

Public Consultation

on

the Electricity Grid Connection Network Codes

PC_2022_E_02

Evaluation Report

26 September 2022

1.1 Requirements for pump-storage hydro PGMs

Respondents		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
APREN, Terna S.p.A., Eurelectric, BDEW Bundesverband der Energie- und Wasserwirtschaft e.V., undisclosed stakeholder	Several stakeholders stressed that a proper evaluation of capabilities and constraints of the pump-storage hydro PGMs is important.	Agree	The need for running a detailed assessment was acknowledged in paragraph 39 of the draft Policy Paper. To date, the evaluation of the relevant capabilities and constraints was carried out by the dedicated Expert Group of the Grid Connection European Stakeholder Committee (ESC) and considered in the draft Policy Paper. Stakeholders are invited to provide detailed input during the full-fledged public consultation aimed for September 2022.
APREN, Terna S.p.A., Eurelectric, BDEW Bundesverband der Energie- und Wasserwirtschaft e.V., Edison S.p.A., EDF, undisclosed stakeholder	Stakeholders stressed that the technical requirements introduced by the NC RfG should duly take into account the technical characteristics of pump-storage hydro PGMs.	Agree	As stated in the draft Policy Paper, technical requirements applicable to pump-storage hydro PGMs should reflect the constraints related to various types of those units and specific modes of operation.
DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE, WindEurope	Rules should address identified disproportions between technical requirements and actual PGMs' effect on the overall system while not going beyond the necessary minimum and ensuring stable operation.	Agree	The draft Policy Paper notes that it must be ensured that each type of pump-storage hydro PGMs should meet all the feasible technical requirements per operation mode.
DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	Without good justification, revision of the existing rules should not cover new installations where the challenges can be designed out.	Partly agree	The application of the technical requirements should be properly considered, taking into account the principle of optimisation between the highest overall efficiency and lowest total cost for all involved parties.
Iberdrola S.A., EDF	Provisions of the NC RfG should not mandate to apply a variable speed technology in pump-storage hydro PGMs.	Agree	The draft Policy Paper does not suggest mandating the application of variable speed solutions. Instead, it recognises differences in capabilities and constraints of different pump-storage hydro technologies.

Iberdrola S.A., EDF	For transparency and regulatory stability for the new technical requirements of the NC RfG applicable to pump-storage hydro PGMs need to be reflected in the text, given the importance of these installations for the energy transition.	Agree	Adequate transitory rules should accompany the proposed amendments to the NC RfG regarding pump-storage hydro.
Eurelectric, BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.,	Findings of the final report of the expert group "Requirements for pump-storage hydro power generation modules" set up by the GC ESC should be included.	Partly agree	As indicated in paragraph 15, the draft Policy Paper takes note of the final report of the relevant Expert Group and the report informed some high-level policy recommendations; however, detailed requirements are out of scope of (any) policy paper.
EDF	Technical requirements related to the methods of the frequency control should take into account various technologies and innovations that could be employed at the pump-storage hydro PGMs. In the interest of the power system, facility owners should be able to choose efficient frequency control methods.	Partly agree	Amendments to the technical requirements should result from balancing benefits and costs. It is necessary that, where feasible, they encourage innovation while remaining non-discriminatory, proportionate and technology neutral.
EDF	Following improvements to the NC RfG should be considered: - Providing clarification on the transition dynamics between voltage levels to rule on the use of a tapping regulator transformer - clarifying the voltage dip requirements and the demonstrations that must be made (Article 14) ; - distinguishing the requirements for a non-synchronous park depending on whether it is fully-fed or doubly-fed for reactive current injection (Article 20(2)(b)).	Partly agree	Where desired, clarity of legal texts is beneficial in order to avoid misinterpretation and facilitating the level playing field; however, the proposed improvements go beyond the level of detail to be addressed in the Policy Paper. EDF is invited to propose concrete and justified amendments during the full-fledged public consultation aimed for September 2022.
BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.	It must be ensured that existing pump-storage plants are not forced to be decommissioned for economic reasons due to new grid regulations. Especially there must be a protection of vested rights for existing pump-storage plants or, alternatively, investments to meet new grid standards must be reimbursed. A modernisation or extension of existing pumped storage plants must not lead to the loss of the protection of vested rights.	Partly agree	The existing PGMs are out of scope of the NC RfG unless they undergo a substantial modernisation – please refer to the relevant section in the Policy Paper.

1.2 Determination of significance of PGMs

Respondents		Summary of respondents' feedback		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)		
<p>EUGINE – European Engine Power Plants Association, Energie-Nederland, IFIEC Europe, VDMA Power Systems, SolarEurope, EUROPGEN Grid Codes Working Group</p> <p>vgbe, EDF, DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE, Iberdrola S.A., Falck Renewables, Westnetz GmbH, VDE FNN</p>	<p>Several stakeholders expressed a preference for the complete removal of the voltage criterion so as to determine the significance based on capacity only.</p> <p>In contrast, other replies opposed the complete removal of the voltage criterion and supported adjusting the criterion to reflect the actual effect on the system.</p>	Partly agree	<p>Currently, the significance of PGMs is determined based on the cumulative application of voltage and capacity criteria. An amendment of the voltage criterion, or even more so, its removal, would likely cause the reassessment of capacity thresholds established in the Member States. Moreover, changes to the PGMs' classification should not lead to adverse disproportions or trigger connection decisions that are not optimal from the system's perspective.</p> <p>Nonetheless, all three options outlined in paragraph 28 of the draft Policy Paper shall be considered in the amendment process.</p>		
<p>EUGINE – European Engine Power Plants Association, VDMA Power Systems, EUROPGEN Grid Codes Working Group</p>	<p>More clarity is needed on the type classification of synchronous power generating modules (SPGM) – there are today some inconsistencies across the EU on how the significance is determined (installed capacity vs individual unit rating).</p>	Agree	<p>Clarity on the maximum capacity notion is relevant to ensure harmonisation of the significance determination practices across the Union.</p> <p>Interpretation of the notion can be harmonised based on the stakeholders' proposals submitted to the public consultation planned for September 2022.</p>		

DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE, Terna S.p.A., Eurelectric, EDF, EFAC, WindEurope, undisclosed stakeholder	<p>Some answers highlighted the risks associated with the revision of significance determination criteria. Depending on the design, it may incentivise large facility owners to divide them into smaller units to fall under less strict requirements.</p> <p>On the other hand, other stakeholders recalled that the requirements should be established based on the principles of fairness and proportionality. In their view, PGMs should adequately contribute to system safety.</p>	Agree	<p>As indicated in the draft Policy Paper, changes to classification of PGMs should not result in evading rules designed to ensure stable operation of the interconnected system.</p> <p>In addition, the recommendations envisage a closer link between the type of PGMs (and hence, contribution to system safety through compliance with relevant requirements) and its effect on the overall system.</p>
ČEZ, a.s., Edison S.p.A., EFAC	A few responses suggested a need for further analysis of the issue preceding the adjustment of the significance determination rules.	Partly agree	<p>Amendments to the GC NCs should be based on informed proposals. As noted in paragraph 16, final reports of the relevant ESC Expert Group informed the Policy Paper drafting process.</p> <p>Stakeholders are invited to provide further analysis during the full-fledged public consultation aimed for September 2022.</p>
Iberdrola S.A., vgbe	Stakeholders recommended further harmonisation of criteria for significant modernisation (e.g., by defining a range of minimum and maximum capacity thresholds for each type)	Partly agree	It is necessary to analyse diverse motivations for a wide range of capacity thresholds in the Member States and understand possible ways for harmonisation also in the context of the significant modernisation.
Eurelectric, ENEL SpA, WindEurope	It is important to set out appropriate transitory rules (including the reference dates and criteria to define the scope of revised codes' application)	Agree	As stated in paragraph 52 of the draft Policy Paper, establishing proper transitory rules is essential to ensure legal certainty.
DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	Changing or removing the voltage criterion might trigger other needed changes, which can be very different in each MS.	Agree	Given that the current significance determination is based on two criteria (concerning voltage and capacity) amending or removing one criterion would probably trigger further changes.
DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	Some stakeholders pointed to the Expert Group's proposals for a national threshold determined between the Type B and Type C thresholds is a pragmatic solution to the issues and appropriate careful drafting of wording on this is needed.	Partly agree	In the case of the application of the voltage criterion only above a specific capacity threshold, it will be crucial to identify that threshold. In particular, appropriate consideration should be given to small-size PGMs.
APREN	The maximum voltage threshold for types A, B and C is the same, and hence, the removal of voltage criteria would not have a major impact.	Disagree	Should the voltage criterion not be applied, small-size PGMs connected at 110kV or above would not fall under the type D category.

1.3 Requirements for type A PGMs

Respondents		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
Terna S.p.A., Iberdrola S.A	<p>Harmonization of the thresholds for Type A and Type B at EU level is not considered useful. The harmonization of the A/B threshold removes the right of Member States to choose an individual and technically justified threshold.</p> <p>Further national specification of requirements is not considered problematic.</p>	Partly Agree	Harmonisation is not an objective in itself but can efficiently be used to strike a balance in obtaining specific objectives. On the one hand, an insufficiently harmonised regulatory framework for types B, C and D PGMs may limit the level-playing field, hamper the economies of scale, and impede benefits of the common connection rules, while on the other hand, harmonisation may limit Member State needs to address certain local specificities e.g. associated with generation mix or grid structure.
EUGINE, VDMA Power Systems, EDF, WindEurope, SolarEurope	Harmonisation of thresholds would be an advantage and should be assessed and done carefully with consideration of local characteristics. SolarEurope proposed a minimum threshold between Type A and Type B of 500 kW.	Partly Agree	See the previous answer above. In addition, the harmonisation of the thresholds should be assessed in conjunction with the possibility to add additional requirements for a certain size of smaller generation (and storage) units, as well as introducing another intermediate PGMs type (between today's type A and B).
APREN, ENTSO-E, WindEurope, SolarEurope, Falck Renewables, German Federal Ministry for Economic Affairs and Climate Action, Terna, ENEL SpA, DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	<p>Type A PGMS shall be capable of enhanced participation in system stability. Recommendation, that the Fault Ride Through (FRT) and Post Fault Active Power Recovery, etc, requirements for PGM Type B also be extended to PGM Type A, as this will benefit system safety.</p> <p>The FRT requirement for Type A PGMs is supported by many stakeholders (Apren, BNetzA, DSO Entity, ENEL, ENTSO-E, Falck, German Federal Ministry for Economic Affairs and Climate Action, SolarEurope, Terna S.p.A., WindEurope).</p> <p>Falck Renewables, Terna Sp.A. and DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE also agree with the proposed expansion of Type A requirements with Active Power Control (APC).</p> <p>In contrast, APREN and SolarEurope suggested, that subcategories should be created, to create different requirements for different sizes of Type A PGMs, mainly for cases of APC.</p>	Partly Agree	For PGMs (and storage units) connected via power electronics, such as PV, additional requirements may not be a direct concern, however this may possibly be a concern for small PGMs with other technologies. Indeed, there are Member States that have already added certain requirements for Type A PGMs in addition to the NC RfG requirements.

