COGEN Europe Response: ENTSO-E's "Briefing Note to all interested parties on the status of the Network Code on "Requirements for Generators", of 17th December 2013

15 January 2013

On December 17th 2012, ENTSO-E responded with a Brief Note addressing the four areas of concern raised by ACER in its opinion on NC RfG of 13 October 2012. COGEN Europe would like to comment on the points ENTSO-E raised in the Briefing Note.

This response includes a summary of the Joint EHI and COGEN Europe Working Group proposals (2013-01-08) addressing the ACER opinion on NC RfG which most immediately affect type A modules particularly new market entrants and micro CHP (attached as Appendix 1 here). In addition, COGEN Europe comments on the justification of the significant deviations from existing standards and practices raised by ACER and included by ENTSO-E in their briefing note.

Briefing Note issue No. 2: Significance test to identify "significant grid user"

COGEN Europe believe that for a healthy innovation environment within Type A module micro generators a significance test should be used to minimize innovation risk due to advancing NC requirements the introduction of which into the significant grid user base is important for system stability. However this must be coupled with a modified derogation procedure to allow higher volume micro generation products to make a reasonable and orderly transition to high volume designs.

Significance test type A

COGEN Europe proposes **that a significant grid user test** should be established using the accumulated capacity impact of generating units on frequency as the guiding principle, as concerns cross-border issues. Frequency impact is linked to technology and the accumulated capacity test will refer to particular technology groups.

Given that there are a range of technologies within the type A generator category, each has its own and different characteristics with respect to the different Network Code articles and sub-clauses, there is no implicit accumulation of the behaviours which suggest that the capacity of different non-significant grid users' needs to be added. However, technologies with identical behaviours should be treated cumulatively.

A significant generator should be one whose accumulated capacity in a given technology around 0.1% of maximum system load in the respective synchronous zone. Studies[1] show that the maximum frequency impact of a technology with total capacity below this level would be 1/10th Hertz,and that the additional deviation of 100 mHz will not trigger the first level of the under frequency load shedding scheme at 49 Hz. The 0.1% level is a conservative estimate and higher accumulated penetrations may be possible.

The significant generator approach addresses the need to encourage innovation and provide proportional treatment in the type A generator class.

It gives developers a clear boundary to their sales volume before they must meet any changes in NC which emerge during development or early launch of a new technology.

The level proposed is such that any resulting frequency impact will not be significant.

A DSO records connections of new Type A modules and can track, and relay aggregate data to TSOs, so that the accumulated capacity by technology type, control area and synchronous zone level are available. With such low penetration only new or launching technologies of a small individual capacity could be deemed insignificant with under the Significance Test.

Under this system any type A generator with a new technology which has reached market volume will be obliged to conform to grid code requirements funded from ongoing volume sales. Detailed commentary on "significance test" and amendment proposals are provided in Appendix 1.

Derogation process

ENTSO-E proposes that the interests of highly invested new technologies can be covered by an extension of the derogation process to cover derogation with specific restrictions for defined technologies (**"certain types of technology"/ "Technology Groups")** and proposes introducing the possibility of **ACER convening** a Europe wide consultation process **(ensuring non-discriminatory and objective Europe wide-treatment for derogation**) for a nationally approved derogation initiated by a user.

COGEN Europe agrees with the conclusion that ENTSO-E has arrived at regarding the specific needs that a) the NC should allow technologies to be treated individually and b) the NC requires a process for pan-European derogation led by ACER. However COGEN Europe believes **that an amended derogation alone will not achieve the objectives** of giving clarity to investors and encouraging innovation. Using only the amended derogation approach described in the briefing note of 17th December is inadequate because it neither offers a practical solution nor removes unnecessary risk:

[1] M. Kurth, E. Welfonder: Importance of the Selfregulation Effect within Power Systems, IFAC Symposium on Power Plants and Power Systems Control, Kananaskis, Canada, 2006. Figure 3 shows the measured maximum frequency deviation Δf_{max} versus relative disturbance caused by tripping power plants. The graph shows a correlation of ~1 Hz per 1% referred disturbance power.

