Public Consultation on Provision in HV and MV Capacity for Expected Future Growth in Microgeneration Connections

Smarter HV and MV Customer Connections Project

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Feedback to: innovationfeedback@esbnetworks.ie

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1. Introduction

1.1 Background

As part of an ongoing innovation project, ESB Networks issued a public consultation entitled *Smarter HV and MV Customer Connections – New Approaches to Distribution Planning and Security of Supply Standards,* in November 2019[1].

This public consultation followed a comprehensive review and analysis, in collaboration and consultation with stakeholders, of existing distribution network planning standards and new innovative approaches to distribution network development, both here in Ireland and internationally.

A key focus of the innovation project was to facilitate the connection of increasing amounts of Distributed Energy Resources (DER), including utility scale distributed generation, energy storage and microgeneration. Additionally, enabling the electrification of heat and transport, accounting for advancements in technology with a move towards a more active network management system and changing customer consumption were further key drivers.

The *Smarter HV and MV Customer Connections* consultation period closed on 13th December 2019, and following consideration of consultation responses and further work and analysis carried out by ESB Networks, a suite of three documents were submitted to CRU in March 2020, for their review and approval.

- Distribution Security of Supply and Planning Standards, Revision 3.3 [2]
- Non-Wires Alternatives to Network Development, Revision 1.2 [3]
- Non-Firm Access for Distribution Connected Distributed Generators, Revision 1.3 [4]

These documents cover general network development principles to cater for future expected load growth, the connection standards for new demand load and distributed generators, and the introduction of the use of flexibility, or non-wires alternatives, to conventional network reinforcements.

These standards were approved by CRU in September 2020 and have been published on the ESB Networks Website.

[1] https://www.esbnetworks.ie/docs/default-source/publications/public-consultation-on-the-smarter-hv-and-mv-customer-connections-project-0811195792622d46d164eb900aff0000c22e36.pdf?sfvrsn=f64306f0_0
[2] https://www.esbnetworks.ie/docs/default-source/publications/doc-170220-fom-distribution-system-security-and-planning-standards.pdf?sfvrsn=d99501f0_0
[3] https://www.esbnetworks.ie/docs/default-source/publications/doc-140220-fol-non-wires-alternatives-to-network-development.pdf?sfvrsn=659201f0_0
[4] https://www.esbnetworks.ie/docs/default-source/publications/doc-190220-fot-non-firm-access-for-distribution-connected-distributed-generators.pdf?sfvrsn=9b9501f0_0

1.2 Provision for Future Growth in Microgeneration Connections

Included in the standards approved by CRU, was a provision in HV/MV transformer capacity for expected future growth in microgeneration connections.

Microgeneration is defined by CRU[5] and ESB Networks as a source of electrical energy and all associated equipment, designed to operate in parallel with the ESB Networks low voltage (LV) system, and rated up to and including:

- 6 kW, when the network connection is single phase
- 11 kW, when the network connection is three phase

The size of this interim provision, to be applied in ECP2.1, is 30% of the capacity of one transformer, to be applied in the situation where a non-firm distributed generator connection is under consideration at a HV substation, as set out in Section 2.4 of the Non-Firm Access for Distribution Connected Distributed Generators document. For the avoidance of doubt, small generators with MECs in excess of the microgeneration limits above, e.g. those up to 50kW, termed minigeneration (see Section 5), are not considered in this capacity provision, as these generator applications require a technical study.

Without such a capacity provision, should high growth in microgeneration connections occur, the transformer capacity of the connecting HV substation could be exceeded, and the station may need to be uprated with higher capacity transformers, or a new HV substation built, which takes time to plan and develop, and in particular cases, transformer uprating may not be technically feasible if the station is already accommodating its maximum capacity. Providing a provision of 30%, which in a typical larger HV substation (2x10MVA transformers) would amount to no more than 3MW (equating to an export of 1000 units at 3kW), allows scope to accommodate more microgeneration export initially, but the overall quantity of microgeneration that can export through the station is still ultimately limited by the HV substation capacity. Obviously, a greater amount of microgeneration can connect and be used for self-consumption, as the system limits locally and at the HV substation are all related to the amount of microgeneration exported, not the amount installed.