Edison S.p.A	The additional technical requirements identified by the Expert Group “Baseline for Type A PGMs” should not be applied to these plants. Edison S.p.A shares the need to revise the threshold between type A and type B and is not opposed to consider the opportunity to introduce another intermediate PGMs type between type A and type B, which is harmonized at EU-Level.	Agree	Indeed, harmonisation of the thresholds should be assessed in conjunction with the possibility to add additional requirements for certain size of smaller generation (and storage) units, as well as, introducing another intermediate PGM type (between today’s type A and B).
APREN, EDF, SolarEurope	A cost-benefit analysis should be conducted to ensure that the introduction of new requirements does not impose additional costs on smaller PGMs. Also, local characteristics must be considered.	Partly agree	A full-fledge cost-benefit analysis is not possible. However, a high-level assessment, including of MSs’ local specificities, should result in equitable treatment of system users and demonstrate the maintenance of the system security and system stability.
ČEZ	Type A PGMs are small units, they should not be burdened by additional requirements.	Partly agree	As per the NC RfG, MSs have applied a wide range of the Type A/B thresholds (10 kW - 1.5 MW). However, because of the accelerated decarbonisation of the energy sector there are Member States that have added already, as per the 50549-1:2019 standard, certain requirements for Type A PGMs in addition to the NC RfG requirements.
VDE FNN, SolarEurope	A standardized and harmonized communication interface for active power control of type A PGMs should be used.	Partly agree	In principle, standardised communication should be used; however, this is out of scope of the EU connection rules.
BDEW Bundesverband der Energie- und Wasserwirtschaft e.V., Eurelectric	For existing PGMs, the continued applicability of existing regulations must be ensured.	Agree	Of course, only new, or substantially modified existing power generation facilities are covered by the NC amendments, as currently regulated in Articles 3 and 4 of the NC RfG.
EFAC, Eurelectric	Where appropriate, reference should be made to the EN 50549-1 standard.	Disagree	References to specific standards shall not be quoted in the legal text of the regulations. Rather than that, relevant requirements from standards can be replicated in the network codes.
CogenEurope	The focus of the strategy paper is on the requirements of the operation of the electricity network and not on the requirements of the creation of a properly functioning market for PGMs of type A. However, the internal market for these facilities is as such also a task of European legislation.	Disagree	Capabilities of system users are founded on the identified system needs. The system cannot efficiently function in the absence of these capabilities. Moreover, harmonisation, which enables the level playing field, is one of several other principles (e.g. subsidiarity, proportionality) that is pursued in the development of the EU connection codes.

Westnetz GmbH	This stakeholder reported in that Type A should start at 0 kW.	Disagree	The NC RfG requirements are subject to the proportionality principle. The connection rules can be changed in the future should PGMs with capacity below 800 W become a tangible subset of the EU generation portfolio. Nevertheless, the MSs can apply distinct connection rules for this subset of generators even today.
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1.4 Electromobility

Respondents		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
BDEW, EDF, EDISON, EFAC, undisclosed stakeholder	Several stakeholders pointed out to the increase of costs which should not be undue and affect negatively active consumers. EFAC suggested to take into account provisions of EN 50549-1.	Agree	The adoption of the new rules should, as far as possible, be achieved via simple demonstration of compliance and use of the appropriate standards (e.g. EN 50549-1) cutting the red tape.
DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	Stakeholders prompted that, in paragraph 57, the consideration of injecting in an internal installation should be treated in the same way as injecting into public grid.	Agree	ACER agrees to make no distinction between injecting into the public grid and internal installations because from the point of view of the stability of the system, the behaviour of the EV should be the same unless the EV is injecting into an internal installation isolated from the synchronous area grid (island operation).
ENEL SpA, APREN, WindEurope, VDE FNN, Westnetz GmbH, Iberdrola, undisclosed stakeholder	Several stakeholders mentioned that it is important to differentiate either requirements between V1G and V2G charging points or between electromobility and storage in general. Also some pointed out that V2G should be viewed as a storage asset.	Agree	This is already assumed in the draft Policy Paper. Moreover, a storage device operating in electricity generation mode and AC connected to the public network is to be considered a power park module.
APREN	Option 1 seems to be the one to follow between the 3 considered, however it should be considered a more developed option.	Agree	Ad hoc capacity threshold for electrical charging parks shall be detailed in the NC RfG.
BDEW	Pointed out to difference between private and public chargers; technical requirements regarding the latter ones are already regulated by the Alternative Fuel Infrastructure Directive (AFID).	Partly agree	The differences between private and public chargers indeed lie mainly in the capacity and usage (e.g. diversity of charged EVs and time of charging). However, the AFID technical specifications refer to standards that are not tackling grid security aspects, whereas the purpose of the NC RfG and the NC DC is precisely that.

BDEW, ENEL	BDEW mentioned that interaction and communication between the market participants should also be considered. In ENEL view, the requirements should be set considering the inputs of all the stakeholders involved in the flexibility value chain of electromobility: Charging Point Operators, Mobility Service Providers, technology providers, OEMs, DSOs, TSOs and Aggregators	Partly agree	Although ACER agrees that these points are important, they lie out of scope of the grid connection network codes and may be addressed by the possible new flexibility network code (or other relevant regulation).
EDISON, ENEL	Although, recognising the asymmetry between large withdrawing capacity (that accommodates fast charging) and relatively low injecting capacity (likely, classifying electrical charging points as type A PGMs) Edison believes that "Option 2", consisting in introducing two distinct thresholds, for exporting and importing capacities, matched with current thresholds at national level, could better reflect the main function of the electrical charging parks, which is still to ensure a quick EVs charge (the V2G functionality seems secondary, though promising). Similar views were expressed by ENEL.	Disagree	Given the recent acceleration of the decarbonisation of the energy and transport sectors, the V2G functionality will likely become 'business as usual' by the time the amended NC RfG will enter into force.
ElaadNL	<p>1) All new charging equipment and new electric vehicles should comply to smart charging requirements, such as defined in handlerdownloadfiles.ashx (agendalaadinfrastructuur.nl)</p> <p>2) There should be regulation that allows DSO's to set barriers on grid usage per grid area.</p> <p>3) A new grid tariff for EV chargers is needed, that will set EV charging apart from regular low voltage grid connections and will also stimulate flexibility. In the Netherlands, promising results were obtained by combining all chargers that are on the same cable or transformer, and allowing them to share a power allowance among the chargers that are used. This technique results in a steep increase in grid efficiency, but is not yet allowed in grid codes. This grid tariff can either be a capacity based tariff or a flexibility based discount.</p>	Partly agree	<p>ACER views on each of the points are as follows:</p> <ol style="list-style-type: none"> 1) It would be technically sensible to require from all storage devices to comply with smart charging functionality, but it is likely that this is not economically efficient – see the comments by several other stakeholders concerning cost implications. 2) ACER understands this is, in many countries, already part of the connection agreement struck between the system user and the system operator. 3) Tariffication is out of scope of the grid connection network codes.
ENTSO-E	Charging stations shall be capable of enhanced participation in system stability (frequency control, fault ride through, autonomous reconnection, etc.).	Partly agree	Insofar charging stations exceed a given capacity threshold (see policy option considerations) they should comply with stricter requirements – this approach is mirroring the banding of the power generating modules.

DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	Several stakeholders understand the draft policy paper proposes that V2G is treated separately under the NC RfG and that any thresholds so developed are also used in the application of the NC DC.	Partly agree	This was a misunderstanding. The preferred policy option (1) as explained in the Policy Paper advocates for a single harmonised capacity threshold for the classification of electrical charging parks (boundary between type A and B). Conversely, an asymmetrical capacity threshold policy if deployed would allow for using an on-site stationary battery to technically reduce the type-related obligations by charging the stationary battery from the V2G EVs instead of injecting this energy directly into the grid.
vgbe, DSO Entity with CEDEC, E.DSO, Eurelectric, GEODE and ElaadNL	Several stakeholders proposed V1G charging points (maybe as from a certain uniform threshold) should be obliged to deliver demand response in extreme circumstances. E.g. charging mode has to be stopped before disconnecting other "classic" load / consumption.	Agree	Indeed, in light of the unprecedented volumes of EVs AC connected to the public networks and the challenge of the electric power system to function securely, there are merits in requiring V1G (but perhaps other system users as well, e.g. heat pumps with heat storage) technologies to be capable of (local/remote) disconnection and/or provide an LFSS-U response in certain system conditions. The details of such response should be elaborated in the network codes.
Falck Renewables	V2G electrical charging infrastructure shall be classified as a storage unit and consequently it shall be considered as a generator which need to comply only with the NC RfG requirements both in injection and withdrawal modes.	Agree	V2G electrical charging infrastructure could comply with the NC RfG requirements both in injection and withdrawal modes.
German Federal Ministry for Economic Affairs and Climate Action	In the context of the grid connection codes, charging points for electro mobility should be treated as demand and/or PGM, depending on the underlying technology (unidirectional or bidirectional). We do not see the necessity to establish a new category for electro mobility in the grid connection codes.	Agree	ACER believes that the underlying technology used in EVs and charging points needs to be appropriately recognised in the grid connection network codes.
Terna S.p.A.	Main connection requirements for electrical charging points should apply to each individual charging column and not to individual stations consisting of multiple columns.	Partly agree	This issue is similar to the consideration of a power park module whereby it means a unit or ensemble of units generating electricity. Depending on the charging capacity of the individual column, standards should mainly be used in the demonstration of compliance. In turn, additional capabilities could also be sought for, depending on the overall capacity of the charging station.

1.5 Weather hazards resilience of generators

Respondents		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
Better Energy A/S, Eurelectric, ENEL SpA, VDMA Power Systems, Edison S.P.A, ČEZ, a.s., EDF	Several stakeholders stated that such requirements do not belong to the grid connection network codes. Some stakeholders suggested that these should be elaborated in technical standards and not in the RfG.	Partly agree	Indeed, the extreme weather conditions impact various PGM technologies differently and related technical capabilities can be ensured via product standardisation. In the draft Policy Paper, ACER was not promoting a single policy option in this regard and opened the door to further stakeholders' proposals. ACER nevertheless considers that the efficient electric power system design includes addressing the problem of PGMs' weather resilience and should thus be part of the system operators' task.
Undisclosed stakeholder, Terna, Westnetz GmbH, Iberdrola S.A., vgbe, VDMA Power Systems	Some stakeholders mentioned that regional weather conditions should be considered as it is difficult to regulate technical aspects at a common level.	Partly agree	The system operators and the PGM owners should take due account of possible extraordinary climate parameters in place (pan-EU, regional or local) and consider them in the design of the underlying assets.
Undisclosed stakeholder, WindEurope, VDE FNN, VDMA Power Systems, Iberdrola S.A., DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	Some stakeholders mentioned the proportionality of costs imposed on PGMs and the need to avoid overdesigning PGMs. Also, some few stakeholders mentioned the need to avoid additional barriers for small generators (particularly type A PGMs)	Agree	ACER considers that the system operators need to ensure the efficient electric power system design where certain regional specificities in terms of climate parameters should be used both in designing the transmission/distribution networks and associated PGMs. ACER agrees not to add any specific additional capabilities for PGMs in the RfG NC. However, the system operators and the PGM owners (in particular of large size, i.e., type C and D) should take due account of possible extraordinary climate parameters in place and consider them in the design of the underlying assets.