1) Restricting the original applicant to the grid user is not practical: The user of the network in the case of the very small Type A module is an individual home owner. It is unrealistic to expect that an end customer will make such an application for a product or that thousands of home owners should be expected to make individual applications. The manufacturer of Type A generating units acting on behalf of future and current consumers is the appropriate applicant for derogation.

2) Leaving the decision process even for very low penetration new technologies to a derogation process adds unnecessary additional risk and red-tape costs for innovation and puts a negative pressure on innovation. Firstly, a derogation process implies the threat that ultimately no derogation will be granted. The current NC draft does not specify an appeal procedure. Secondly, the process of applying for and being granted a derogation adds cost and elapsed time to a planned process which will have to be accounted for as a risk by investors.

The derogation process requires more extensive amendment than is proposed by ENTSO-E in the Briefing Note of 17th December.

- Manufacturers should be specifically cited as able to make such requests for type A modules. ACER should open a consultation process to check the non-discriminatory nature of any derogation **and** to decide on the request on extending a nationally granted derogation Europe-wide.
- There should be an effective process to establish a pan-European derogation.
- The time periods for such derogations should be proportionate to the type of change required and a minimum of 5 years for redesign of hardware should be considered.
- Non-exhaustive requirements of the network code (where technical requirements are incomplete) can be the subject of derogation.

This process will in coming years be the route to maintaining ongoing innovation in the distributed generation sector particularly and must be framed to support secure and safe grid operation while allowing adequate transition for economic engagement in this sector. The derogation procedure will be useful for fast track amendments in the Network Code. Detailed commentary on derogation and amendment proposals are available in Appendix 1.

<u>Briefing Note Issue No. 3Justification of the significant deviations from existing standards and practices</u>

a. <u>Fault-Ride-Through capability for type B generators (Article 9(3) (a))</u>

COGEN Europe acknowledges that it is desirable to introduce an enhanced level of Fault-Ride-Through requirements for type B generators in the NC RfG. However, COGEN Europe does not believe that the significant proposed additional requirements being requested in the NC have been justified with clear additional benefits in the case of type B generators. An example of the fault ride through requirement moving to a maximum clearance time of 250 ms in the new NC

illustrates the point. The 250ms level disregards the current baseline in grid operation practice, of largely 150 ms other than in the Nordic countries.

In the case of cogenerators, imposing the current proposals will require fundamental changes to design, which should be justified by ENTSO-E against alternative approaches at network level to merit this imposed cost on manufacturers and users.

In assessing the value of the changes proposed by the ENTSO-E NC, COGEN Europe asks that ENTSO-E provide a CBA, as outlined necessary in the Framework guidelines. The CBA should be carried out against accepted, transparently agreed parameters which for directly coupled synchronous generators include: the ability to deliver short circuit power, the effect of existing protecting schemes (distance relays), consideration of alternative network level approaches. Asymmetric fault ride through requirements may differ from symmetric faults and such level of precision should be included in the CBA.

Once a clear basis for the CBA is established, industry will find it much easier to provide the specific data which ENTSO-E requires. COGEN Europe members are ready to assist this process.
COGEN Europe recommends that ENTSO-E assesses (as part of the CBA) the adequacy and feasibility of modifying the Fault-ride-through parameters for type B and the overall scope of the change that is desirable.

