area

[4] with the exception of some remaining firm capacity in eastern areas of the system and at cluster substations
[5] https://www.nienetworks.co.uk/documents/final-cfe-soni_nie-networks.aspx
[6] https://www.nienetworks.co.uk/getattachment/Connections/Generation-connections/Generation-Consultation/NI-Gen-Connections-Consultation.pdf.aspx
[7] https://www.nienetworks.co.uk/documents/generation/ni-gen-connections-next-steps-paper.aspx
[8] http://www.soni.ltd.uk/media/documents/TES-NI-2019-Consultation.pdf

where there is no firm capacity. In particular the CIWG was to consider the technical feasibility of allowing such connections to be made in the current absence of further RES-E policy while considering the uncertainty that this could present around the network investment required for projects to achieve fully firm market access. The CIWG members were required to determine the:

- Commercial viability of such non-firm connections for DER operators of both 1) new and 2) existing projects, taking account of factors including constraint/curtailment information
- How these connections sit within current and future market arrangements.
- How the network capacity allocation and connection process would operate for these connections.

A further objective of the CIWG is to look at whether Active Network Management (ANM) schemes should be introduced at Distribution level. Given that ANM connection would likely result in non-firm market access it was agreed that the consideration of ANM was dependent on the outcome of the CIWG determination with respect to the viability of non-firm connections.

This consultation paper is therefore limited to key considerations discussed by the CIWG with respect to non-firm access. This includes setting out in greater detail the system limitations and implications of connecting additional RES in the absence of new energy policy including:

- Curtailment (output reduction due to system wide issues)
- Constraints (output reduction due to network issues)
- Controllability – the impact of uncontrollable generation on the operability of the system
- Transformer capacity

The members of the CIWG believed that having taken account of this more detailed information with respect to the impact of committing to connect further generation there may be appetite to revise the approach for enabling further generation connections to the distribution system. The CIWG members also believed that although projects are more difficult to fund post NIRO, there would be scope for projects to avail of connection offers with non-firm market access and that SONI and NIE Networks should consult with wider industry in the merits or otherwise of introducing non-firm connections and agree any potential changes to the current ACAOP approach. The CIWG believed that this would be a pragmatic approach in anticipation of further progressive renewable energy targets. The CIWG also articulated that as the current ACAOP approach was driven and supported by industry, further consultation and support from industry should be sought when considering a change to this approach. This consultation is therefore seeking views on the following:

1) The current distribution offer process assessment process including distribution and transmission capacity assessments

2) The potential distribution offer process including distribution and transmission capacity assessment which would allow offers with non-firm market access

3) The impacts of connecting further RES in the absence on a new energy policy for both new and existing connections

Throughout this consultation SONI and NIE Networks are seeking industry feedback on a number of questions. These questions along with this paper have been both reviewed and informed by the CIWG members. SONI and NIE Networks have taken this approach with the aim of ensuring the information provided and questions asked result in well informed feedback from interested parties.

3 Renewables Update

In September 2019 DfE published statistics for the 12 month rolling period ending 30 June 2019, which reported 44% of electricity generated from renewable sources having been attained. The surpassing of the 2020 target of 40% has been aided by the rapid growth in the connection of renewable generation particularly seen in the last eight years.

This rapid growth in generation connected to the NI Networks from 2012 to 2018 shows small scale generation (SSG) growing over tenfold and large scale generation (LSG) near trebling in terms of MW value connected. The values shown for renewable generation connected in 2019 to date, suggest a slow-down in terms of LSG and SSG generators connecting, mainly due to a lower level of applications during 2017 when developers were focusing on meeting the NIRO deadlines for projects at construction stage. Also contributing to the slowdown in connections is general industry awareness that there is no capacity in the west of Northern Ireland other than clusters with remaining capacity.

The Northern Ireland Growth chart in Figure 2 below shows a breakdown of how generation has grown in the period 2012 to Q3 2019[9] in Northern Ireland in terms of:

- Large Scale Generation 'LSG' (greater than 5 MW)
- Small Scale Generation 'SSG' (greater than 3.68 kW single phase /11.04 kW three phase but less than 5 MW)
- and Micro Generation (up to 3.68 kW for Single Phase and up to 11.04 kW for Three Phase)

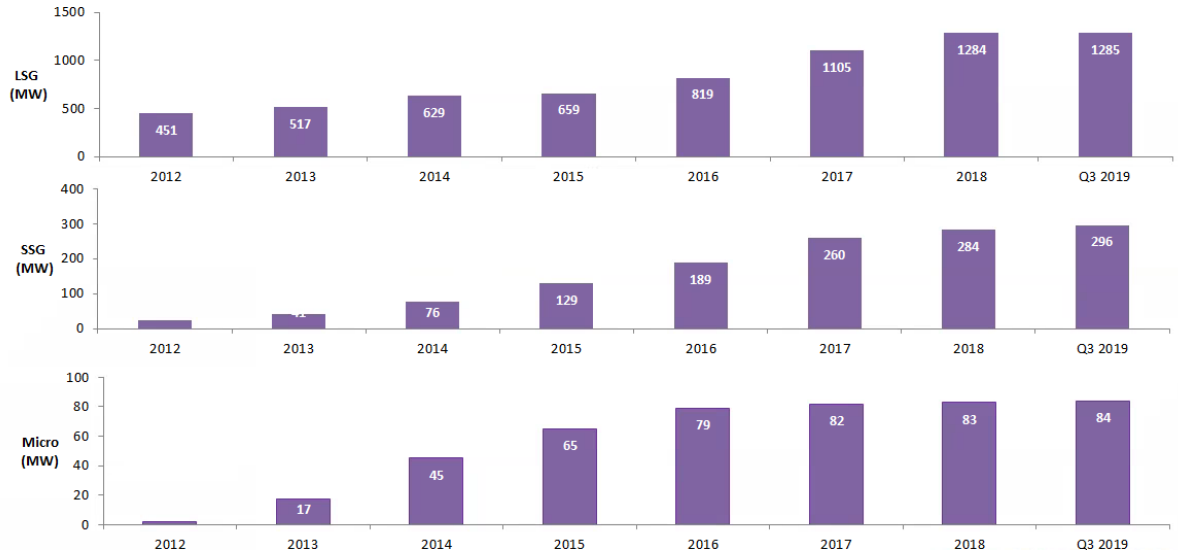


Figure 2: Renewable Growth Chart between 2012 to Q3 2019

It is important to note however that NIE Networks is still receiving a significant number of applications for both LSG and SSG connections. For example since adoption in May 2018 of the alternative queuing principles, described in the NIE Networks Decision Paper on Distribution

[9] MW values rounded to nearest whole number

Generation Process change and introduction of Milestones[10], NIE Networks has issued circa 200 MW[11] of LSG connection offers to distribution applicants in the eastern area of the system and at cluster substations, with an acceptance rate of c70%. The lack of generation connected to date in 2019 is simply due to the nature of connections involved, with many of the LSG projects that are committed to connect, expected to connect in the latter half of 2020, or in 2021 or up to 2022. SSG and Micro generation however continues to steadily connect year on year.