<p>BDEW, Undisclosed stakeholder, ENTSO-E, Eurelectric, SolarEurope, CogenEurope, Iberdrola S.A., Falck Renewables</p>	<p>Several stakeholders mentioned that the overall system must be set up in such a way that resilience to weather hazards can be improved and generator failures can be compensated for. In this regard the resilience and capability limits of the transmission & distribution grid to unusual weather events should be evaluated. One stakeholder stated that the topic seems more relevant for the System Operation Guideline.</p>	<p>Partly agree</p>	<p>The system operators and the PGM owners should take due account of possible extraordinary climate parameters in place and consider them in the design of the underlying assets.</p>
<p>Energie-Nederland</p>	<p>It is questionable whether weather resilience of generators should be covered. It is primarily the responsibility of the generator itself to take care of the technical availability of its plant and thus also its capability to produce during extreme weather. Higher availability will result in higher revenues, which should provide the correct signal to invest in resilience or not.</p>	<p>Disagree</p>	<p>A large number of simultaneous disconnection of PGMs has proven to represent the issue for the stability of the interconnected power system (e.g. PV disconnections at 50.2 Hz). The safe and secure power system operation cannot be left to market forces only.</p>
<p>Westnetz GmbH, VDE FNN</p>	<p>A couple of stakeholders asked ACER and NRAs to define what resilience means and to what level it should be achieved.</p>	<p>Partly agree</p>	<p>Insofar as ACER agrees that weather resilience needs to be defined, it shall, in line with comments by several other stakeholders, rather be defined in coordination with the system operators and PGM owners, considering the underlying assets at a local (regional) level.</p>

1.6 Requirements for units providing demand response services

Respondents		Summary of respondents' feedback		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)		
Ignacy Lukaszewicz Institute for Energy Policy, DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE, Iberdrola S.A., PGE Polska Grupa Energetyczna S.A., ENEL SpA, ČEZ, a.s., EDF	Some stakeholders expressed the opinion that all necessary provisions concerning demand response services should be included in the new NC DSF (particularly for distribution-connected system users). On the other hand, few responses opposed the inclusion of technical requirements laid down in NC DC in the new NC DSF, arguing that the latter should rather cover market rules.	Partly agree	As outlined in the draft Policy Paper, appropriate amendment proposals should be in line with the Framework Guidelines on Demand Side Flexibility, particularly concerning the scope of the new network code. Revisions to the GC NCs should be consistent with the relevant EU energy regulations.		
Eurelectric, ENEL SpA, WindEurope	Stakeholders mentioned that reviewing NC DC technical requirements for units providing Demand Response services shall not hinder their effective and non-discriminatory participation in DSO local ancillary services markets.	Agree	Technical requirements should be based on the principles of non-discrimination as well as on the principle of optimisation between the highest overall efficiency and lowest total cost for all involved parties		
Eurelectric, ENEL SpA, WindEurope	Currently, most demand response providers (regardless of size) are identified as significant grid users (SGUs). The definition of SGUs should be reviewed to cover large system users with a substantial impact on the grid only. Moreover, concerned stakeholders are against a possible uptake and application of the definition so worded also in the Demand Connection Code.	Partly agree	The topic of SGUs is out of the GC NCs amendment process scope. SGUs are defined in the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation ('SO GL') and Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration ('NC ER'), which are not under revision. Definition of SGUs is relevant to the system operation rules provided in the SO GL/NC ER, while it plays no role in the NC DC.		

WindEurope, undisclosed stakeholder	<p>It was pointed out that the broader scope of application of the technical requirements for units providing demand response services is linked with two problems:</p> <ul style="list-style-type: none"> ▪ The ability to withstand frequency variations would be difficult if not impossible to demonstrate for units with older assets and equipment; ▪ Stringent requirements are not imposed equally to all users but only when system users decide to provide relevant flexibility services. 	Partly agree	<p>Although possible challenges related to the compliance shall be acknowledged, it is necessary to properly weigh them with the need to provide reliable demand response services to the system operators for grid security, particularly to minimise critical events.</p> <p>More stringent requirements should not be applied to all system users covered by the NC DC, as they are tailored for the demand response service providers. This approach stems from the principle of proportionality.</p>
Better Energy A/S, Edison S.p.A.	Requirements for services should not be included in a Grid Connection Network Codes.	Agree	As proposed in the draft Policy Paper.
IFIEC Europe	GCNCs should not stipulate too many requirements for units providing demand response services to system operators, as these are too static and not necessarily provide a good basis for tackling the intrinsic differences between Member States. Instead, requirements for units providing demand response services to system operators shall be set out in the product specifications of the various services requested by system operators.	Partly agree	<p>Indeed, GC NCs should not generate unreasonable administrative burdens or costs associated with demand response services provided to relevant system operators.</p> <p>Nevertheless, the requirements applicable to the providers of these services should ensure the services' reliability and capacity to use the demand response over system operational ranges thereby minimising critical events.</p>
Edison S.p.A.	In case of retroactive application of new requirements to existing units, national regulators should consider introducing compensation schemes for owners of those units that already provide demand response to the system.	Partly agree	The solution proposed in the draft Policy Paper does not envisage the retroactive application of technical requirements on existing system users. Also, national compensation schemes are out of scope of the Grid Connection Codes.
Energie-Nederland	Grid Connection Network Codes cover technical requirements for connection, and these requirements should not depend on the provision of specific services to the market or system operator.	Disagree	Technical requirements laid down in Articles 28-30 of NC DC reflect the relevant users' or third parties' obligation to ensure the reliability of the services offered to system operators for grid security.
vgbe	All storage devices have to offer demand response services in charging mode. This must be an obligation imposed at the EU level.	Partly agree	It depends, inter alia, on what "demand response service" entails. This issue shall be explored further to understand the possible risks and opportunities related to this proposal.

Technical Requirements for Storage

Respondents		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
Ignacy Lukaszewicz Institute for Energy Policy	General provisions on big energy storage have to be implemented, however new regulations for small units will eventually lead to the emergence of barriers to the development of active consumers, local communities. Energy storage is a promising tool in supporting technical balancing of local areas at LV network. The small PV supported by storage is an expecting unit for unstable generation and, at the same time, contributes to reducing disturbances on the grid by supporting its balancing. There is no need for detailed provisions for storage as such. Storage should be considered from the point of view of being able to provide flexibility services (demand response) at local level for the grid operator. However, in this case any new regulation should be introduced by the NC DSF taking into account the responsibility of the distribution operator for its implementation and enforcement.	Partly agree	As proposed in the draft Policy Paper, there is a need to assess the potential technical requirements for storage units. Technical rules must take into account system needs (in particular, operational security). Indeed, depending on the type of service, any storage units can also provide flexibility services to both distribution and transmission system operators. However, specific solutions will be addressed in the Demand Side Flexibility Framework Guidelines.
Better Energy A/S	An MCS should be evaluated as a whole in the point of connection and not the individual units (generation/storage/demand)	Partly agree	The main purpose of the concerned policy is to elaborate technical requirements for storage connected to the power system as stand-alone units or in combination with other units (generation or demand). MCS are addressed in a dedicated policy as well. Nevertheless, at the connection point, conditions necessary for system stability should be fulfilled by the MCS, taking into account interactions between the power system and the site (export or not the power), and specific requirements applicable to the units composing the MCS. In an MCS the ensemble of a generating unit and/or demand unit and/or a storage unit also has to fulfil various requirements concerning frequency/voltage control or protection, requirements which depend on the capabilities of individual units composing the MCS.
APREN	Technical requirements for storage units should be included, with the differentiation between the different applicability of the storage	Agree	Storage units could be classified similarly as PGMs as far as the significance criteria and operating in synchronism are concerned.

	units. The electricity storage can be split into synchronous and non-synchronous.		As it is stated in the draft Policy Paper, in developing technical requirements, one needs to consider topology, underlying technologies and the impact of storage units on the power system.
Energie-Nederland	One should consider to develop just one connection code, covering connection requirements for all connected assets (generators, demand, storage, conversion). This could help to ensure consistent requirements and provision of a level-playing field for all connected grid users on the market.	Disagree	The Connection Codes shall constitute a coherent and consistent set of rules regardless of the number of volumes. Also, each code addresses system needs according to the relevant types of assets, underlying technologies and inherent constraints of units. The scope of the existing Connection Codes varies significantly, and each captures technologies with comparable capabilities and effects on the system. ACER considers that creating a single network code could hamper overall regulatory efficiency. Moreover, should this be the aim of the comment, ACER disagrees with covering all connected assets in the network codes developed under Article 58 of Regulation (EU) 2019/943, as this would be in contradiction with the principles of subsidiarity and proportionality.
DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	<p>We think it is important to include storage in the connection network codes. In some MS requirements have already been integrated in their national/regional legislation.</p> <p>Many of them based their requirements on what is provided by the EN 50 549-1 & -2.</p> <p>So integrating storage in NC RfG and NC DC should not ignore the existence and the relevance of these standards.</p> <p>The DSOs support in full the work undertaken by the Expert Group on this topic. However we now believe that the work is not quite complete in that although the Expert Group made provisions for how storage should respond to frequency falling below norms in an emergency event, it did not address how that storage should behave as the frequency recovers. Although not a particular technical challenge, there does need to be clarity of response in these conditions to both avoid unintended unhelpful behaviour, and also so TSOs can be certain about how the contribution from storage will change as frequency rises. Appropriate development for this characteristic should be built into the developments of proposals.</p> <p>Since storage would mainly be integrated in the NC RfG, it is important to point out that also the new proposed type A requirements for PGMs, as mentioned above, would be applicable</p>	Agree	<p>The number of storage units will inevitably increase, and system stability will depend on such assets. Hence, relevant technical rules should be considered. Standards in question could support the development of possible amendments as they contain some requirements which helped to integrate storage units into power systems.</p> <p>Rules regarding storage units' behaviour during the frequency recovery after the incident should be considered in the amendment process.</p> <p>According to the draft Policy Paper, the ability to provide an active power control by type A PGMs and, consequently, storage units should be explored. In particular, one needs to consider different requirements developed by DSOs to utilise active power control.</p>

	to storage units, especially the possibility to modulate/control active power.		
Iberdrola S.A.	We consider very important and urgent to include storage technologies in the connection network codes. Appropriate amendments to the existing Network Codes should be rapidly implemented to avoid conflicts with the increasing number of batteries connected to the distribution grid and should be compatible with regulatory processes that have already started (e.g. Spain). Such developments are necessary to ensure regulatory certainty to the very complex investment cases on storage assets today in process. Potential exemptions in #56 should be duly defined. Hence, we do not deem necessary to promote an individual Network Code for storage instead of amendments of existing ones and requirements for storage should be aligned to the maximum extent to those set out for generation and demand, without extraordinary requirements above them.	Agree	Storage technologies play a vital role in the decarbonisation of the electric power sector and the lack of harmonised connection rules could hamper the common energy market. Nevertheless, we agree there are some storage technologies, which are not able (yet) to fulfil certain requirements relevant to system stability (e.g., synchronous flywheels and regenerative braking systems) because of the absence of physical control. Under these circumstances and in order not to stifle the innovation it seems appropriate to define the associated connection rules at the national level.
Edison S.p.A.	Edison believes that the inclusion of minimal technical requirements specific for storage units should be considered in the review of the GC NCs, when needed.	Agree	Storage units must be integrated into power systems taking into account their impact on power system stability by connection schemes, topology and interaction with power systems (transmission and distribution systems)
ČEZ, a.s.	We see some merit in establishing non-discriminatory conditions for storage.	Agree	As indicated in the draft Policy Paper, the technical requirements should be based, inter alia, on the principle of non-discrimination.
Terna S.p.A.	Terna agrees the definition of technical connection requirements for storage is a priority to be considered in the next review of the European network codes. We believe it is essential to define general requirements for these technologies by picking up the pattern of requirements already defined in the Codes for other technologies, specifically PPMs.	Agree	Indeed, as mentioned in the draft Policy Paper, the application of requirements like those for the PGMs should be considered.
BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.	Including technical requirements for storage into the NC RfG and DCC would ensure harmonisation of rules across Europe as well as equal treatment of with power plants and other network users. In this respect, the relevant characteristics and limitations of storage technologies shall be duly taken into account in order to provide sufficient flexibility for connecting new upcoming technologies.	Agree	As outlined in the draft Policy Paper, the specific characteristics and constraints of particular storage units should be analysed and reflected by the technical requirements if so necessary.