Regarding the specific requirements of Fault-ride-through, COGEN Europe believe that a value of 150 ms for three phase faults, as the default value, is adequate when coupled with good network design. Any TSO with other regional needs can ask for derogation, and impose a stricter requirement, according to Article 53(5).

b. Combined Heat and Power units on industrial sites (Article 3(6) (h))

COGEN Europe welcomes ENTSO-E commitment to avoid undue discrimination that may occur as a result of Article 3 (6) (h). ENTSO-E acknowledges that steam is only one form of heat carrier in cogeneration processes and that, depending on the specific industrial process, other heat carriers will be employed. On this basis, ENTSO-E proposed an amendment to Article 3 (6) (h). In order to completely reflect the conclusions drawn by ENTSO-E and the ACER opinion, COGEN Europe proposes the following modifications to the Article in an attempt to improve text consistency

"Without prejudice to the general applicability of the requirements set forth in this Network Code, a requirement of this Network Code shall not apply to Power Generating Modules of facilities for combined heat and power production (CHP) embedded in the Networks of industrial sites in the following cumulative circumstances:
- the primary purpose of these facilities is to produce ***heat*** *for production processes of this industrial site;*
- the generation of ~~***steam***~~ ***heat*** *and power are rigidly coupled to each other, i. e. any change of* ~~***steam***~~ ***heat*** *generation results inadvertently in a change of Active Power generation and vice versa;*
- the Power Generating Modules are of Type A, B or C according to Article 3(6) (a) to (c); and

- the requirement is related to the capability maintain constant Active Power output or to modulate Active Power output other than Article 8(1) (c) and (e).”

Appendix 1: Micro-CHP Joint Working Group proposals to address the ACER opinion no 08/2012 on the Network Code on Requirements for Generators (NC RfG) drafted by ENTSO-E (08 January 2013)

Introduction

Following the stakeholder consultation of November 22nd the micro CHP stakeholders formed a Joint COGEN Europe – EHI extended Working Group to develop proposals for consideration by ENTSO-E in responding to the ACER opinion. This document presents the resulting proposals.

The ACER opinion no 08/2012, regarding the ENTSO-E NC RfG recognises that some amendments and elaborations are desirable and particularly requests that:

1) An appropriate enhancement of the significance test with a development of a credible methodology to take account of the identified user significance issues.

ACER highlights that at the moment the NC RfG …

2) … risks stifling innovation by imposing onerous requirements before they are justified and potentially preventing emerging technologies from entering the market in time to contribute to the 2020 targets.

The joint COGEN Europe – EHI extended micro CHP working group took the above two points as their point of departure and propose:

1) That a **significant grid user can be defined** and that the concept is necessary to encourage innovation in the micro generation sector. A significance test should be introduced as required by the Framework guidelines. The test should be based on a cumulative penetration in a single synchronous area which can be regarded as tolerable from its low potential to disrupt safe operation and take into account a thorough cost-benefit analysis. Given the likely low level of the cumulative penetration in the beginning of market introduction, this test will allow type A power generating modules to be considered more differentiated. Within the type A class only those that are either close to market or on the verge of series production at the point of NC change need special care to avoid barriers for new technologies. The methodology for significance should be based on a) an accumulated level of penetration whose simultaneous loss would result in a **loss of generation ≤ 0.1%** of maximum system load. b) The penetration level

should apply to the accumulated capacity of type A modules in specific technology groups. c) That the penetration level should apply for specific aspects of the Network Code.

2) That an amended derogation procedure is required such that a **manufacturer** shall be entitled on behalf of its customers to introduce **Europe wide** module derogation within type A. The Network Code should not be a static entity and periodic revisions will be needed to mirror new methods of grid operation with growing shares of distributed generation. For manufacturers bringing new products to market any uncertainty on future requirements adds to the risk of investment and can paralyse innovation. New products, initially niche products, have not the ability to refinance major design changes besides launching the core invention. The development of new technology needs a stable investment framework. Hence, manufacturers should be entitled to initiate a technology specific class action derogation procedure on behalf of their current and future customers.