As at Q3 2019, 1665 MW of renewable generation has been connected to the NI Transmission and Distribution System with a further 292 MW of generation committed to connect, which would bring the total connected figure to 1957 MW[12]. It is worth noting that 93% of the connected generation is connected to the distribution system and that of the 292MW committed 273 MW of this is LSG. The technology mix of this generation can be found in Figure 3 below:

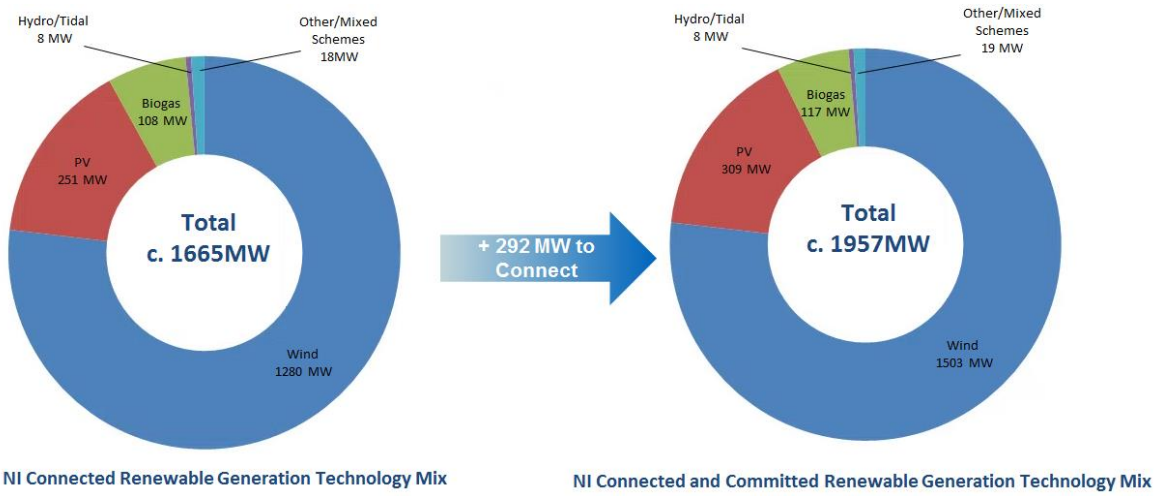


Figure 3: Q3 2019 Connected & Committed Renewables Technology Mix

The connected and committed figures show that the ACAOP process and the current alternative queuing principles have been successful and have contributed to meeting the 2020 RES-E Energy target ahead of time. The additional 292 MW of committed generation will only further enhance the capability to provide an increased share of electrical demand from renewable energy sources.

[10] https://www.nienetworks.co.uk/documents/decision-paper-on-distribution-generation-process.aspx
[11] Figures as of Q3 2019
[12] The renewable figures reported are correct as of Q3 2019

4 Important considerations impacting on further connections

4.1 System Capacity and Firm Access

Under the terms of the ACAOP applications for generators seeking to connect to the distribution system were assessed to determine if their connection would impact on the transmission system to the extent that they required Additional Transmission Reinforcement (ATR). Through this process, offers to connect to the distribution system were only issued if;

- there were no distribution issues that could not be charged to the applicant
- there was transformer capacity at the Bulk Supply Point (BSP)
- did not result in a breach of the uncontrollable limit as set out in section 4.4 (only for generators less than 5 MW)
- and their connection did not drive additional transmission reinforcement under the terms of the ACAOP[13]

This approach was considered by industry to be the most efficient approach to manage the large influx of applications to the distribution system.

4.2 Firm Access and FAQ

The generation capacity released through the ACAOP process saw the release of a large volume of the remaining untapped firm capacity on the transmission system. A generator's "firmness" is an important factor for generators that participate in the Single Electricity Market i.e. LSG of 5 MW or above. Firmness is a commercial construct that associates the available transmission network access to a generator. A generator with firm access is entitled to compensation if generation output reduction instructions are issued by the transmission system operator.

A generator's Firm Access Quantity (FAQ) is assessed alongside existing generators to determine its impact on the system across a range of scenarios using the Incremental Transfer Capability (ITC) methodology[14]. This process determines the point at which the generator causes any issues (i.e. the Transmission System is not compliant with the planning standards) during circuit or other outages on the Transmission System. The point at which the output of the generator causes an issue becomes that generator's FAQ.

- Generators are described as firm if the generator does not cause issues driving further transmission reinforcements and it will have full FAQ i.e. its FAQ will be equal to its MEC.

[13] For the purposes of this assessment regulatory approved associated transmission reinforcements in the process of being delivered were discounted.

[14] http://www.soni.ltd.uk/media/documents/Operations/Generators/SONI-NIE%20Consultation%20Paper%20on%20Consenting%20Requirements%20in%20Advance%20of%20Application%20for%20Offshore%20Generation%20Connection-v2-0.pdf

- If the generator drives further transmission reinforcements its FAQ will be less than its MEC. Until the associated transmission reinforcements (ATRs) are delivered this generator would be described as being non-firm in terms of market access.

As highlighted above the FAQ level for these large scale generators becomes important when SONI as system operator, requires a generator to reduce its output due to transmission network issues (also referred to as a constraint). The SEM compensates the generator for this required output reduction proportional to its FAQ level. Therefore a generator with full FAQ will be fully compensated for this operator action against a transmission constraint. Those generators with partial FAQ will receive financial compensation up to their partial FAQ level and those with zero FAQ will receive no compensation. As further transmission network reinforcements are delivered, generators with non-firm market access will become more firm and consequently be entitled to further compensation if their output is reduced due to transmission constraints.

4.3 Controllability and Curtailment

Curtailment refers to situations where the output of generators may be reduced to keep the overall power system secure e.g. where there are limits on the amount of non-synchronous generation that can generate at any point in time.

SONI has the responsibility of balancing generation and demand on the system to maintain system stability. Managing this balance requires a minimum number of synchronous generators to be dispatched at all times. Too much generation relative to demand will cause the system frequency to increase above 50 Hz. The SONI control centre manages high frequency events by reducing generation output and this may include the dispatch down of controllable renewable generation.

In addition to the fundamental requirement to maintain supply-demand balance as described above, there are a number of different types of system security limits and requirements that necessitate curtailment: system stability requirements (synchronous inertia, dynamic and transient stability), operating reserve requirements, including negative reserve, voltage control requirements and System Non-Synchronous Penetration limit.

By its nature uncontrollable generation cannot be curtailed and has the same effect as further eroding system demand and may necessitate the increased curtailment of larger controllable generation.

In managing the system there is a minimum number of “must run” synchronous generators scheduled to ensure system stability[15]. At times of low system demand and with these generators operating at their minimum output it can be difficult to balance the system due to the level of uncontrollable generation. The total capacity of connected uncontrollable generation export is subject to an operational limit as a result. This is referred to as the Uncontrollable Generation Limit.

[15] http://www.soni.ltd.uk/media/documents/Operational-Constraints-Update-Version-2019.pdf

4.4 Summary of Key Points

1. Generators that have their output dispatched down as a result of the reasons referred to above (i.e. curtailed) are not compensated for their reduced output
2. Curtailment is carried out pro rata on an all island basis
3. No Grandfathering exists for curtailment – i.e. incumbent generation is not protected from curtailment
4. An increase in the amount of uncontrollable generation i.e. SSG export and zero export is likely to contribute to increasing levels of curtailment for LSG
5. Reduction in overall system demand is likely to contribute to increasing levels of curtailment for LSG

5 Overview of Technical Studies

The connection of further RES generation (whether large or small scale) will have an impact on the current levels of constraints and curtailment experienced on the Northern Ireland system. Increasing levels of SSG export which is typically uncontrollable may present increased complexity with regard to system stability as discussed in 4.3.

This section outlines the findings of analysis carried to assess the impact of curtailment and constraints and gives an update of the uncontrollable generation limit that had previously been established in the ACAOP.

5.1 CIWG Study - Impact of connecting further generation on Constraints and Curtailment

The connection of further generation will impact the current levels of constraints and curtailment. SONI's Northern Ireland Constraints Report 2016[16] provided information on the possible levels of generation output reduction for the period 2016-2024. These output reductions are made up of both constraints and curtailment.

SONI carried out analysis to assess the impact of further generation connecting to the transmission and distribution system beyond that considered in the 2016 constraints report and to inform the discussions at the CIWG. The analysis used the 2016 report as a reference point for consistency and ease of comparison. The underlying study assumptions and results of the analysis are set out in greater detail in Appendix 3.

16 http://www.soni.ltd.uk/media/documents/Operations/SONI%20Northern%20Ireland%20Constraints%20May%202016.pdf

Scope of Analysis

The constraints and curtailment analysis studied the impact of connecting additional generation to the Northern Ireland system. The study applied additional blocks of generation relative to the levels set out in the Northern Ireland Constraints Report 2016.