REESCOPE EU	Ensure legal clarity and coherence	Agree	The Policy Paper notes that the applicability of perspective rules for storage should consider legal certainty and system security.
EDF	<p>The policy paper correctly recognises the increased importance of storage in system operation both at TSO and DSO levels. The conclusions of the GC-ESC Expert Group on the issue provides relevant input, which is already to a large extent a reference for TSOs in the absence of legal requirements defined at EU level. New EU rules should first and foremost base on these works.</p> <p>In case the issue is raised, EDF would also like to underline the need to integrate requirements for storage in the exiting network codes while taking its specificities into account, rather than to develop a separate code.</p>	Agree	Indeed, the draft Paper Policy proposes the inclusion of the technical requirements for storage units in the existing Connection Codes as this is considered a robust and transparent solution facilitating operational security and better integration.
IFIEC Europe	IFIEC Europe understands the importance of this topic but does not at this point have a specific position on it.	/	/
VDMA Power Systems	We see a big uncertainty in the market regarding storage systems. Clear technical requirements will help establishing a bigger market for storage systems.	Partly agree	The draft Policy Paper recognises the need for legal certainty, which in turn will facilitate the level playing field.
Falck Renewables	In general we strongly support the policy recommendations on the technical requirements for storage defined by Acer and CEER. However, we do not agree with the proposal to apply rules for power-generating facilities and demand facilities according to the fact that the storage units principally operate in injection and withdrawal modes [reference to paragraph 20 of the Policy Paper].	Agree	We agree to remove the contested sentence.
SolarEurope	We support the work on a further harmonisation of requirements including behaviour during charging and handling of different architectures of combination with PPMs (e.g. AC-coupled / DC-coupled)	Agree	The draft Policy Paper mentions that the technical requirements shall correspond to specific limitations arising from the configuration of facilities.
EFAC	Provisions of EN 50549-1 should be taken into account; references should be given where applicable.	Partly agree	<p>Technical conditions included in EN 50549-1 and EN 50549-2 for storage units connected to low voltage and medium voltage (version from 2019) are only for power response to under-frequencies and there it is necessary to assure power system stability for PGMs.</p> <p>Nevertheless, references to specific standards shall not be quoted in the legal text of the regulations. Rather than that, relevant requirements from standards can be replicated in the network codes.</p>

Westnetz GmbH	Definitions for storage should be clearly described and mobile storage should be included. Mixed customer sites and system architecture or solutions should be appropriately considered. Topics such as controllability by the DSO and ancillary services such as grid balancing of frequency and voltage deviation should also be considered.	Partly agree	A definition of energy storage is provided in the Energy Directive (Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity). Mobile storage units inject energy into power systems by the fixed connection points, not by mobile connection points. Thus, rules for storage units shall apply accordingly. Ancillary services are subject to the operation regulations (SO GL and NC ER) and the future NC DSF.
WindEurope	The requirements should consider both short- and long-term storage and also the colocation of storage with renewables. Requirements for assets combining renewables and storage should not only consider cases where the storage unit is only integrated for self-consumption in the generation facility but also assets where both generation and storage (sharing the same grid access point) can both supply power to the grid independently. Requirements should also address cases of integration of storage in existing generation (or demand) facilities and not only stand-alone storage units or completely new assets.	Agree	The draft Policy Paper mentions developing storage unit requirements in various configurations including standalone sites or sites where electricity storage occurs along with generation (e.g., renewable generation) or demand, in combination with renewables, with PPMs, and is not only integrated for self-consumption in generation facility). Relevant transitory rules, definition of applicability and the issues of significant modernisation should be analysed adequately.
VDE FNN	Storage should be clearly defined and mobile storage should be included in the definition. Mixed customer sites and system architecture or solutions should be also considered when appropriate. Other important topics to be considered are controllability by the DSO and ancillary services such as grid balancing of frequency and voltage deviation.	Partly agree	See the answer to Westnetz GmbH above.
German Federal Ministry for Economic Affairs and Climate Action	The Member State's right to establish stricter requirements at national level should remain untouched. Storage facilities should generally be treated equally to PGMs when operating in generating mode and equally to demand facilities when consuming electricity.	Partly agree	In implementing existing Connection Codes, Member States specify non-exhaustive requirements and may decide to apply non-mandatory requirements. In doing so, they are required to take into consideration agreed European and technical standards. As regards the application of technical rules, similar approach and requirements with the NC RfG and NC DC should apply to storage units both in injection and withdrawal operating modes.

1.7 Simulation models and compliance monitoring

Respondents	Summary of respondents' feedback	ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
APREN	This harmonization of criteria will benefit all parts involved (energy suppliers, grid operators and producers) and could help to have accurate models applicable to all countries and networks. Just to exemplify, in Portugal the testing requirements of ORD are different from ORT.	Agree	Testing requirements done by DSOs have to be similar to those of TSOs taking into account the differences between distribution and transmission systems.
EUGINE – European Engine Power Plants Association	Having a general acceptable simulation model all over the EU will help manufacturers minimize the most difficult and expensive tests (FRT) while allowing site-specific FRT simulation checks.	Agree	We agree to use general simulation models in order to validate tests for FRT and minimising site-specific FRT simulation checks. However, the FRT characteristic is not the same in all MSs, since its parameters are non-exhaustive parameters. Using minimum and maximum values for the FRT characteristic at European level could enable reaching a minimisation of costs.
DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	The DSOs recognize that this is a key issue for TSOs, and is generally content to recognize their need to have the appropriate accurate modelling capabilities. We also recognize that the growth of distributed generation is increasing the needs of TSOs and DSOs to be able to model better the individual and combined effect of that generation. However the requirements need to be mindful of the mass market and lower complexity/capability of equipment and process at DSO level, and not specify requirements that are impractical. The burden on smaller generators should be kept in mind in setting these requirements.	Agree	Distributed generation must be properly modelled analysing the individual effect of small generators (types A and B) as well as types C and D PGMs. An adequate model must be used taking into account lower complexity and lesser requirements applicable to small generators connected to distribution network. Some TSOs are already using models, aggregated or not, for small generators. TSOs' experience in aggregation of small generators could be used in modelling/simulation.

Iberdrola S.A.	For the sake of a secure and efficient grid operation, it is important that in the process of access and connection of generation units, all the necessary information is provided to simulate the behaviour of the facilities for a correct load flow analysis (in static and dynamic regime). A development project of the company is defining the kind of information that fits better such targets and has detected in gap in the regulation in place.	Agree	Load flow analysis, static and dynamic simulations, have to use equipment's validated models. In practice, TSOs know errors due to improper models and therefore it is their main interest to reduce them. It is important that TSOs receive the same validated models for the same generating, demand, storage units and are able to use them efficiently in their analyses.
vgbe	As stated in topic 16 above, no requirements exist if a new synchronous PGM is developed in the vicinity of an existing HVDC terminal or near a large PPM. Potential interactions leading to sub-synchronous torsional oscillations are possible and need to be investigated. The statement in the Issue Logger that the local TSO has to solve this, has no European level playing. A European regulation has to be specified.	Agree	Interaction studies of synchronous PGM in proximity of existing HVDC terminal or large PPM, identifying sub-synchronous torsional oscillations, have to be conducted. It is not sufficient to stipulate that the local TSO has to address this. This must be addressed at European level. It is sensible to request TSOs/ENTSO-E to investigate and perform interaction studies but this rather fits in the scope of the SO Regulation.
PGE Polska Grupa Energetyczna S.A.	Currently, different operators, even within a single country, require different types of models - it is not standardized in any way. Standardization of requirements while being non-discriminatory always simplifies connection processes.	Agree	It is likely that different system operators from a single country require different types of models due to the different simulation tools they use and for different purposes, e.g RMS and/or EMT simulations. For the same purpose the same model shall be used by system operators.
EUTurbines	Any new requirements shall not trigger unsustainable costs and efforts by manufacturer. Model fidelity shall be reasonable for the purpose to be used. Costs seems to be displaced only on manufacturer and can generate economic unbalance among manufacturers and technologies. Any new requirements shall take in consideration the protection of manufacturer know how. Use of common/library models shall be used as much as reasonable in general studies.	Agree	Manufacturer <i>know-how</i> must be protected – a confidentiality agreement is mentioned in the draft Paper Policy. Common/library models (IEEE, IEC) in simulation tools could be used in general studies where it is allowed and not building equivalent new models without to be necessary.
Edison S.p.A.	Edison believes that possible amendments of the NC RfG and NC DC could introduce, in a proper way, common requirements for simulation models, considering the confidentiality and encrypted level. Nevertheless, the introduction of contractual arrangements with manufacturers doesn't seem to be easily accomplished. Further details on the conditions applicable to such contracts must be considered.	Partly Agree	The draft Policy Paper mentions (#22 and #34) that it is necessary to develop harmonised rules and a common approach - the <i>GC ESC's Expert Group report on Interaction Studies and Simulation Models</i> could be used in this regard. Confidentiality obligations are foreseen in Article 12 of the NC RfG and are already used by manufacturers and TSOs/DSOs which helps in protecting manufacturer property. If TSOs/DSOs need a possibility to use/modify models received from manufacturers additional conditions could be introduced in confidentiality

			agreements (e.g. via maintenance agreements) as stated in the draft Paper Policy #58.
Terna S.p.A.	Monitoring is definitely an important aspect from a compliance perspective. Terna does not agree with the possibility to limit information sharing with TSOs so to preserve privacy issues. Whatever the chosen approach to address confidentiality and privacy concerns regarding simulation and monitoring models will be adopted, it is a top priority to ensure the use of models that allow TSOs to have a complete and detailed understanding of the operation of the plants and equipment that are to be connected to the network. Complete and clear models are essential because the TSO cannot be in the position of having to connect systems to the network without knowing their operation in detail. While we acknowledge potential benefits of standardized models, by our experience, we do not deem them appropriate because too often their application does not allow to represent the real and complete functioning of the system to be connected.	Agree	Information has to be shared, in order to model and simulate properly the behaviour of the power system, in the agreed way between manufacturers and TSOs/DSOs, black-box, open-source, encrypted or detailed, using confidentiality arrangements or not, as it is specified in the draft Policy Paper. Standardized models (e.g. IEEE or IEC models used by software libraries) could be used according to TSOs/DSOs decision – fine-tuning could also be used on these models to attain the behaviour of the real equipment.
BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.	A validated simulation model is useful. However, several points need to be clarified: a.) For which systems / components are simulation models required? b.) Simulation scope/scope c.) Clear specifications on the scope and content of the simulation in order to avoid multiple loops during simulation creation d.) Cost bearing / cost sharing in case of iteration of the simulation models in the course of component development or due to further simulation requirements on the part of the grid operator e.) Duration of the final simulation coordination between power plant operator / plant manufacturer and grid operator in the case of replacement of plants or new plants f.) Protection of the status quo for simulations already created or cost bearing by the grid operator	Agree	a) The starting point for which system/components simulation models are required is mentioned in the draft Paper Policy #22 referring to the report elaborated by the <i>GC ESC's Interaction Studies and Simulation Models Expert Group</i> b) Some simulation scope is included in the RfG and DC NCs and in the <i>GC ESC's report by Interaction Studies and Simulation Models Expert Group</i> , where RMS and EMT methods are referred to. c) Any know-how from experienced entities (e.g. IEC, ENTSO-E) is welcome. d) The maintenance process is specified in the draft Policy Paper #34. e) The duration of simulation is usually specified in the connection contract with TSO/DSO where a maximum period is defined. f) These are covered by confidentiality arrangements or maintenance agreements.