This measure was proposed and approved as an interim approach for ECP2.1, to ensure a level of certainty for:

- Applicants and developers of distributed generation projects seeking connections under ECP2.1
- Customers installing or planning to install microgeneration
- ESB Networks, in assessing applications for distributed generation connections

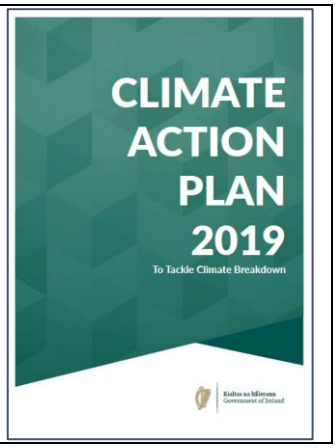
While this measure was approved by CRU in September 2020, a commitment was given to seek the views of stakeholders and interested parties, through a public consultation in late 2020.

[5] www.cru.ie/wp-content/uploads/2007/07/cer07208.pdf

2. Climate Action Plan 2019

2.1 Context

In June 2019, the Irish Government, through the Department of Communications, Climate Action and Environment (DCCAE), published the *Climate Action Plan 2019 – To Tackle Climate Breakdown*[6] (CAP) which sets ambitious targets to facilitate and enable the transformation to a low carbon future. The CAP outlines a target to increase electricity generated from renewable sources to 70% by 2030, as well as stating a commitment to *"a very significant increase in the level of clean, renewable energy"* to be *"achieved by a significant step change"*.

Climate Action Plan (CAP) Published in June 2019	

Microgeneration forms a key part of the aims of the CAP, and there are three specific microgeneration-related actions set out:

Micro-generation	
30	Develop an enabling framework for micro-generation which tackles existing barriers and establishes suitable supports within relevant market segments
31	Deliver pilot solar PV micro-generation scheme with a view to commencement of enduring support scheme by 2021, at the latest, to ensure that people can sell excess electricity they produce back to the grid
32	Deliver Smart Metering Programme in line with current planned timelines that will support the market for micro-generation

Figure 1: Actions 30, 31, 32 from CAP

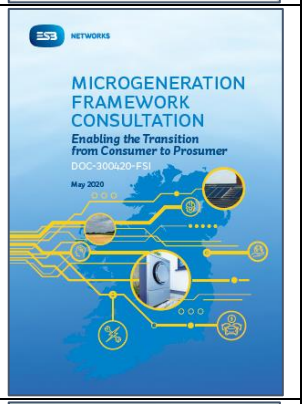
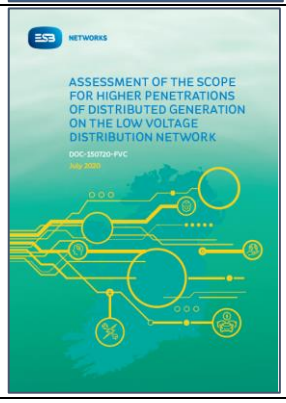
As the installation of domestic microgeneration is strongly supported under CAP and the introduction of a support scheme for export from domestic microgeneration installations is planned for mid-2021 (as stated, *'The Government strongly supports enabling people to sell excess electricity they have produced back to the grid*'), there is a reasonable expectation that further growth in this area will occur in the coming time.

[6] https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf

3. ESB Networks' Consideration and Facilitation of Microgeneration

3.1 ESB Networks' Publications

ESB Networks has facilitated the connection of microgeneration for some time; however its prominence has increased significantly since the publication of the CAP in 2019, and as a result of actions from the CAP, and other ongoing innovation activities, a number of public consultations and documents have issued from ESB Networks in the past year, covering the topic. The consultation periods for these documents are now closed.

Smarter HV and MV Customer Connections [7] Public Consultation issued in November 2019	
Microgeneration Framework [8] Public Consultation issued in May 2020	
Assessment of the Scope for Higher Penetrations of Distributed Generation on the LV Distribution Network[9] Document published in July 2020	

The primary focus of the impact of microgeneration connections is on the Low Voltage (LV) system, and this impact is covered comprehensively in the 'Assessment of the Scope for Higher Penetrations of Distributed Generation on the LV Distribution Network' document above.