2019 was used as the base case study year with an initial total of 1662 MW RES connected to the system. The assessment included a series of studies consisting of a 500 MW mix of wind, PV and AD technology connecting to the network in a) west and b) east. This was then repeated with a total of 1000 MW connecting in each locational scenario.

For context there is at present 1665 MW of RES connected to the Northern Ireland system, with a further 292 MW committed to connect, once connected this would bring the total RES to 1957 MW.

The table below summarises the relative volumes of RES under assessment.

Study	Base Case	Add RES - East	Add RES -West	Total RES Studied	Current Connected & Committed RES	Additional RES Headroom
Initial	1662 MW	+500 MW	-	2162 MW	1957 MW	205 MW
		-	+500 MW			
Follow Up	1662 MW	+1000 MW	-	2662 MW		705 MW
		-	+1000 MW			

Table 1 Summary of RES volumes under assessment

5.1.1 High level discussion of Initial Study results

The studying of an addition of 500 MW and 1000 MW of RES generation provides an indication of potential curtailment and constraints at total RES generation levels of 2162 MW (Table 2) and 2662 MW (Table 3) respectively. In all of these scenarios an increase in both curtailment and constraints can be seen. In both locations it can be seen that additional RES will result an increase in curtailment levels with the increase in the western scenarios being greatest. This is due to the fact that in the western study we are adding more wind, which is highly correlated with the current mix of intermittent generation.

The addition of further wind will impact on existing wind farms since they are competing for market share and will reduce the incumbents' revenues. The studies showed that existing constraints (i.e. network issues) in the west are further exacerbated with the connection of additional generation in that location.

Study	Base Case		Add 500 MW RES - East		Add 500 MW RES - West	
	Constraint	Curtailment	Constraint	Curtailment	Constraint	Curtailment
Climate Year 2009	0.0%	6.0%	1.0%	7.0%	1.0%	8.0%
Climate Year 2013	0.0%	4.0%	0.0%	5.0%	1.0%	6.0%

Table 2 Impact of additional 500 MW RES on base case - Curtailment & Constraints

Study	Base Case		Add 1000 MW RES - East		Add 1000 MW RES - West	
	Constraint	Curtailment	Constraint	Curtailment	Constraint	Curtailment
Climate Year 2009	0.0%	6.0%	0.0%	9.0%	2.0%	11.0%
Climate Year 2013	0.0%	4.0%	0.0%	7.0%	2.0%	9.0%

Table 3 Impact of additional 1000 MW RES on base case - Curtailment & Constraints

5.1.2 Further Study to minimise curtailment levels

The discussion with the CIWG members of the initial study results led to a question: Do the levels of curtailment indicated by the analysis mask the underlying network constraint? It was requested that results were presented to show the specific impact on Northern Ireland rather than the All Island impact as presented in the initial studies. In order to determine this, further studies were carried out. The studies were set up so that "surplus" curtailed energy could be exported from the Northern Ireland system. The modelling approach artificially increased interconnector capacity and further relaxation of operational rules, therefore minimising the curtailment, so the underlying constraint could be assessed. Constraints and curtailment values, averaged across all nodes (substations) in the East and West study areas, were presented.

5.1.3 Discussion of Study to minimise curtailment Results

The results of the assessment show that the connection of an anticipated 1000 MW of additional generation in the east of Northern Ireland would increase curtailment and constraints. Locating this additional 1000 MW generation in the west would create a "worst case scenario" having an impact on total curtailment and constraints experienced by existing generation capacity located across the whole system, including the east.

Looking specifically at constraints (shown in Appendix 3 Figure 11) it can be seen that the average NI nodal constraint value based on 1000 MW additional generation is in the order of 2.1 – 8.6%. It is important to note that as this is an average nodal value; there will be nodes that could experience less or far in excess of this average value.

Study	Curtailment & Constraint NI %	Curtailment & Constraint West NI %	Curtailment & Constraint East NI %
Base case	7.3%	7.3%	6.7%
Base Case + 1000 MW East	11.1%	11.3%	10.9%
Base Case + 1000 MW West	19.6%	20.5%	13.4%
	Average Nodal Constraint in NI	*Average Nodal Constraint seen by generation located in West NI*	*Average Nodal Constraint as seen by Generation located in East NI*

Table 4 Impact of additional 1000 MW RES on base case - Curtailment & Average Nodal Constraint Combined

Study	Potential Constraint NI %	Potential Constraint West NI %	Potential Constraint East NI %
Base case	1.3%	1.3%	0.7%
Base Case + 1000 MW East	2.1%	2.3%	1.9%
Base Case + 1000 MW West	8.6%	9.5%	2.4%
	Average Nodal Constraint in NI	*Average Nodal Constraint seen by generation located in West NI*	*Average Nodal Constraint as seen by Generation located in East NI*

Table 5 Impact of additional 1000 MW RES on base case - Average Nodal Constraint Only

5.2 Uncontrollable Generation Limit Study Update

The majority of generation under 5 MW is uncontrollable. For those applicants who are less than 5 MW, SONI and NIE Networks need to ensure that connecting this generation would not bring NI beyond the uncontrollable generation limit and risk the system stability issues as set out in detail in section 4.3. In the ACAOP 2016 paper SONI and NIE Networks set out the issue of uncontrollable generation and presented limits to maintain system stability. As part of the ongoing ACAOP process SONI have worked with NIE Networks in managing the operational limit for uncontrollable generation.

SONI have identified that managing the impact of surplus electricity caused by uncontrollable generation is becoming increasingly challenging. The connection of further generation of this nature could result in significant operational risk for the system. Due to the risk associated with breaching the uncontrollable limit and the complexity involved in coming up with a solution SONI and NIE Networks have not highlighted the proposed way forward to overcome this uncontrollable generation limit in this paper. SONI and NIE Networks will review the current process and propose a way forward for distribution applications less than 5 MW.

5.3 Conclusion of Technical Studies and considerations for way forward

- Constraints will increase particularly if generation locates in the west
- Constraints improve if the network is reinforced or if demand is increased in the constrained area e.g. new industrial demand or demand increases with the uptake of low carbon technologies – there is no certainty around approval of additional network reinforcements to provide firm capacity or of third party investments in demand at present
- Curtailment is not paid for or grandfathered
- At times of low system demand if SONI control room can't switch off uncontrollable generation so that large scale generation is further curtailed. Connecting more uncontrollable generation may increase curtailment for controllable generation and introduce a risk to system stability and security, as explained in Section 4.4.
- New SSG export applications may need to be made controllable following further review.

6 Proposed Ways Forward

The Department for the Economy (DfE) appointed external consultants in February 2019 to carry out research on the future of renewables in Northern Ireland including consideration of the potential for a new renewable electricity target. This work is an important step for the Department in considering its approach to facilitating growth in renewable electricity generation going forward. This will form part of a wider NI Energy Strategy which will be consulted on during 2020. It is likely that this new NI energy strategy and policy will require a shift in both network investment decisions and the approach taken to connections applications. It was recently announced that the Irish government is aiming for at least 70% of Republic of Ireland's electricity supply to be generated from renewables by 2030.

In anticipation of progressive RES-E policy and having regard to the analysis set out in this paper NIE Networks and SONI wish to support industry by seeking their input into how new applications to connect to the distribution system should be managed.

NIE Networks and SONI have set out a number of approaches below for consideration by industry:

- **Approach 1: Maintain Status Quo** - Maintaining the existing ACAOP process
- **Approach 2: NIE Network Issues Non-Firm Market Access Distribution Offers for Large Scale Generation (5MW and above)** – Offers issued provided there is transformer capacity
- **Approach 2A- NIE Network Issues Non-Firm Market Access Distribution Offers for Large Scale Generation (5MW and above) within an agreed MW limit** – Offers issued provided there is transformer capacity and within an agreed total RES limit

These potential approaches are set out in more detail below.

6.1 Approach 1: Maintain Status Quo

NIE Networks would continue to only provide terms for connection for distribution applicants who are in areas of firm capacity at both Transmission and Distribution level. Applications to connect in areas where there was no firm capacity would be issued refusal letters.