	<p>A final comment is only possible once further concrete information is available in the course of the consultation process.</p> <p>Any amendment should be an outcome of a comprehensive stakeholder consultation process and also reflect the ongoing developments at international standardisation organisations (IEC et. al.) on simulation model standardisation and model validation.</p>		
ENTSO-E	<p>We consider that simulation models and compliance monitoring is a high priority subject to ensure the rapid deployment of renewable energy into the network.</p>	Agree	<p>Simulation models and compliance monitoring need to be considered alongside other factors affecting renewable energy deployment.</p>
Eurelectric	<p>We recognise that this is a key issue for TSOs, and are generally content to recognise their need to have the appropriate accurate modelling capabilities. We also recognise that the growth of distributed generation is increasing the needs of TSOs and DSOs to be able to model better the individual and combined effect of that generation. However the requirements need to be mindful of the mass market and lower complexity/capability of equipment and process at DSO level, and not specify requirements that are impractical. The burden on smaller generators should be kept in mind in setting these requirements. To facilitate this a certification of the model supplied by the manufacturer through testing and comparison between test results and model expected output, should be required from the manufacturer (independently of generator size). A standardisation of the model formats would also be advantageous as it would simplify studies Europewide. Standards could be proposed by EU DSO Entity and ENTSO-E and approved by ACER.</p>	Agree	<p>Similar response as to DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE.</p> <p>Distributed generation must be properly modelled by analysing individual effect of small (A&B types) as well as large generators (C&D types). An adequate model must be used taking into account lower complexity and less numerous functions of small generators connected at DSO level. Some TSOs are already using models, aggregated or not, for small generators and their experience could be used. TSOs' experience in aggregation should be used in modelling/simulation.</p>
EDF	<p>EDF considers that it is up to the local TSO to best determine the characteristics of such simulation models and would like to draw the attention on the subsynchronous torsional interaction. The commissioning of new HVDC lines and offshore windparks may trigger interactions with existing installations, potentially leading to cracks in power plants shafts, these interactions have to be solved and clarified.</p>	Agree	<p>This requirement is already stipulated in Article 21 of the NC DC: <i>each TSO shall specify the content and format of those simulation models or equivalent information.</i> A minimum set of requirements is established: <i>The content and format shall include: (a) steady and dynamic states, including 50 Hz component; (b) electromagnetic transient simulations at the connection point; (c) structure and block diagrams.</i></p> <p>Interaction studies between synchronous PGM in proximity of an existing HVDC terminal or a large PPM have to be performed at European level (due to the cross-border effect).</p> <p>In order to perform accurate, reproducible and validated interaction studies, an accurate representation of the equipment, detailed model requirements and relevant signal interfaces</p>

			<p>between the control layers in the models (black-box, open source) is required. This is known to TSOs and ENTSO-E.</p> <p>It is sensible to require all TSOs/ENTSO-E to investigate and perform interaction studies (i.e. like between synchronous generators in proximity of PPMs/HVDCs.) but this rather fits the scope of the SO Regulation.</p>
IFIEC Europe	IFIEC Europe understands the importance of this topic but does not at this point have a specific position on it.	Neutral	/
VDMA Power Systems	<p>Common requirements in Europe concerning simulation models and compliance monitoring would be a positive step forward but should be aligned with ISO/IEC/EN standards and industry best practice (FGW TR4) to avoid unacceptable costs and efforts borne by the manufacturers.</p> <p>Validated simulation models of generators could be used for certification in different countries instead of multiple test runs due to some other thresholds for same functionalities within country specific grid codes.</p> <p>The required simulation model fidelity shall be appropriately related to the simulation task. It would help manufacturers to minimize the effort spent on the most elaborate and expensive tests (FRT) while still facilitating site specific FRT capability evaluation, if a general simulation model approach was accepted all over the EU.</p> <p>The use of mathematical model and simulation is already in practice and the definition of common requirements could help the manufacturer for example during the compliance process. However it is expected that the requirements associated to model definition are based on recognized technical standard.</p> <p>The new requirements shall not trigger unsustainable costs for manufacturer. Requirements for model fidelity shall be reasonable for the purpose to be used.</p>	Partly agree	<p>Simulation models and compliance monitoring stipulations are present in the GC NCs but not with highly detailed descriptions. It is ENTSO-E/ TSOs' and EU-DSO Entity/DSOs' role to propose what is needed (including ISO/IEC/EN standards or industry best practices) concerning the simulation models and compliance taking into account common models for load-flow and dynamic simulations of the interconnected system.</p> <p>Due to different thresholds, different requirements have to be fulfilled (by a PGM) and in turn verified. Validated simulation models used for certification have to take into account these conditions but also functions which have to be incorporated for a PGM category. For example, in one country a PGM may be classified as type B while in another country it may be classified as type C. Therefore, initial tests are not enough. If a type B PGM fulfils type C requirements it should not be a problem to use a validated simulation model. The other way around is not as straightforward.</p> <p>FRT tests, similar to other tests, have to demonstrate the required capability according to the FRT characteristic established by a TSO according to the NC RfG. This task must be covered by Expert Group concerning Certification and 50549-10 standard.</p> <p>The Policy Paper will specify that the recommendations by the EG Certification shall be used in compliance verification process by TSOs/DSOs.</p> <p>Normally, additional tests are done when characteristics required by TSOs are not present in simulation tests and conformity certificates. Conformity certificates may help manufacturers to avoid additional costs.</p>

	<p>To provide black-boxed simulation models enables PGM manufacturers to include all functionalities and capabilities within the simulation models without putting any intellectual property at risk. Simulation models which provide more detail (for others to see) are simplified and hence less accurate than black-boxed models. Additionally, these models need more time for development and will be available for evaluations several months after black-boxed models could be provided.</p> <p>If lacking trust in the performance of black-boxed models is the main concern, this could be addressed in other means.</p> <p>National authorities should not be able to define certain simulation software and/or give extra privilege for special software manufacturer. This would not uphold the principle of fair competition.</p> <p>Proposal: If at all, national authorities and grid operators should be able give options for multiple simulation software selection.</p> <p>Any new requirements shall include considerations regarding the protection of manufacturer intellectual property.</p>		<p>We agree that black-box simulation models contain more information than explicit models supplied by a manufacturer but there is a possibility for manufacturers to sign an agreement with system operators in order to safeguard the confidentiality of the explicit models. This option is described in draft Policy Paper. The main problem with black-box models is that the changings of equipment structure in models cannot be factored in. Therefore, the use of detailed explicit models is preferable.</p> <p>Requirements from ISO/IEC/EN standards for simulation could have impact on the selection of simulation tool/software. It is possible to provide models in a standardised model form and use a model conversion function.</p> <p>Manufacturer's <i>know-how</i> has to be protected as mentioned the in the draft Policy Paper, e.g. by establishing a confidentiality agreement.</p>
EFAC	<p>Simulation models should not demonstrate the compliance of a generation unit (paragraph 22 of the policy paper), but rather be facilitated to demonstrate the compliance of PGMs (facilities) via simulation!! Be aware that a validated model will be based on type tests (to perform the validation against)! Hence, the PGU's compliance is demonstrated by the type testing. Only for non-tested PGUs in terms of a family definition respective enhanced models (taking into account the physical differences between family members) may be used to demonstrate the compliance of these non-tested units.</p>	Partly agree	<p>The draft Policy Paper (#22) states that <i>To demonstrate compliance of the unit with applicable provisions, responsible entities shall produce and provide a validated model.</i></p> <p>The EN 50549-10 project standard, 5.3.1.6 <i>Verification procedure using documentation and calculation or numerical simulation</i> includes information concerning model validation for types A and B PGMs .</p> <p>A function of the purpose is required - various grid connection and network planning studies/methods use EMT/RMS to determine the PGM compliance.</p> <p>Tests done for a PGM are valid for the same family products and used by TSOs according to the NCC. The differences between family members (physical differences) and the non-tested PGM is that for the latter the compliance with the NCC's requirements is yet to be demonstrated.</p>
CogenEurope	<p>Model requirements shall be reasonable and not trigger unsustainable costs and efforts by manufacturer or generating plant owner. Model fidelity shall be reasonable for the purpose to</p>	Partly agree	<p>See the reply to EUTurbines.</p>

	<p>be used.</p> <p>Plant model requirements shall be limited to the installed main electrical component (generating units, transformer, etc.). For example in the case of a cogeneration plant embedded in an industrial plant, it is not expected that the model will cover the extended industrial plant, but be limited only to the main generating units embedded in the cogeneration system.</p> <p>Model requirements shall be drafted considering that manufacturer know how and manufacturer intellectual property shall be protected. In case model information shall be completely disclosed, standard model (with their eventual fidelity limitation) shall be used for the purpose.</p> <p>When validated simulation model are requested, the manufacturer shall be allowed to provide the model based on the software of its choice.</p>		<p>A generating unit has various components, e.g. voltage regulator, governor, etc. which have to be simulated. Also, an industrial plant could have various components (e.g., compensators, static voltage regulators, long cables, etc.); therefore, modelling only generating units or transformers would not be able to describe dynamic behaviour properly.</p> <p>See the answer to VDMA Power Systems.</p> <p>To give liberty to a manufacturer to supply a model based on a software of its choice is not realistic because these might be unknown to the TSO community.</p>
WindEurope	<p>Possible amendment of the NC RfG and NC DC could introduce common requirements for simulation models requested by system operators, considering the confidentiality and encrypted level (including cross-border network stability studies), validation of the models, and future maintenance if needed. The outcomes of the EG Interaction Studies and Simulation Models should be considered including the recommendations for the simplification and cost-effectiveness of the validation methods (which are included in the report of the EG but not mentioned in the Policy Paper).</p>	Agree	<p>The draft Policy Paper mentions the need to include common requirements for simulation models, considering confidentiality and encryption, validation models and future maintenance (#34), as well as suggests using the report by the Expert Group Interaction Studies and Simulation Models.</p> <p>The Policy Paper has a general character while the simplification of methods and cost-effectiveness could be achieved through a dialogue between manufacturers, standardization bodies, TSOs and DSOs.</p>
EUROPGEN Grid Codes Working Group	<p>Common requirements would be a positive step forward but should be aligned with ISO/IEC/EN standards and industry best practice (for example FGW TR4).</p> <p>Simulation software is an issue - National authorities should not define certain simulation software and give extra privilege for special software manufacturer. This does not uphold the principle of fair competition.</p> <p>Proposal: National authorities and grid operators should give options for multiple simulation software selection. If the grid operators have difficulty in maintaining various simulation software,</p>	Partly agree	<p>See the answer to VDMA Power Systems.</p>

	then they should only require the neutral model description (model block diagram and mathematical representation published in a document format).		
VDE FNN	Common requirements for simulation models could be defined in the NC RfG. However, no specific technical requirements for the simulations should be specified in the NC RfG as these models are continuously being updated and have a great complexity.	Partly agree	<p>The common requirements for simulation models are defined in the NC RfG and NC DC, but these do not specify the number of steps necessary for frequency simulations, the value of ramping rate, the operating point for the simulations, simulation parameters, etc. Minimum requirements for simulation, necessary for ENTSO-E and TSOs/DSOs could be elaborated.</p> <p>We acknowledge that equipment and their models are being continuously updated and developed, but it is still necessary to consider models for excitation, AVR, speed governor, inverters, etc.</p> <p>The GC NCs could be updated should the complexity increase.</p>