3) That in practise for small type A generators the use of **product standards** is a far more effective method to achieve conformance to requirements than offered by the Network Code RfG. The process of standards development is well understood proportionate to the volumes and types of products in type A and an accepted process widely used within the implementation of EU legislation. It is one in which manufacturers are already prepared to bear the cost of this standardisation and DSOs are relieved of the administrative burden of certification for the numerous smaller units. The NC RfG should therefore be amended to include the procedure to provide a mandate to e.g. CENELEC for developing harmonized standards e.g. EN 50438. Standards harmonized to the NC RfG are listed in the OJEC – NC RfG and provide "presumption of conformity to comply with the NC RfG". This procedure is already used for other EU Directives such as LVD, GAD, PED.

The authors note the proposals by ENTSOE from 17th December and have incorporated a limited response to that proposal.

Significance test to identify "significant grid users"

Opportunity must be left for technologies in development and/or at market entry (low penetration) to make an orderly market launch independent of the periodic changes in the Network Code which become necessary.

The present Network Code proposal for generators seeks to provide a secure and safe supply of electricity in a high-renewables-grid with increased distributed generation. The Network Code considers cross border impacts. The Network Code covers matters of frequency and voltage stability and outlines an approach which would keep the grid within acceptable parameters. At the same time the authors agree with ACER that the Network Code should not discourage the entry into the market of innovative low carbon generating solutions. Nor should concerns about risk of managing a transition for a near

market product deter investment at a time when both innovation and a wide range of technologies are needed to meet our 2020 objectives and beyond. Hence the code must have provisions to allow for an orderly market entry of new technologies.

The priority issue for transmission grid operators is to maintain grid frequency stability under significant loss of generating capacity (cf. Operation Handbook - Policy 1: Load-Frequency Control and Performance). The most difficult situation to address is a major disturbance with a dynamic frequency drop beyond the design specification of a given synchronous area. Using this as the determining factor, the authors propose as a criterion for significance under frequency disconnection of a total installed capacity of approximately 0.1 % of maximum system load in the respective synchronous zone. Assuming a self-regulation effect of 1%/Hz as noted in UCTE's Policy 1, a loss of generation of 0.1% will result in an additional drop in frequency of an extra 1/10 Hertz. This is a conservative assumption as the real self-regulation effect is larger than the design basis given of Policy 1[2] and therefore the effect on frequency is lower.

While an additional 0.1 Hz drop is not desirable during a dynamic frequency reaction, it will not make an ongoing disturbance significantly worse. According to the ENTSO-E Draft Network Code for Load Frequency Control and Reserve (2012-09-14), Article 8, the maximum instantaneous frequency deviation is a target value of 800 mHz. Thus, the additional deviation of 100 mHz will not trigger the first level of the under frequency load shedding scheme at 49 Hz.[3]

Once the new requirements in the Demand Connection Code for temperature controlled devices such as fridges and heat pumps become effective, the response of the grid as a whole will be more frequency stabilizing and the impact of the loss of generation will be arguably even less problematic.

Given that there are a range of technologies within the type A generator category, each has its own and different characteristics with respect to the different Network Code articles and sub-clauses. There is no implicit accumulation of the behaviours which suggest that the capacity of different non-significant grid users' needs to be added. However, technologies with identical behaviours should be treated cumulatively. Hence a launching technology should be identified as one of the major types (directly coupled linear synchronous generator, fuel cell, steam engine, ORC cycle, internal combustion engine, etc.) or as new.

Proposal

[2] Kurth, Welfonder: Importance of the Selfregulation Effect within Power Systems, IFAC Symposium on Power Plants and Power Systems Control, Kananaskis, Canada, 2006.

[3] Any compensation by expanding the costly primary control reserve is fruitless, as primary control e.g. in RG Central Europe works only in the intervall 49,8 Hz – 50,2 Hz. The loss of generation will be compensated by the self-regulation effect, as primary control reserve is already used up in case the frequency is below 49,8 Hz.