In maintaining the status quo NIE Networks would continue to assess each distribution generation application in line with the key principles set out in the ACAOP for the distribution capacity assessment process. This assessment considers capacity issues on the distribution system, whether the solution to the distribution capacity issues is chargeable, whether the connection would have an impact on the transmission system and if this impact drives the need for additional reinforcement under the terms of the ACAOP. In the event that there are capacity issues under these terms NIE Networks would issue the applicant with a refusal to connect due to lack of capacity. The process is illustrated in Figure 4 below. In this example a connection offer would be issued to Applicant 1 but would not be issued to Applicant 2, as there is no remaining firm access to the transmission system.

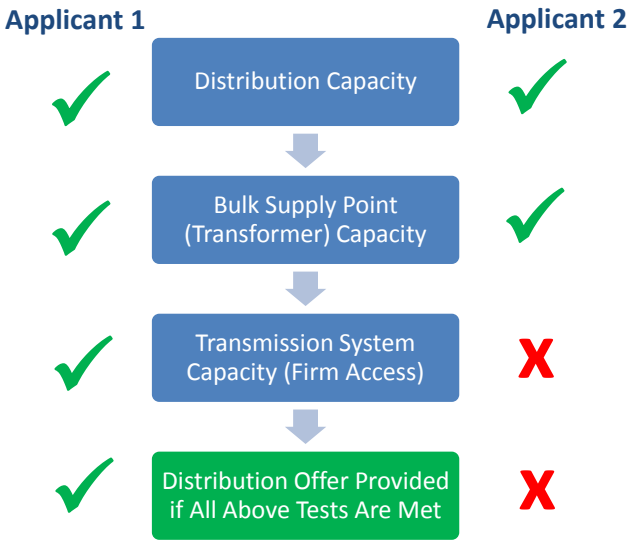


Figure 4: Current ACAOP Distribution Capacity Assessment Process

Once a generation application is deemed valid, NIE Networks will determine if terms for connection can be issued as outlined in Appendix 2, by first determining if there is Distribution System capacity available for the applicant by carrying out preliminary connection studies in line with its policy[17]. The preliminary design will also consider possible route length and preliminary specification of the design.

If there is no distribution system capacity available for the export of power from the Generating Unit, NIE Networks will issue the applicant with a refusal to connect on lack of capacity[18].

If NIE Networks finds no capacity restrictions or safety concerns which cannot be charged to the customer in line with the current NIE Networks Statement of Connection Charges and where there may be a transmission system impact (as typically applies to all applicants seeking export capacity), NIE Networks will refer the application to SONI to determine if there is transmission system capacity available for the applicant in question.

SONI's assessment for a distribution offer determines if there is capacity is terms of:

- Bulk Supply Point Transformer Capacity
- Firm Transmission Capacity – can this applicant be connected without the need for any further transmission reinforcement (other than those which have already been identified to achieve NI's 40% renewables target)

If an application fails any of the above SONI will advise NIE Networks that there is no transmission system capacity available or that the application exceeds the uncontrollable limit. NIE Networks would therefore issue the customer with a refusal.

[17] Policy 21/006 –'Determining Distribution Capacity for Generation Connections'

[18] NIE Networks is exempt from making a connection in the circumstances set out by the Distribution Licence Condition 30 and Article 21 of the Electricity Order (NI) 1992.

Where an application passes all the relevant transmission tests and SONI determines transmission system capacity is available, NIE Networks will carry out further design of the connection in line with its policies[19]'. If NIE Networks finds no capacity restrictions or safety concerns which cannot be charged to the customer in line with the current NIE Networks Statement of Connection Charges, NIE Networks will proceed to preparing offer of terms for connection. This is the position for Applicant 1 within Figure 4.

NIE Networks will confirm the appropriate milestones as detailed in NIE Networks' 'Distribution Application and Offer Process Statement' in the offer of terms for connection depending on the type of connection being offered and the evidence provided to NIE Networks prior to terms being offered. For applicants who have an application for a generator with a, 'Maximum Export Capacity' (MEC) of greater than or equal to 5MW, A FAQ report will be issued by SONI following confirmation of planning permission. FAQs are calculated and issued by SONI under the arrangement consulted[20] on in 2013, where an applicant queue position in the FAQ process is determined by the later of application date or date of receipt of planning permission. This FAQ report will identify the ATRs required to give the generator full FAQ. It is important to note that if an applicant choses to apply for a connection to NIE Networks ahead of receiving planning permission, it is likely that given the current FAQ process, this applicant will have to decide whether to or not accept their distribution offer of terms ahead of receiving their FAQ report.

6.1.1 Advantages and Disadvantage of Approach 1

The advantages of maintaining the status quo are that:

- Applicants are directed to areas where capacity is available therefore minimising the impact of future connection on constraint and curtailment on existing and new generators.
- The applicant has more certainty around deeper network reinforcements associated with their connection

The disadvantages with maintaining status quo are:

- NIE Networks will continue to issue refusals to applicants applying for connection in the West of Northern Ireland except clusters where capacity is available
- There is the potential that NIE Networks could get to a point there is very limited scope to issue distribution export offers if the transmission system capacity becomes saturated in the East of Northern Ireland and at existing Cluster substations.
- The disparity between the distribution and transmission connection process would continue i.e. under its licence SONI must offer terms to connect to applicants seeking a connection to the transmission system. For example a generator seeking a distribution connection in the west would likely receive a refusal from NIE Networks, however if they applied to SONI to connect to the transmission system they would receive an offer.

[19] https://www.nienetworks.co.uk/documents/distribution-generation-application-and-offer-proc.aspx

[20] http://www.soni.ltd.uk/media/documents/Consultations/Generator%20Connection%20Process%20Decision%20Paper%20-%20July%202013.pdf

6.2 Approach 2: NIE Network Issues Non-Firm Market Access Distribution Offers for Large Scale Generation (5MW and above)

Approach 2 differs from the existing ACAOP approach by removing the requirement for firm transmission system when assessing an application for a distribution connection. Figure 5 below sets out this process at a high level. This would mean that provided all distribution capacity requirements were met and there was available bulk supply point capacity at the relevant node, an offer would be issued. This process is illustrated in Figure 5 below. In this example a connection offer would be issued to Applicant 1 but would not be issued to Applicant 2, as there is no BSP transformer capacity.

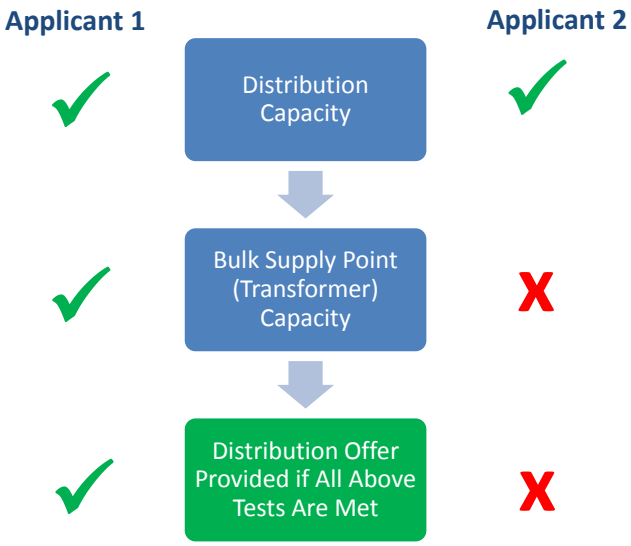


Figure 5 Approach 2: Non-Firm Distribution Offers for Large Scale Generation

Following confirmation of planning permission SONI will carry out an FAQ assessment for projects that have received a connection offer. With residual firm capacity existing mostly in the east it is likely that applicants will receive only a partial or potentially zero FAQ level i.e. non-firm market access.