2.8 Advanced capabilities for grids with high penetration of DER:

Respondents		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
Apren, BDEW, Enel, ENTSO-E, SolarPower Europe, VDE FNN, Westnetz GmbH	<p>New capabilities (grid forming, inertia, restoration, voltage requirements, anti islanding) are required for systems with high share of power electronic interfaces power resources, no matter where it is connected (to TSO or to DSO).</p> <p>Nowadays many developers are designing technical solutions for future plants enabling grid forming functionalities.</p> <p>Hence, it is important to define the concept of Grid forming in RfG and to complete the list of the technical requirements for the grid forming Power Conversion Systems. RfG update shall be based on the findings achieved by the Grid Connection European Stakeholder Committee (GC ESC) work that is nowadays in progress. The detailed requirements for Class III inverters will be finally defined in the proper documents (Standards from CENELEC) as well as their compliance tests.</p>	Agree	<p>The consultation focused on new functionalities from the DSO side, but also new infrastructures and new functionalities from unit side as grid forming is relevant. Reduced inertia and short circuit power issues were implicit as now clarified in the Policy Paper.</p> <p>GC ESC's Expert Group contribution should be explored while proposing amendments to the codes, as well as CENELEC standards.</p>
CEZ	Not clear whether this topic falls under connection codes	Disagree	Advanced capabilities are a relevant topic for the integration of dispersed generation (including RES), electromobility and demand response.
CogenEurope	Requirements shall be seen as a service and not be mandatory. Connection codes 2.0 are expected to ease or keep the current requirements without adding the new ones	Disagree	<p>It is important to distinguish between connection requirements (mandatory or not) and the provision/procurement of services in line with the Directive (EU) 2019/944. The latter (e.g. see Articles 31, 32 and 40 thereof) allows for the procurement of services using procedures other than market-based if so decided by the regulatory authority.</p> <p>Also, an equitable contribution of all system users is of utmost importance to achieve an efficient system operation. Some new requirements are needed at the unit design phase and once a unit is put in operation it cannot efficiently be retrofitted to provide certain capabilities needed by the system in order to maintain its stability during large disturbances.</p>

DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE, Enel	Smarter networks are the right tool to a more efficient, reliable and clean energy system. Grid development should take into account several factors through a long term CBA (reliability, impacts on value of load/value of generation, OPEX and CAPEX): Due care needs to be taken to the possible added requirements (grid forming) to avoid any restriction to future developments and innovation.	Partly agree	Smarter networks are one of the proper tools indeed, but some new requirements are needed for a secure operation of the interconnected EU system.
EDF, undisclosed stakeholder, Edison	New services as congestion management shall be promoted. grid operators prerogatives in developing their network shall be preserved.	Partly agree	New services are of utmost importance (see flexibility topic), but some new requirements are needed for a secure operation of the systems throughout EU. Grid development prerogatives are important, but a more efficient usage of the already connected resources shall also be achieved.
Edison	An holistic approach looking at all the network codes should be followed	Partly agree	The consistency throughout all the network codes shall be ensured, but unfortunately the codes will be revised stepwise, thus a complete holistic approach cannot fully be ensured.
ElaadNL, WindEurope	A more explicit wording of “smarter approach” is needed in order for the regulation to yield result. Consulting DSOs is important. Before defining advanced capabilities and integrating any relevant requirements in a revised code, it is crucial to create a common basis for terms and definitions of capabilities, whether advanced or not, across the EU, going to the necessary level of detail.	Agree	A smarter approach is under discussion. More details should be added to the codes, as well as common definitions.
Enel, Eurelectric	Investments needed to improve DSO capabilities and face the new role include grid real-time monitoring and control devices, so as functionalities for flexibility services planning and management (DERMS tool), TSO-DSO flexibility services coordination system. All those system improvements related cost should be duly considered by NRA in DSO remuneration, as foreseen by EU Directive 944/19. Also operation aspects as islanding shall be taken into account. However, it seems quite challenging to set common rules for very heterogeneous distribution grids across MSs.	Disagree	The cost recovery is out of scope of the connection codes and to be dealt with at the national level.
Enel	The regulation of the use of the revised connection requirement in terms of perimeter of the involved fleet (definition of the new plants involved, possible capacity or voltage level thresholds) and timeframe of the entry into force, should be addressed at national level, based on a careful evaluation of the impact of the new requirements on the security and quality of supply, with particular regard to the DSO network (namely, protection control and automation devices and operating rules).	Partly agree	Some common deadlines across the EU are needed to ensure a proper system behaviour.

Energie-Nederland	This seems to be related to the operation of a grid or system. It thus needs to be addressed in other codes, like the SO code.	Disagree	DSO-connected units shall have some specific capabilities because they are offsetting the transmission-connected conventional units which otherwise inherently provide for the stability to the system.
EUGINE – European Engine Power Plants Association, EUROGEN Grid Codes Working Group, VDMA Power System,	A “smarter approach” might result in higher requirements for PGM manufacturers, which comes with more effort, time and cost for development, internal validation, type testing and certification. Consideration should be given to the impact on manufacturers.	Partly agree	The improvements come indeed with a cost, but a compromise between the impact on manufacturers and the overall system security shall be reached.
Iberdrola	Smarter networks are the right tool to more efficient, reliable and clean energy system. In particular, low voltage grids, with a scenario of increasing penetration of DER, should be more automated and receive new investments and innovate with digital tools. DSOs should be the neutral facilitators in this challenge. It is important to balance in terms of CBA the upgrade of type A/B standards in the context of the current deployment of smart grids that is required to integrate massively DER.	Agree	All the aspects are relevant, from digitalisation to new requirements. DSOs shall facilitate the energy transition. A CBA to balance the new requirements against the smartness of the network is a key point to avoid imposing an exaggerated effort.
Ignacy Lukaszewicz Institute for Energy Policy	This is an extremely important issue. The TSO managed the stability of the whole system as such will always have a superior role, but it should be noted that the change of approach towards "from consumer to grid LV->MV->HV->EHV" requires a change of approach to the way in which the system is balanced, by solving problems on the grid at exact level where they occur, in such a way as to prevent their escalation to higher voltages and consequently to the whole system.	Agree	This is in the scope of the Policy Paper
SolarPower Europe	Beyond the capabilities mentioned in the paper, other capabilities and services will be needed in power electronics dominated electricity systems. The basic technical requirements for e.g providing system services as mentioned in the EU Regulation EU 2019/944 as non-frequency ancillary services should be picked up and harmonized throughout Europe, but as optional requirements rather than mandatory for all systems.	Partly agree	The issues and requirements as identified by the dedicated Expert Group working under the GC ESC shall be considered.

Terna	ACER scope is not clear: is it intended for DSO grids or technical requirements for dispersed resources? Technical requirements shall be preferred so to make the distributed resource smart rather than focusing on the distribution network to which the distributed resource is connected. Indeed, TSOs want to extract value for network management from distributed resources, and this can only be achieved by acting on the technical connection requirement of the distributed resource.	Partly agree	The scope is two-tier: on one side, the DSO network performance is relevant; on the other side, so are the system users' capabilities. Nevertheless, it is not the monetary value that TSOs need to extract from distributed resources - the review of the codes shall aim at ensuring the overall system security while attaining the highest overall efficiency and lowest total costs for all parties involved.
Undisclosed stakeholder, VDMA Power Systems, WindEurope	<p>Full support is given to any initiative for making distribution systems smarter and utilising the assets more efficiently. Moving to a smarter approach seems the more efficient solution in the long term. Some investments are needed at the beginning to install new intelligent and control devices, but in the long term the benefits in terms of flexibility and less costly infrastructures would overcome the initial costs.</p> <p>Smarter control by the distribution grid operators of the already available capability of installed PGMs will become of high importance.</p> <p>A significant amount of already today available capability of PGMs remains unused when connected to distribution grid.</p> <p>Only when already existing capabilities are used to their full extent, increasing requirements towards PGMs connected at distribution grid could be considered reasonable.</p>	Agree	/
VGBE	Potential interactions with existing and new synchronous machines, leading to sub-synchronous torsional oscillations shall be investigated upfront.	Agree	See the answer under policy on " <i>Simulation models and compliance monitoring</i> ".
WindEurope	Defining advanced capabilities requires a clear identification of respective power system needs that can only be achieved with a very active engagement and coordination of the work by several TSOs and DSOs. There is a major benefit in defining such advanced capabilities in the codes but this requires some important steps in arranging the proposal	Agree	The work from the dedicated EG should be taken into account. A coordination within the EG with TSOs and DSOs is of utmost importance to assess the topic from all the different points of view.

<p>WindEurope</p>	<p>Updates on the regulatory regime and the introduction of specific ancillary services for distribution systems are expected. Ancillary services are not just a matter of system operation requirements, contracting options with the system operator and market design but need to be addressed also from the grid compliance point of view. The large variety of terms, definitions and units used to describe the different capabilities of grid connected assets (normally covered by the NC RfG) and the lack of common definitions of non-exhaustive requirements makes it impossible to establish an EU framework for scaling up ancillary services.</p> <p>The Grid Connection Codes need to define to an adequate level of detail capabilities and which are mandatory (which will necessarily clarify which are non-mandatory and should be remunerated) in a common way across the EU so that this basis can afterwards be used by other regulatory items for designing all market and remuneration related aspects. This applies not only for “advanced capabilities” but also for all other core capabilities such as voltage control which are today required and addressed in a large variety of ways by the different NRAs and System Operators. Certification for grid compliance should result in certification to participate in ancillary services market, avoiding redundant certification processes and not justified discrimination of technologies.</p>	<p>Partly agree</p>	<p>A certain level of harmonisation is welcome, but the peculiarities of the different DSOs’ networks in the different MSs cannot be ignored.</p>
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1.8 Active customers/energy communities:

Respondents		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
Apren, SolarPower Europe	Fine with the approach proposed. It should be considered that in closed distribution grids, where the NC RfG doesn't apply, different rules should be harmonized.	Partly agree	Harmonising the rules in closed distribution systems is not so easy, since these grids are ruled in a different manner in the MSs.
BDEW Bundesverband der Energie- und Wasserwirtschaft e.V., SolarPower Europe	Any review of the NC RfG and NC DC has to be in line with the upcoming NC on Distributed Flexibility and mustn't prejudice the provisions to be laid down in the latter NC.	Partly agree	The connection codes will be reviewed likely before the publication of the NC on flexibility. The process will partially overlap, thus a certain level of coordination will be ensured, but unfortunately the revised connection codes will not be able to take into account details about flexibility that are not yet written.
CEZ	Clarification on the application of RfG / DCC could be beneficial. With regard to communities not connected to the public network, it is unclear how the electricity directive conditions (i.e. equal approach to consumers connected and not connected to the main network, meeting the same technical standards) could be achieved if minimum standards are not met. This could be also endangering for appliances used by consumers.	Disagree	Connection codes set out rules on the connection to the TSO/DSO networks. The Directive (EU) 2019/944 allows for Member States to grant citizen energy communities the right to manage distribution networks in their area of operation and establish the relevant procedures. However, this does not mean that these communities will sever their connection(s) with the public networks. Also, it is not the aim of the Policy Paper to interpret the Directive (EU) 2019/944.
CogenEurope	Micro-CHP solutions are on the market today and will be key contributors to active consumers and energy communities, as well as supporting power system resiliency more broadly by complementing electrification and intermittent renewable solutions. To ensure that micro-CHP benefits can be delivered, network code requirements shall take the technology specificities into consideration. Correspondent stakeholder are expected to be taken in consideration.	Partly agree	Micro CHP specificities could be considered indeed, but in principle, a technology neutral approach should rule the entire connection codes review.