A significant type A generator is one whose total installed technology capacity in a synchronous area as reported by the DSO's (EED directive requirement) and monitored by the Regulator (fit and inform requirement as exists) exceeds the values in the Table 1 below. A manufacturer introducing a type A generator of a technology which does not fully comply with the Network Codes should identify the technology according to major type or new.

Once the market penetration levels are reached by a grid user type then all new units being sold have to meet the ENTSO-E requirements.

Table 1

Synchronous area	Peak Load	Significance threshold
Continental Europe	425.8 GW	300 MW
Nordic	61.5 GW	50 MW
Baltic	4.5 GW	5 MW
Ireland	6.4 GW	5 MW
Great Britain	59.0 GW	50 MW[4]

The advantages of the significance test approach are listed below:

- It lowers the risks associated with investment and hence encourages innovation.
- It allows the manufacturer the opportunity to build market knowledge and adjust the design in response to market signals including volume growth (rather than code changes).
- It extends the proportional concept of the type classifications under the Network Code.
- It defines a significant grid user as identified in the framework guidelines.
- It is advantageous directly written in the ENTSO-E NC from the start and not open to interpretation and multiple complex national derogations.
- The significance test will make clear to manufacturers when requirements would need to be in place based on market penetration, allowing a reasonable investment decision.
- The significance test approach gives a result now rather than moving it in an uncertain future.
- The significance test can be centrally policed and monitored in terms of market penetration.
- A significance test, as well as being the route recommended by ACER, is likely to be a low cost market solution for those who fall under it. Implementations via derogation will cause transaction costs at the manufacturer, the DSO and the grid user level.

Derogation

Accepting that the proposed Network Code will change periodically in response to the significant deployment of distributed energy resources and other requirements of energy and climate policy, a

[4] In the synchronous area (Great Britain) 50MW has already been established as the significance threshold for the linear Stirling technology relevant to G83/2.

clearly defined derogation process is required. The impact of such changes is proportionally higher on type A modules and amendments to encourage ongoing investment in this sector are desirable.

The proposed derogation procedure is written in such a way that only a TSO/DSO/CDSO can apply for a derogation. In the briefing note of 17 December ENTSO-E proposes a refinement of this process in which National Regulatory Authorities may set specific criteria (time and volume limited) for certain types of generation technologies taking into account the views of the TSO. The authors welcome several elements of this refinement (technology recognition, time for derogation, identification of regulator as responsible body) and suggest further with reference to the proposal of December 17th that

- Manufacturers should be specifically cited as able to make such requests for type A modules. ACER should open a consultation process to check the non-discriminatory nature of any derogation **and** to decide on the request on extending a nationally granted derogation Europe-wide.
- There should be an effective process to establish a pan-European derogation.
- The time periods for such derogations should be proportionate to the type of change required and a minimum of 5 years for redesign of hardware should be considered.
- Non-exhaustive requirements of the network code (where technical requirements are incomplete) can be the subject of derogation.

Extension of the 800W for type A de minimis / harmonized standards

The authors have considered how a change in the 800W threshold might help address the challenges that the code presents to early market stage generators. There are a range of different options in how to establish an appropriate de minimis level for type A but the authors discussions highlighted that the real opportunity of simplifying the network codes for generators and DSOs alike is to use harmonized product standards wherever possible to ensure network and system stability.

The advantages of this approach are:

- Harmonised standards are widely used in EU legislation to bring products into conformance with regulations.
- The standards ensure non-discriminatory conditions across the member states.
- DSO will anyway need some type of certification process for units around the low (800W) end of the type A scale.
- The cost of certification is borne by the manufacturer not the DSO.

The authors propose that the European Commission should issue a mandate to develop the necessary harmonized standards for type A generating products which must comply with the network codes and specifies more detailed requirements and test methods considering also the non-exhaustive requirements of the NC RfG. Such harmonized standards shall be listed in the OJEC and if listed that they provide “presumption of conformity with the NC RfG.