The applicant would be provided with a high level outline of ATRs required to bring their project to full FAQ. These ATRs will be developed under SONI's 4 Part Process for Grid Development, and as such can only be described in general rather than specific terms at the offer stage. These will continue to be progressed as projects where regulatory funding can be secured. To date energy policy has played a major role in supporting the approval of funding system reinforcements driven by renewables.

Figure 6 below provides a high level comparison of the assessment process for Approach 1 and Approach 2.

System Requirement	Approach 1	Approach 2
Distribution Capacity	Must be available	Must be available
Bulk Supply Point (Transformer) Capacity	Must be available	Must be available
Transmission System Capacity (Firm Access)	Must be available	No longer necessary

Figure 6: ACAOP Approach versus Approach 2

6.2.1 Advantages and Disadvantages of Approach 2

The main advantages of Approach 2 are:

- NIE Networks will be able to issue a more distribution connection offers than under Approach 1.
- Distribution connection offers will be issued regardless of location (i.e. east and west) provided bulk supply point capacity is available.
- Provides greater parity between applicants to SONI for transmission connections and those applying to NIE Networks for distribution connections
- It provides industry with the chance to maintain momentum with delivering controllable generation projects to the distribution network ahead of a new Energy Policy. This also enables projects to be better positioned in the FAQ process to benefit from future reinforcements

The main disadvantages of Approach 2 are:

- This approach could lead to a high volume of applicants. This could have a significant impact on curtailment and constraints on both new generators and those generators already connected.
- Until new energy policy is in place there would be uncertainty around the approval of further system reinforcements specifically driven by RES-E generation.
- There will still be cases where applicants are refused due to lack of capacity at distribution level or transformer capacity at transmission level.

6.3 Approach 2A- NIE Network Issues Non-Firm Market Access Distribution Offers for Large Scale Generation (5MW and above) within an agreed MW limit.

Approach 2A is essentially the same approach as Approach 2 with the exception that the total MW volume of distribution generation offers issued would be managed within an agreed limit. Offers to connect to the distribution system would be issued provided both distribution system and bulk supply point capacity existed and the agreed total MW limit was not breached. This approach is set out at a high level in figure 7 below. In this example a connection offer would be issued to Applicant 1 but would not be issued to Applicant 2, as the MW limit has been reached.

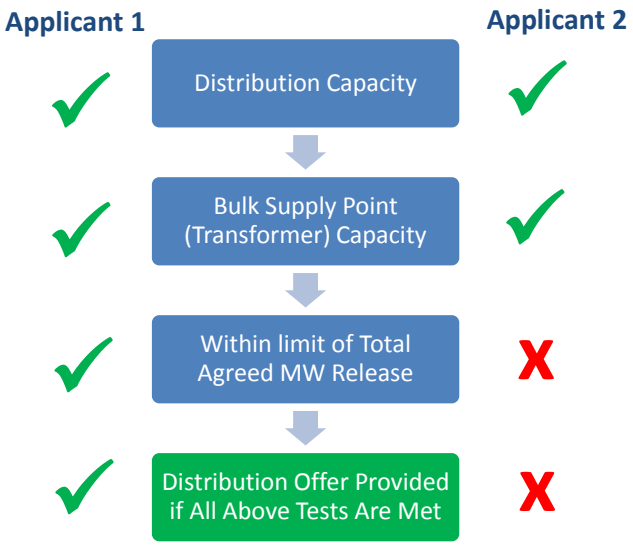


Figure 7 Approach 2A: Non-Firm Distribution Offers for Large Scale Generation within limits

It would be envisaged that this would be an interim approach until a new Strategic Energy Framework (SEF) was put in place. In determining a MW limit a number of considerations could be factored in e.g. projected RES – E target volumes set out in Tomorrow's Energy Scenarios Northern Ireland 2019[21], potential locational restrictions and treatment of technologies such as batteries.

SONI and NIE Networks believe that an interim MW level should be 206 MW in order to meet the 2025 Target outlined in the Addressing Climate Change Scenario in the TES NI. This additional 206 MW would bring the constraints and curtailment values similar to the studies outlined in section 5 where average nodal constraints and curtailment values are below 10%.

6.3.1 Advantages and Disadvantages of Approach 2a

[21] http://www.soni.ltd.uk/media/documents/TES-NI-2019-Consultation.pdf

The main advantages of Approach 2a are:

- NIE Networks will be able to issue more distribution connection offers than under Approach 1.
- Distribution connection offers could be issued with consideration to some additional defined criteria e.g. location (i.e. east and west)
- Provides greater parity between applicants to SONI for transmission connections and NIE Networks for distribution connections
- It provides industry with the chance to maintain momentum with delivering controllable generation projects to the distribution network ahead of a new Energy Policy. This also enables projects to be better positioned in the FAQ process to benefit from future reinforcements
- Limit could provide some longer term protection around the level of constraint and curtailment level experienced by new and existing connected generators.

The main disadvantages of Approach 2a are:

- Fewer distribution connection offers will be issued than under Approach 2
- Offers issued may increase the impact on curtailment and constraints on both new generators and those generators already connected.
- There still will be cases where applicants are refused due to lack of capacity at distribution level or transformer capacity at transmission level.
- This limit may be reach quickly if large MW transmission applicants apply.
- Uncertainty in managing the risk or lost opportunity in predicting a potential new RES-E target.

7 Consultation Questions

SONI and NIE Networks are seeking views from industry and other interested parties on the proposed ways forward for the connection process for applicants to the distribution network. In particular we would welcome your responses to the following questions.

Approach 1:

Q1. Do you agree with the advantages and disadvantages associated with Approach 1 as set out in this paper?

Q2. Are there any advantages or disadvantages with Approach 1 which has not been identified?

Q3. Do you believe that NIE Networks and SONI should maintain the status quo in relation to distribution connection offers until new RES policy is implemented?

Please set out the rationale for your response.

Approach 2:

Q4. Do you agree with the advantages and disadvantages associated with Approach 2 as set out in this paper?

Q5. Are there any advantages or disadvantages with Approach 2 which has not been identified?

Q6. Do you believe that NIE Networks and SONI should change the distribution offer process to enable the issue of offers with Non-firm market access to LSG generation where there is capacity in the distribution system and transformer capacity at bulk supply points?

Please set out the rationale for your response.

Approach 2a:

Q7. Do you agree with the advantages and disadvantages associated with Approach 2a set out in this paper?

Q8. Are there any advantages or disadvantages with Approach 2a which has not been identified?

Q9. Do you agree with SONI and NIE Networks MW limit of Non-Firm Market Access? If you believe other rationale should be considered please outline what and how this should be used.

Preferred Option

Q11. Which of the approaches outlined in this consultation is your preferred approach?

Q12. What do you believe should trigger a further review of the decisions that arise from this consultation?

8 Next Steps

Key Milestones	Proposed Dates
Consultation Release	20 December 2019
Consultation Workshop	Week commencing 27th January 2020 (details to be circulated via mailing list and website)
Consultation Close	28th February 2020
Decision Paper	Spring 2020

NIE Networks and SONI invite interested parties to respond to this consultation. Responses should be sent electronically to ConnectionDesign@NIENetworks.co.uk and Connections@soni.ltd.uk by **4pm on Friday 28th February 2020.**

Respondents who wish that their response remain confidential should highlight this when submitting the response. SONI and NIE Networks may share responses with UR. Respondents should be aware that as UR is a public body and non-ministerial government department, the UR is required to

comply with the Freedom of Information Act (FOIA)[22].

22 The effect of FOIA may be that information contained in consultation responses that is shared with UR is required to be put into the public domain. Hence it is possible that all responses made to this consultation that may be shared with UR will be discoverable under FOIA, even if respondents ask for the responses to be treated as confidential. It is therefore important that respondents take account of this and in particular, if asking that the responses are treated as confidential.

Appendix 1: Connection Innovation Working Group Terms of Reference

Overview

Responses from industry to the Consultation on Connecting Further Generation in Northern Ireland published by NIE Networks and SONI in January 2018, welcomed the proposed establishment of a Connections Innovation Working Group. This was in recognition that, with limited policy support for investment in transmission reinforcements further to those required for already contracted generation, alternative connection methods should be investigated to better exploit existing transmission capacity where practical.