[7] https://www.esbnetworks.ie/docs/default-source/publications/public-consultation-on-the-smarter-hv-and-mv-customer-connections-project-0811195792622d46d164eb900aff0000c22e36.pdf?sfvrsn=f64306f0_0

[8] https://www.esbnetworks.ie/docs/default-source/publications/microgeneration-framework-consultation---may-2020-final.pdf?sfvrsn=591d07f0_0

[9] https://www.esbnetworks.ie/docs/default-source/publications/assessment-of-the-scope-for-higher-penetrations-of-distributed-generation-on-the-low-volage-distribution-network.pdf?sfvrsn=d2d501f0_0

However, the impact on higher voltage networks, when microgeneration is connected in high penetrations is also recognised and discussed in these public consultations and documents, as set out below.

Sections 6.3 and 6.5.6 of the 'Smarter HV and MV Customer Connections' public consultation highlights, that while the impact at time of writing was not considered material, it is considered an area to be kept under review:

> 6.3 Generation Connection Considerations
>
> 'A generator connection must ensure that the network capabilities in terms of thermal and voltage limits, power quality limits, short circuit capacity, and connected in a manner consistent with the long-term development of the electricity network in the area.
>
> The future growth of embedded generation at LV could reduce the headroom on voltage and thermal capacities for upstream generation connections, and this should be reflected by an allocation of the available upstream capacities to cover this impact. This is being kept under review and currently the impact is not material.'
>
> 6.5.6 Existing or Committed Generation Connections
>
> 'Any generators already connected or committed to connect must also be considered when determining available system capacity. Currently the impact of photovoltaic (PV) based generation at LV is not considered material but this may change in the future.'

Section 4.3 of the 'Microgeneration Framework' document discusses this aspect:

> 4.3 System Impact of PV at MV and Above
>
> 'In system terms and for high penetration rates:
>
> • PV microgeneration at LV may at times displace imports of electricity from MV connected generators upstream, requiring them to export more of their generation upstream. This could cause an increase in voltage at MV above required limits. However, this would require high penetration levels at LV which could take a significant time to develop.
>
> • Additionally, significant PV export from widespread microgeneration may also interact with other larger scale generation exports on associated upstream high voltage networks and hence require significant reinforcement'.

The potential impact is also noted on page 10 of the 'Assessment of the Scope for Higher Penetrations of Distributed Generation on the LV Distribution Network' document:

> 'There are also impacts upstream at MV from high levels of PV export, as such exports will add to exports from other generators and create potential bottlenecks at other upstream plant such as 38kV substations.'

4. Current Status of Microgeneration Connections

4.1 Microgeneration Connection Process

The current approved ESB Networks policy for the connection of microgeneration is on an 'inform and fit' basis[10], which facilitates the connection of microgeneration installations through a 'fast track' approach on a single page application form (NC6), with no application fee, and which generally does not require a formal network study, however under certain conditions a study might be required [11].

4.2 Microgeneration Connections

ESB Networks has facilitated over 18,5000 microgeneration grid connections to the distribution network. The majority of these of are 6kW or less (single phase connections), with a smaller number of connections up to 11kW (three phase connections).

These microgeneration connections are located throughout the distribution network, with concentrations in larger urban areas, typically where there are new housing developments recently completed.

The total accumulated MEC from these approved microgeneration connections is in excess of 45MW.

[10] www.esbnetworks.ie/docs/default-source/publications/conditions-governing-connection-and-operation-of-micro-generation-policy.pdf
[11] Certain limitations apply, as set out in the policy document.

5. Consultation Question:

Do you have any feedback or input on the current capacity provision level of 30% of one HV/MV transformer capacity for future growth in microgeneration connections to be used in technical assessments for distributed generation assessments from ECP2.2 onwards?

Do you have any alternate approach(es) that could be taken in the future, and please provide your rationale for those approaches?

Please send your feedback or responses to **innovationfeedback@esbnetworks.ie**

This consultation closes at 17:00 on Friday 29th January 2021

We look forward to your responses.