<p>DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE</p>	<p>There is no reason for differentiation between energy communities and other customers of grids regarding the technical conditions of the connection point to the grid.</p> <p>the legal structure and applicability is already clear. The DSOs note that application of the EU NCs will also be dependent on the connection point, i.e. whether the local network is owned by a DSO or CDSO or a third party. In the latter case the connection point is in a different place to the former – and non-synchronous generating units downstream of the connection point will need to be aggregated to form a power generating module.</p>	<p>Partly agree</p>	<p>There is a misunderstanding. ACER has never intended to propose different requirements for energy communities and other grid users.</p> <p>The requirements should be the same, depending on the specific connection point(s).</p>
<p>EDF, Edison, ENTSO-E, Falck Renewables, German Federal Ministry for Economic Affairs and Climate Action, Iberdrola, SolarPower Europe, Terna, VDE FNN, Westnetz GmbH, WindEurope</p>	<p>Agree with regulators that there should be not asymmetric treatment of any system user and that all types of PGMs/demand facilities should contribute to system safety proportionately to their impact on the system; hence no need to provide separate requirements for active customers/energy communities.</p> <p>Requirements in the NC RfG and NC DC should in fact always be related to the grid connection point of a PGM.</p> <p>Besides, active customers and mixed customers sites are equivalent, with regard to their impact to the power grid, and thus the same rules and requirements should apply.</p> <p>The definition of specific technical requirements for plants included in energy communities (different from the requirements of plants non included in energy communities) could create distortions by encouraging energy communities only with the aim of less restrictive connection requirements and not for energy efficiency reason.</p>	<p>Agree</p>	<p>It is the scope of the Policy Paper.</p>
<p>Energie-Nederland</p>	<p>There is no need to mention active customers, aggregators or local energy communities or any other market role in the connection codes. As the connection codes should only deal with connection requirements for assets. The extent to which a certain customer is active on the market and through with arrangement, should not be relevant for connection requirements.</p>	<p>Disagree</p>	<p>Some roles need to be specified, especially when it comes to active customers (defined as customers with potential generation on site) or energy communities (whose members may be connected to a DSO/TSO networks).</p>
<p>Enel</p>	<p>In general, in various EU countries is already similar as in the proposals written in the paper</p>	<p>Agree</p>	<p>ACER is aware of this.</p>
<p>ENTSO-E</p>	<p>Possible interdependencies with the demand-side response in the SO GL should be analysed</p>	<p>Partly agree</p>	<p>A review of SO GL will follow the review of the connection codes. Interdependencies will be elaborated at that stage.</p>

<p>German Federal Ministry for Economic Affairs and Climate Action</p>	<p>There is no necessity for exceptions if an active customer or energy community uses the public grid less than 5 minutes a month as it also depends on the network infrastructure as a back-up.</p>	<p>No position</p>	<p>A negligible usage of the TSO/DSO networks by a resource could be eligible for some exemptions, however an extraordinary usage of the same network by the same resource in the future cannot be excluded. ACER will consider what would happen if the connection requirements are not met.</p>
<p>Ignacy Lukaszewicz Institute for Energy Policy</p>	<p>An active consumer and an energy community are not units connected to the grid. They act through equipment that is connected to the grid. For example, a local energy community acts through its members who are connected to the grid, through energy storage that are connected to the grid, through EV chargers that are connected to the grid. In many cases, EV chargers and energy storage are connected behind the meter in the house installations of the energy community members. It is therefore inappropriate to introduce any additional requirements for active consumers and local communities, as it will lead to overregulation of these. These units should be treated as sources of flexibility, and if needed to support their participation in the flexibility market, regulations should be developed through NC DSF</p>	<p>Disagree</p>	<p>As to the connection requirements, the draft Policy Paper proposes no differentiation between energy communities and other system users. Technical requirements for the connection of all (significant) system users should be defined in the connection codes. Therefore, the idea to consider the units connected to an energy community as flexibility sources to be regulated solely in the flexibility code cannot be accepted.</p>
<p>PGE Polska Grupa Energetyczna S.A.</p>	<p>It is unclear what is the justification for such harmonization at the EU level. And what is the knowledge of the TSO in the field of energy communities and active consumers (prosumers)? Too far-reaching regulations, which in consequence will lead to blocking of local markets, thus preventing the development of local markets of flexibility.</p>	<p>Disagree</p>	<p>The Policy Paper does not propose any additional connection requirements for energy communities and active consumers on top of the Grid Connection Codes' requirements applicable to system users. Technical requirements for the connection should be the same and the same should be the level of harmonisation throughout EU. With proper technical rules known ex-ante, the level playing field is established – the market is facilitated and not hampered.</p>
<p>REScoopEU, VDMA Power Systems, Undisclosed stakeholder</p>	<p>As long as technical requirements as framed in the policy paper are clear and easy to meet, and do not pose any additional hurdles to obtaining access to the market for energy communities and/or their members, they are acceptable. In other terms, requirements towards active customers should not become a barrier towards them.</p>	<p>Partly agree</p>	<p>We agree with the comment to a certain extent; what it lacks is a reference to the overall system security. A requirement may be burdensome for some technologies, but it should be nonetheless included in the codes if it proves to be relevant for the overall system security.</p>

1.9 Mixed Customer Sites

Respondents		Summary of respondents' feedback		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)		
Iberdrola S.A., vgbe, Terna, Eurelectric, VDMA Power Systems, EUROPGEN Grid Codes Working Group	There should be no difference in treatment between facilities connected to a CDS and the other facilities to avoid distortions.	Agree	In line with the NC RfG, the same requirements should apply for the connection of a PGM to a closed or non-closed distribution system to ensure a level playing field.		
Terna	No specific technical requirements should be defined for MCS to avoid distortions.	Agree	There should be no difference in treatment between units/facilities of a MCS and other units/facilities in order to ensure a level playing field and a secure system operation. Combined or not, the provisions of GC NCs should be coherent and clear as to addressing the MCS' issues.		
Undisclosed stakeholder, VDMA Power Systems, German Federal Ministry for Economic Affairs and Climate Action, ENEL SpA	MCS should be considered as one plant and the requirements should always be met at the connection point to the public grid since it would be legally and practically difficult for DSOs and TSOs to investigate and detect in compliance of an element of the MCS. Considering MCS as one plant would allow a coordinated operation of all components within the MCS. Some stakeholders suggest creating a combined RfG and DC NC in the future to deal with this issue.	Disagree			
Falck Renewables	It would be necessary to define a section exclusively dedicated to MCS users also including configurations based on the rated voltage of generators instead of their connection voltage, and along with additional requirements for such configurations.	Partly agree	Combined or not, the provisions and principles of GC NCs should be coherent and clear as to addressing the MCS issues. However, a dedicated section treating MCSs does not seem to be necessary to achieve this objective. Addressing all possible units' combinations and MCSs connection point(s) variants in the Grid Connection Codes seem impossible and futile.		

Vgbe, VDMA Power Systems, EUROGEN Grid Codes Working Group, SolarEurope	Several stakeholders underlined that the issue of MCS could be effectively addressed by modifying the rules for determining significance and expressed a preference for the complete removal of the voltage criterion so as to determine the significance based on capacity only.	Partly agree	Refer to the elaborate answer in the section on the “ <i>Determination of significance of PGMs</i> ”.
APREN, Solar Europe, ENEL SpA	It is important to create rules that enhance the uptake of renewables in such way that the use of an existing connection point to the grid for a mix of technologies (e.g. wind and solar-compensating among each other day/night) will be able to be developed without increasing the capacity of current connection, considering that it won't impact grids well-functioning. The consideration of regulations (dynamic production power adjustments) with regard to the classification of PV power plants can also incentivise a more efficient use of grid capacity. However, the current RfG does not handle the availability of self-consumption facilities sufficiently because the definition of Pmax is not clear enough and can lead to several interpretations.	Disagree	The aim of the GC NCs is to clarify the connection requirements of PGMs and storage units within an MCS. There should be no difference in treatment between facilities of a MCS and other facilities in order to ensure a level playing field and a secure system operation.
PGE Polska Grupa Energetyczna S.A.	These provisions should be included in the DSF Code as they will directly support the flexibility of the system at the DSO network level.	Disagree	The aim is to clarify the connection requirements of PGMs and storage units within an MCS. This subject falls within the scope of the GC NCs and not the DSF code.
SolarEurope,	It is critical to acknowledge that in the near future the majority of European Homes and SMEs will become mixed customer sites. Therefore any processes, technical requirements or certification schemes must be as harmonised and easy-to-fulfil as today's requirements for a simple household connection.	Partly agree	The GC NCs should clarify principles and requirements that apply to MCS and ensure that proportionate requirements apply to them. However, there should be no difference in treatment between units/facilities of an MCS and other facilities/units in order to ensure a level playing field.
BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.	With the decentralisation of electricity production mixed customer sites (MCS) will become an important part of the energy system. On the one hand, new rules have to be easily practicable by the rising number of actors (also households) which both use and produce electricity. On the other hand, the secure grid operation has to remain the leading principle when determining what kind of requirements to MCS are needed.	Agree	

BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.	Any proposal for binding rules in a revised network code should be consulted with representatives of grid operators and the grid users affected.	Agree	The process of the amendment of the GC NCs has been transparent and in line with the Electricity Regulation. Also, besides the use of the Expert Groups reports, the GC ESC has been informed and consulted on the aspects of the network codes amendments.
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1.10 Significant modernisation

Respondents		ACER views	
Name of stakeholders	Summary of stakeholders' views	ACER position	Reasoning (and implemented changes)
APREN, vgbe	A minimum threshold should be defined at EU level above which a modernisation is considered substantial.	Agree	Where possible, a range of potential values of the thresholds concerning the significant modernisation criteria should be defined in the NCs to ensure both that modifications with a significant impact for the system (above the threshold) are necessarily considered as substantial and so that minor modifications (below the threshold) are not considered as substantial.
DSO Entity with CEDEC, E.DSO, Eurelectric, GEODE, Iberdrola S.A., BDEW Bundesverband der Energie- und Wasserwirtschaft e.V., undisclosed stakeholder, ENEL SpA, WindEurope, APREN, ČEZ, a.s.	Several stakeholders agree with the need to clarify the definition of significant modernisation.	Agree	As stated in the draft Policy Paper, the clarification of the definition of significant modernisation and the requirements laid down in the GC NCs which must apply in these cases will allow the definition of coherent principles across Member States. However, given the different requirements of general application defined among Member States, defining strict criteria for significant modernisation in the GC NCs may not be appropriate for some Member States.