SONI and NIE Networks believe it would be prudent for all stakeholders and industry to gain a greater understanding of the impact of various solutions proposed from a system position and commercially for industry. NIE Networks and SONI are committed to bringing forward an overall strategy which will address these matters in a co-ordinated way, subject to what is within the remit of NIE Networks and/or SONI.

Aim

To find solutions that facilitate the connection of further Distributed Energy Resources (DER-Generation & Storage) in Northern Ireland, which are technically and commercially feasible for the Network and System Operators and for DER developers/operators of both new and existing projects.

The group must also ensure that any decisions on solutions are published in a timely manner.

Areas in scope

1. Connection offers with no Firm Access Quantity on a long term basis

This area will include investigation of:

- The technical feasibility of allowing connections to be made on a potentially permanent basis with no firm access quantity and how this can be managed by the TSO.
- The commercial viability of such connections for DER operators of new and existing projects, taking account of factors including:
    - Constraint/curtailment information and forecasting;
    - Network chargeability issues.
- How these connections sit within current and future market arrangements.
- How the network capacity allocation and connection process would operate for these connections.

In assessing the above the impact of further generation will be understood. Subject to the outworkings of the above the following may also form part of the scope:

2. Active Network Management Schemes

This area will include investigation of:

- Identifying areas on the network with sufficient potential for ANM
- The technical feasibility of such schemes

- The commercial viability of such connections for DER operators, including:
    - Constraint/curtailment info and forecasting;
    - Network chargeability issues.
- How the capacity allocation, queuing and connection process would operate for these connections. (E.g. Individual or Clustering approach, Last-In-First-Out vs shared constraint etc.)
- Contractual arrangements
- Potential to scope area(s) for trial dependent on progress made in the areas above

DELIVERABLES

1. Decision on implementation of Zero FAQ Offers for Connected Generation
2. Decision on potential use of Active Network Management Schemes
3. Potential revised policies

ADMINSTRATION OF THE WORKING GROUP

The working group will be administered as follows:

ESTABLISHMENT AND MEMBERSHIP

The members of the working group will include at least;

- 3 representatives from the TSO (SONI)
- 3 representatives from the DNO (NIE Networks)
- 6 representatives for DER developers/operators
- 3 representatives from DS3 project developers
- 1 representative from Utility Regulator
- 1 representative from DfE

In late July SONI and NIE networks will be seeking expressions of interest from industry to join the working group via the Consultation, RGLG, Grid Code and Distribution Code mailing lists. SONI and NIE Networks will review applicants in respect of relevant experience and interest in the group.

It is expected that members of the group represent the interests of industry and not just their own commercial position. Therefore members should take an active role in the dissemination of relevant information to industry.

NOTICE OF MEETINGS

All meetings shall be called by the Secretary on at least ten (10) business days written. The notice of each meeting shall be given to all members of the Connections Innovation Working Group and shall contain the time, date and venue of the meeting, an agenda and a summary of the business to be conducted.

Minutes

The Secretary shall circulate copies of the minutes of each meeting to each member of the Connections Innovation Working Group as soon as practicable (and in any event within ten (10) Business Days) after the relevant meeting has been held. Each member shall notify the Secretary of the member's approval or disapproval of the minutes of each meeting within ten (10) Business Days of receipt of the minutes. A Member who fails to do so will be deemed to have approved the minutes. If the Secretary receives any comments on the minutes, the Secretary shall then include those aspects of the minutes upon which there is disagreement into the agenda for the next meeting of the Connections Innovation Working Group.

TIMESCALES

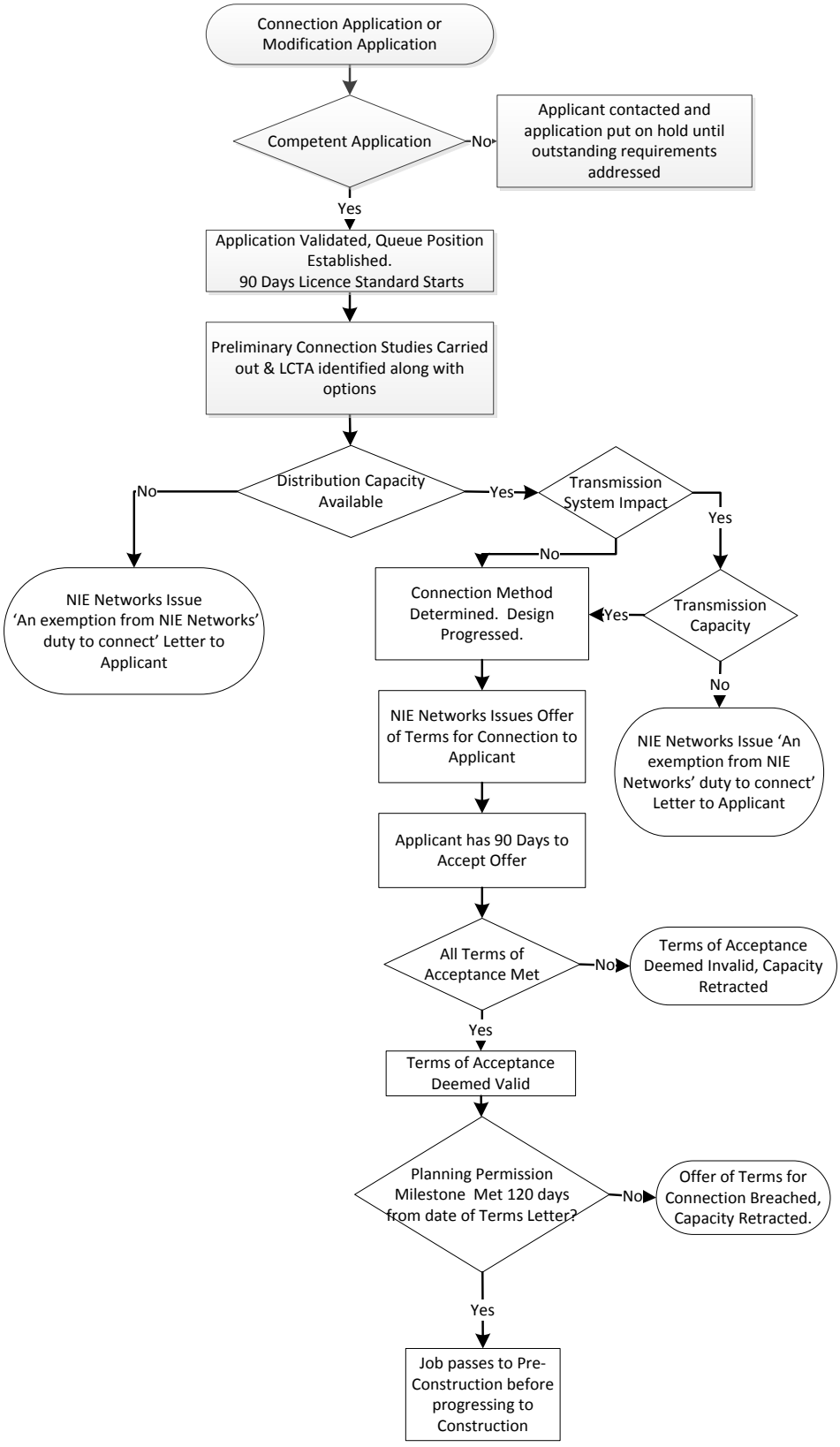
Key Milestones	**Proposed Dates**
Expression of Interest called for	27 July 2018
Expressions of Interest closed for all stakeholders	17 August 2018
Connections Innovation Working Group participant list finalised	7 September 2018
Connections Innovation Working Group first meeting held.	End of September 2018

Milestones and timelines will be agreed at the first Connection Innovation Working Group.

In order to establish the terms of the group a number of meetings in close succession may be required initially. Once established this will revert to at least quarterly (this will be reviewed throughout the lifetime of the Connections Innovation Working Group and the meeting frequency will be adjusted as necessary).

It is expected that the meetings will be held in two locations (SONI Offices – Castlereagh House and NIE Networks Offices – Channel Wharf)

9 Appendix 2: NIE Networks Current Distribution Offer Process



10 Appendix 3 - CIWG Study - Impact of connecting further generation on Constraints and Curtailment

The connection of further generation will impact of the current levels of constraints and curtailment. SONI's Northern Ireland Constraints Report 2016[23] provided information on the possible levels of generation output reduction for the period 2016-2024. These output reductions are made up of both constraints and curtailment.

SONI carried out analysis to assess the impact of further generation connecting to the distribution system beyond that considered in the 2016 constraints report and to inform the discussions at the CIWG. The analysis used the 2016 report as a reference point for ease of comparison.

10.1 Scope of Analysis

The constraints and curtailment analysis studied the impact of connecting additional generation to the Northern Ireland system. For clarity the study volumes were based on additional blocks of generation relative to the levels set out in the Northern Ireland Constraints Report 2016. The base case study year used from the report was 2019 and assumed initially a total of 1662 MW RES connected to the system.

For the new study, the initial four study cases were:

- Adding a 500MW mix of wind, PV and AD connecting to the network in the west, more focused on wind given current indication for applicants *(total RES 2162 MW)*
- Adding a 500MW mix of wind, PV and AD connecting to the network in the east, a strong emphasis on PV due to the current trends shown by applicants. (total RES 2162 MW)
- Adding a 1000MW mix of wind, PV and AD connecting to the network in the west, more focused on wind given current indication for applicants. *(total RES 2662 MW)*
- Adding a 1000MW mix of wind, PV and AD connecting to the network in the east, a strong emphasis on PV due to the current trends shown by applicants. *(total RES 2662 MW)*

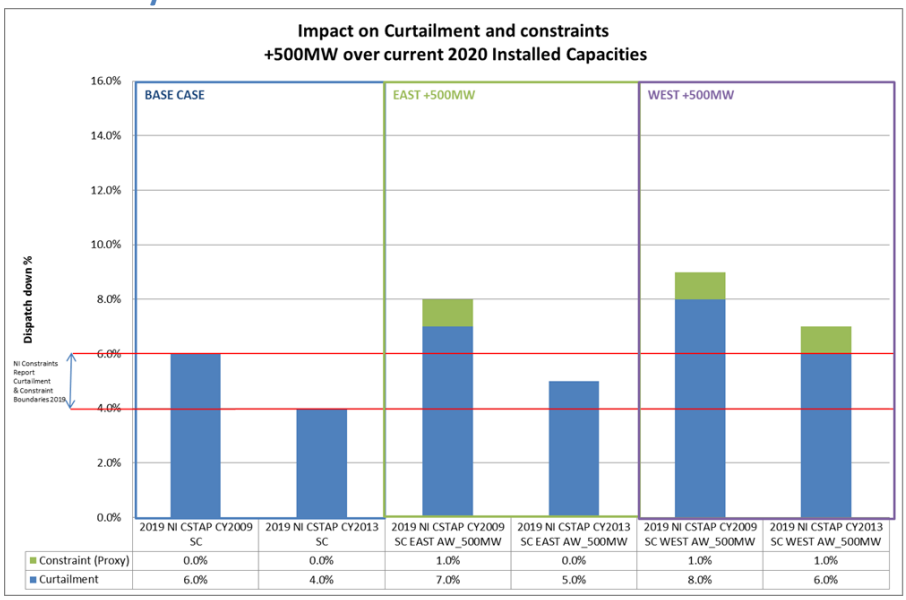
The generation was added to the base case used in the Northern Ireland Constraints Report 2016. High level study assumptions included:

- Base case study year 2019 from the Northern Ireland Constraints report
- 2 climate years (2009 & 2013)
- Assumes RoCoF changes have enabled SNSP level of 70% consistent with NI constraints Report 2016
- SRMC modelling with security constrained dispatch for n-1 testing

[23] http://www.soni.ltd.uk/media/documents/Operations/SONI%20Northern%20Ireland%20Constraints%20May%202016.pdf

- Wind is dominant technology in both regions
- Highest concentration of PV in east
- All additional Wind and PV connecting is controllable
- The analysis assumes ROI RES levels of 3863 MW
- Study results shown impact on All Island basis

10.2 Study Results



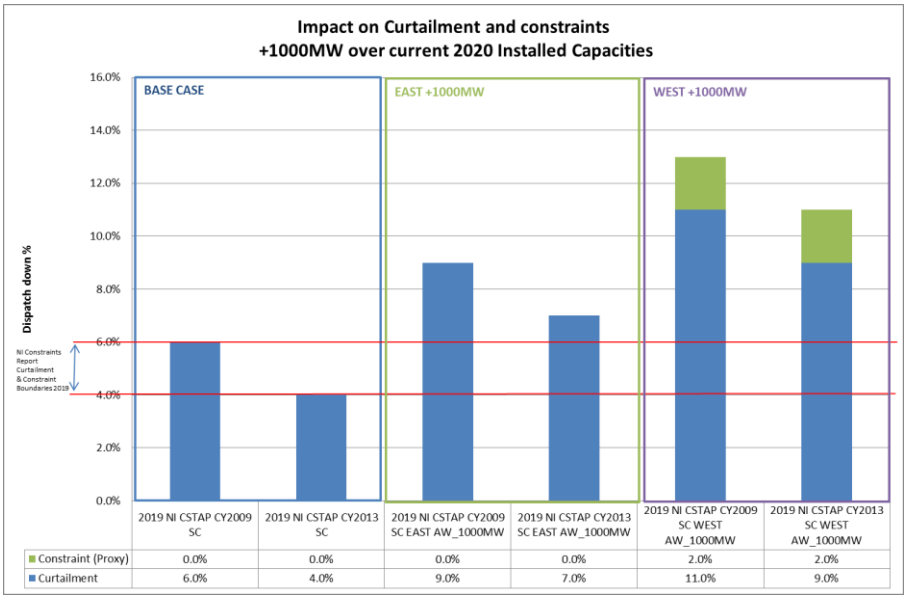
EAST Study +500MW

Node	Wind MW	PV MW	AD MW
Magherafelt	87.5	37.5	0
Kells	62.5	62.5	0
Hannahstown	37.5	75	12.5
Tandragee	37.5	75	12.5

WEST Study +500MW

Node	Wind MW	PV MW	AD MW
Magherafelt	87.5	37.5	0
Omagh	87.5	25	12.5
Coleraine	87.5	25	12.5
Rasharkin	87.5	25	12.5

Figure 8 Impact of the connection of additional 500MW RES



EAST Study +1000MW

Node	Wind MW	PV MW	AD MW
Magherafelt	175	75	0
Kells	125	125	0
Hannahstown	75	150	25
Tandragee	75	150	25

WEST Study +1000MW

Node	Wind MW	PV MW	AD MW
Magherafelt	175	75	0
Omagh	175	50	25
Coleraine	175	50	25
Rasharkin	175	50	25

Figure 9 Impact of the connection of additional 1000MW RES

10.3 High level discussion of results

The connection of an additional 500MW of RES on the 2016 NI constraints report base case brings the total under assessment to 2162MW. In both the 500MW scenario shown in Figure 8 and the additional 1000MW scenario shown in Figure 9 (which brings RES total to 2662MW) the increase in both curtailment and constraints can be seen. In both locations it can be seen that additional RES will result an increase in curtailment levels with the increase in the western scenario being greatest. This is due to the fact that in the western study we are adding more wind, which is highly correlated with the current mix of intermittent generation.

This tends to mean that adding additional wind will impact highly on existing wind farms since they are competing for market share and will reduce the incumbents' revenues. The studies also showed that existing network issues in the west were further exacerbated with the connection of additional generation in that location.

10.4 Further Study to minimise curtailment levels

The discussion of the initial study results led to a query being raised around whether the levels of curtailment indicated by the analysis were masking the underlying network constraint. It was also requested that results were presented to show the specific impact on Northern Ireland rather than All Island impact as presented in the initial studies. In order to determine this, further studies were carried out. These studies required the "surplus" curtailed energy to be exported from the Northern Ireland system through additional interconnection and further relaxation of operational rules.

10.5 Scope of Further Analysis:

Similar to the earlier analysis the study volumes were based on additional blocks of generation relative to the levels set out in the Northern Ireland Constraints Report 2016. The constraint analysis study assessed the impact of connecting additional generation to the Northern Ireland system. The two study cases were:

- Adding a 1000MW mix of wind, PV and AD connecting to the network in the west. *(Total NI RES 2662 MW)*
- Adding a 1000MW mix of wind, PV and AD connecting to the network in the east. *(Total NI RES 2662 MW)*

High level study assumptions for the additional Constraints Study included:

- Climate Year 2009
- 1000 MW of additional generation *(Total NI RES 2662 MW),* separately for both East and West locations
- Changes to the model to remove Curtailment
    - Second North South Interconnector,
    - 2000 MW of interconnection to Britain (1000 at Moyle and 1000 MW at EWIC),
    - Minimum Inertia limit reduced to 15000 MWs (was 20,000 MWs)
    - RoCoF requirement removed.
    - Large Generator must run requirement reduced from 7 to 5 (2 in NI and 3 in IE).

Constraints and curtailment values, averaged across all nodes (substations) in the East and West study areas, were presented.

10.6 Study Results

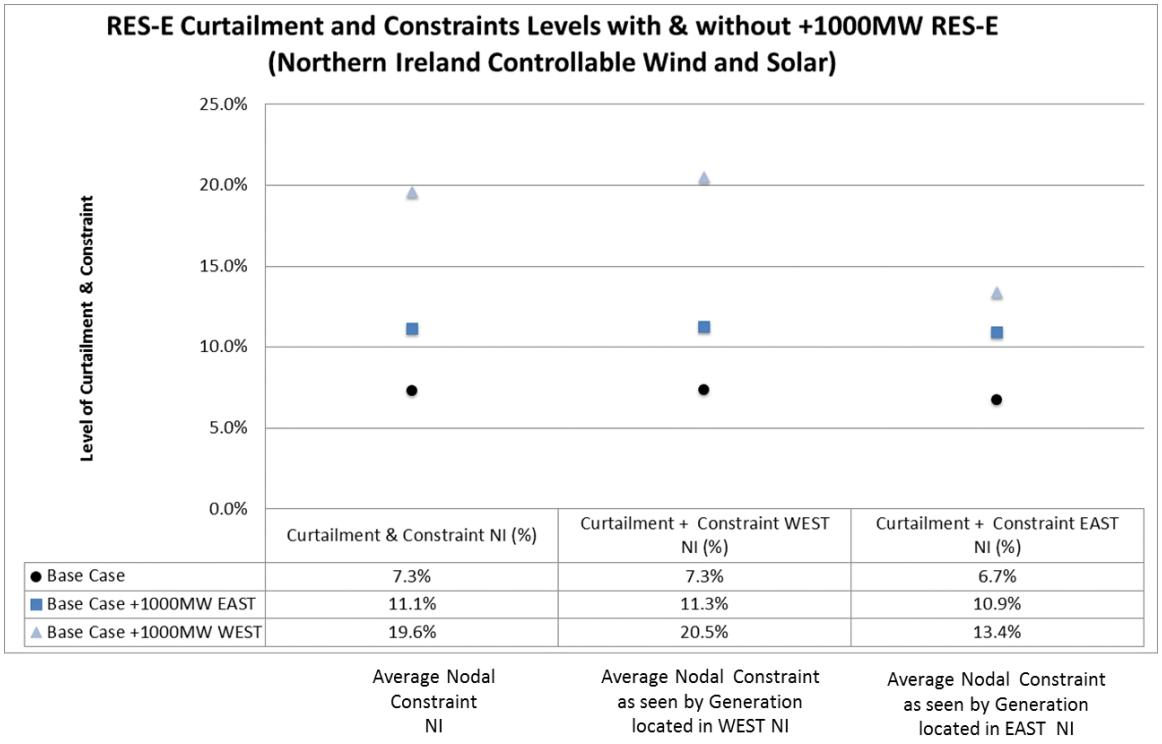


Figure 8 Curtailment and Constraints levels with additional 1000MW RES - Curtailment minimised

The results of the assessment (Figure 10) show that 1000MW of additional generation capacity in the east would increase curtailment and constraints. Locating this additional 1000MW generation in the west would create a "worst case scenario" that has an impact on total curtailment and constraints seen by existing generation capacity located across the whole system, including the east.

Looking specifically at constraints shown in Figure 11 it can be seen that the average NI nodal constraint value based on 1000MW additional generation is in the order of 2.1 – 8.6%. It is important to note that as this is an average nodal value; there will be nodes that experience both less and far in excess of this average value.

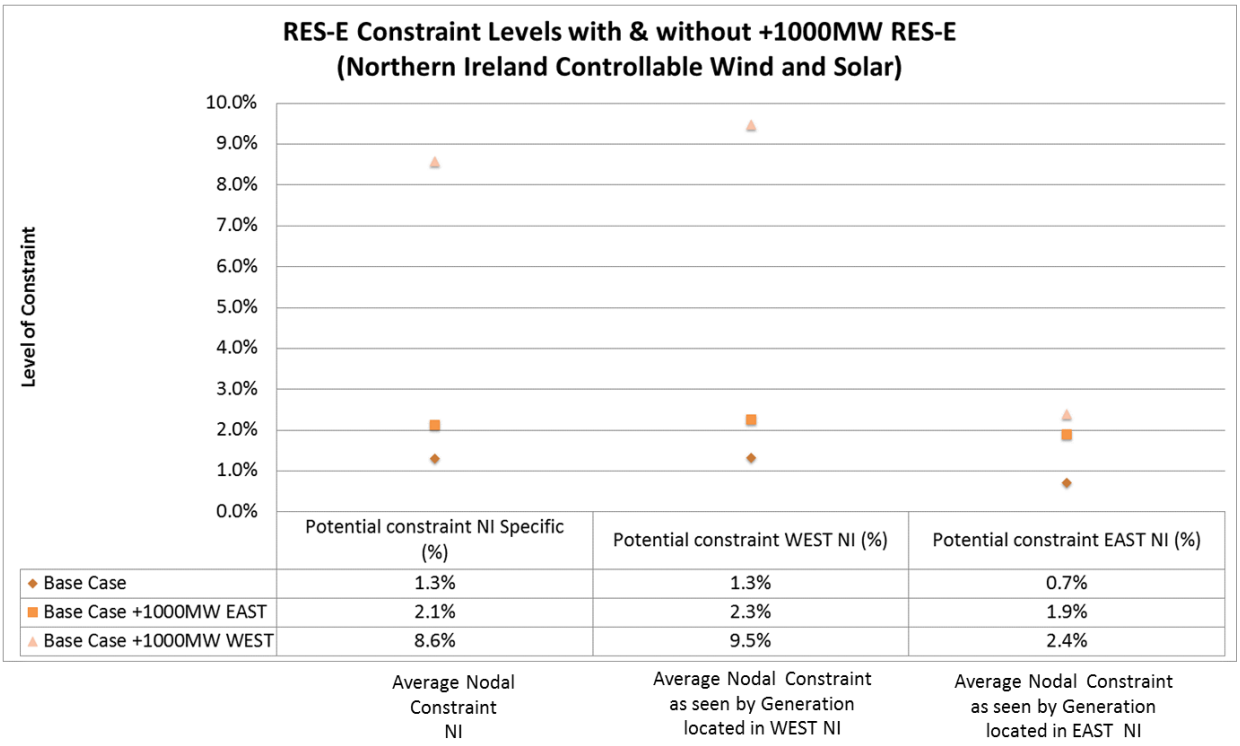


Figure 9: Constraints levels with additional 1000MW RES - Curtailment minimised