<p>EUGINE – European, Iberdrola S.A., vgbe, EUTurbines, ČEZ, a.s., VDMA Power Systems, CogenEurope</p>	<p>Maintenance activities and the use of spare part should not be considered as substantial modernisation.</p> <p>Regarding the application of RfG criteria to any new part / component, it shall be clarified what is meant by new part / component. Sometimes if one use new components fulfilling RfG conditions, it could lead to the need of exchange of further components, bringing higher burden to the PGM. This may put a heavy burden on operators and any such impact should be carefully considered.</p> <p>The definition of spare parts as stated in the standard EN 13306 Ed.2010-10 should be considered.</p>	<p>Partly agree</p>	<p>It is not the intention of ACER to include maintenance and the use of spare parts in the definition of significant modernisation, as stated in the Policy Paper.</p> <p>Regarding the compliance of new parts, it would be required as far as possible so as not to prevent compliance with the GC NCs in the event of subsequent additional modifications. If the addition / replacement of a part / component does not trigger a significant modernisation criterion and if the compliance of the new part / component implies the need to retrofit other parts of the PGM / demand facility, the compliance of this new part will not be required.</p>
<p>Vgbe</p>	<p>One stakeholder underlined that the significant modernisation process should apply equally to Type A and Type B PGMs, not just C and D as described in the current version of the GC NCs, especially as the number of Type A and B units is expected to increase.</p>	<p>Partly agree</p>	<p>Not to address modifications to Type A and B units could pose a security risk to the system and significant modernisation criteria should be defined for all the PGMs from type A to D. However, smaller units are typically standardised products (off-the-shelf) which should not be unduly burdened with bureaucracy. Currently, it is assumed that smaller units when broken down receive a replacement of parts (e.g., converter) which are compliant with the GC NCs because the manufacturers/retailers do not keep stocks of old and outdated equipment.</p> <p>It is however a different case should a small PGM be replaced with a unit with a maximum capacity which is larger than that specified in the connection agreement. In this case, it is clear that the unit should be assessed for the criteria/principles determining significant modernisation.</p> <p>Individual approaches should in general be avoided to ensure a better harmonisation.</p>
<p>ČEZ, a.s.</p>	<p>Another stakeholder considers that the significant modernisation criteria should be defined for type A, B and C PGMs, but not necessarily for type D PGMs, where an individual approach is needed.</p>	<p>Partly agree</p>	
<p>Undisclosed stakeholder, VDMA Power Systems</p>	<p>To support the EC's ambitions for energy transition, it is important that possible performance upgrades of already installed renewable generation are enabled without being classified as significant modernisation.</p>	<p>Disagree</p>	<p>Significant modernisation criteria should be defined based on the impact of the PGM / demand facility on the system. Different criteria can be defined for different technologies taking into account their specificities, but the general rule should be that a modified PGM/ demand facilities having a significantly higher impact on the system than before should be compliant with the GC NCs.</p>
<p>CogenEurope</p>	<p>Modernization to the generating plant associated with energy efficiency and carbon reduction improvement can eventually be permitted without the need of aligning the generating unit to new technical requirements. Additional costs could be impact the decision in improving plant efficiency.</p>		

Energie-Nederland	Any revision of the connection codes should not result in additional requirements for existing assets.		
EUTurbines, CogenEurope	Modification to limited component of the generating unit/plant shall trigger new requirements only for the specific part affected.	Partly agree	So as not to prevent compliance with the GC NCs in the event of subsequent additional modifications, any new parts or components of a facility should, as far as possible, comply with the requirements laid down in the GC NCs. If the modification of a component triggers a significant modernisation criterion by changing one of the key electrical characteristics to be considered, it could be required for all the PGM / demand facilities to be compliant with the GC NCs.
Edison S.p.A, Terna, EDF	The existing provisions of the network codes are sufficient, leaving the necessary room for taking into account local specificities within the existing national regulatory frameworks. Therefore, the amended GC NCs should not introduce further harmonisation at EU level.	Disagree	The current wording of the GC NCs is unclear and may lead to several interpretations. The modifications of existing PGMs / demand facilities cumulatively have security implications for the whole European system and a common understanding of the problem is necessary. Specificities between the MSs exist and could be taken into account in the definition of the precise modification criteria which would be defined at the national level on the basis of the general principles specified in the GC NCs.
Edison S.p.A	In case the criteria used to identify significant modernisations are clarified in the GC NCs, only electrical characteristics that lead to an increased ability to provide a particular service should be considered (e.g. the frequency stability and the active power management, the reactive power capability and/or the short-circuit current of the PGM/demand facility) and not the simple change of components/assets and/or the maximum capacity of the units since these latter interventions do not fundamentally impact the ability to provide a service.	Partly agree	Significant modernisation criteria should be defined based on the impact of the PGM / demand facility on the system and the maximum capacity is one of the key characteristics to evaluate the impact of a PGM on the system (the maximum capacity is the main criterion for the determination of significance of PGMs in the NC RfG).
ČEZ, a.s.	Probably the best option would be to task NRAs / Member States to adopt national-specific transparent criteria on significant modernization by certain deadline, for instance 1 year after entry into force of the revised RfG.	Agree	The significant modernisation criteria would have to be defined at the national level by a deadline defined in the GC NCs.

<p>EDF, DSO Entity with CEDEC, E.DSO, Eurelectric, GEODE, Iberdrola S.A., BDEW Bundesverband der Energie- und Wasserwirtschaft e.V., undisclosed stakeholder, ENEL SpA, WindEurope, APREN</p>	<p>Several stakeholders underline that defining strict criteria for significant modernisation is not be appropriate for some MS and that It is better to define general principles regarding the electrical characteristics to be considered, the ranges of possible values of the thresholds concerning the significant modernisation criteria and the requirements of the GC NCs that must apply for each criterion which will have to be specified at national level by the TSOs and DSOs and approved by the competent authority.</p>	<p>Agree</p>	<p>As stated in the Policy Paper, the clarification of the definition of significant modernisation and the requirements laid down in the GC NCs which must apply in these cases will allow the definition of coherent principles across Member States. However, given the different requirements of general application defined among Member States, defining strict criteria for significant modernisation in the GC NCs may not be appropriate for some Member States.</p>
<p>EUGINE – European,</p>	<p>It would need to be made clear what requirements need to be met once a part is updated.</p>	<p>Partly agree</p>	
<p>IFIEC Europe</p>	<p>The difference of the scope of application between the NC RfG (which applies to single units/facilities) and the NC DCC (which applies to sites) requires a different approach. It is crucial that any significant modernisation should not necessarily lead to the full compliance of the entire site with the GC NCs but should ensure that any modernisation is a step towards full compliance after a full investment of the entire site and should in no case be a hindrance to future compliance with the Network Codes.</p>	<p>Agree</p>	<p>When defining the significant modernisation criteria as well as the requirements that must apply for each criterion, the differences in the type of facility and the scope of the GC NCs requirements should be taken into account.</p>
<p>SolarEurope</p>	<p>Systems installed today already provide a high standard regarding the support of system stability, leading to a relatively low risk when they are modernised in future and not being updated to the latest requirements to the full extent.</p>	<p>Partly agree</p>	<p>Currently, it is assumed that smaller units when broken down receive a replacement of parts (e.g., converter) which are compliant with the GC NCs because the manufacturers/retailers do not keep stocks of old and outdated equipment. It is however a different case should a small PGM be replaced with a unit with a maximum capacity which is larger than that specified in the connection agreement. In this case, it is clear that the unit should be assessed for the criteria/principles determining significant modernisation. For this reason, appropriate significant modernisation requirements should also apply to small units.</p>

SolarEurope, VDE FNN	Criteria for a cost-benefit analysis should be defined and used for the definition of the significant modernisation criteria and the requirements to be met in those cases.	Partly agree	The criteria and requirements should be defined taking into account the risks / benefits for the system and the constraints of PGMs / demand facilities. However, carrying out a comprehensive cost benefit analysis would be very complicated due to the volume of data needed and the approach needs to be to some extent qualitative based on the experience of the stakeholders and SOs.
Eurelectric	Rules that are based on the existing power plant characteristics should be avoided since it may prove difficult to ascertain these characteristics, which may lead to stalemates and indecision, or even, to appearance of non-equal treatment by system operators.	Agree	Significant modernisation criteria should be defined based on the impact of the PGM / demand facility on the system compared to the state before the modernisation.
EFAC	An EU wide consistent approach should be defined instead of allowing member states to choose within a bandwidth.	Partly agree	Clarification of the definition of significant modernisation is needed and a consistent approach should be defined. However, given the different requirements of general application defined among Member States, defining strict criteria for significant modernisation in the GC NCs may not be appropriate for some Member States. Conversely, it seems more relevant to define general principles regarding the electrical characteristics to be considered and/or ranges of possible values of the thresholds concerning the significant modernisation criteria, which will have to be specified at national level by the TSOs and approved by the competent authority. Nevertheless, GC NCs shall provide for specific limits capping the values of significance modernisation criteria in order to ensure a level playing field.
WindEurope	The hybridisation of assets (addition of another generation technology or storage) should also be considered when setting such criteria.	Partly agree	The addition / replacement of a part / component should be considered but defining specific criteria for hybridisation cases does not seem necessary.

1.11 Additional policies proposed by stakeholders

Respondents	Is there any area that you consider important but has not been covered by this Policy Paper?	Please, elaborate on your answer above, if necessary:	ACER views
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1.11 Additional policies proposed by stakeholders

Ignacy Lukaszewicz Institute for Energy Policy	Other	Proposed area is too wide and in many cases overlapped.	The areas (including the overlapping) covered in the draft Policy Paper encompass the issues identified by the GC ESC and areas recognised by ACER/NRAs. The stakeholders were also invited to propose and motivate additional policy areas.
ElaadNL	Yes	Smart charging of electric vehicles	Indeed, smart charging of electrical vehicles is important, but the associated details rather rest in the scope of system operation and balancing. However, the grid connection network codes could potentially require a presence of an interface (input port) and thereby enabling smart charging.
Better Energy A/S	Yes	<p>1. The system operators should be obliged to document how the principles in article 7(3) in the RfG is considered, especially how the lowest costs for all involved parties is fulfilled. We experience very often, that only system security is considered, not associated costs for generators nor technical standards.</p> <p>2. Requirements in the RfG, which is used only to provide ancillary services should not be mandatory with the same arguments as set down for "Requirements for units providing demand response services".</p> <p>3. The system operators should not be entitled to limit the production of electricity when required functions are not activated. Especially the requirements for providing reactive power results in loss of electricity for PV plants as the plant must be limited in order to be capable of providing reactive power, even though it is not requested.</p> <p>4. MCS should be evaluated as a hole in the point of connection and not the individual units (generation/storage/demand).</p>	<p>1. The implementation of the GC NCs is a Member State issue where local specificities can be taken into account via the non-exhaustive requirements.</p> <p>2. Capabilities of PGMs have originally been chosen so that there is an equitable treatment of all system users.</p> <p>3. Operational aspects of PGMs are out of scope of the grid connection network codes.</p> <p>4. This is not how the network codes have been construed.</p>
Verband der Automobilindustrie e. V. (VDA)	No		/
Eaton Electric	Yes		
APREN	Yes	Grid services to be performed by PGM's, storage facilities, and inertial flywheels, as reactive energy producers	Services are out of scope of the GC NCs and rest with the system operation rules.

1.11 Additional policies proposed by stakeholders

<p>EUGINE – European Engine Power Plants Association</p>	<p>Yes</p>	<p>The most important points that, in our view, would also need to be covered are:</p> <p>a) Family definition and use of existing certificates (or harmonized approach towards certification), including acceptance of validated models among ENTSO-E member states.</p> <p>b) Additionally, a harmonized classification of Types A, B, C and D at EU level, including a harmonised approach to SPGM definition (individual power vs total plant power) for Type classification.</p> <p>c) a modification of the protection list for Type A and B (in some cases even C) regarding rotor earth fault would be required, as this can have a significant impact on the costs of generators.</p> <p>d) Include the definition of “prototype declaration” as specified in VDE-R-N 4110/4120. This is important that manufactures have possibility to introduce new technologies.</p> <p>e) Consider test permission approach of plants to demonstrate grid code compliance.</p> <p>f) Harmonize limits for all FRT events, including symmetrical FRT, asymmetrical FRT, and over-/underexcited operation FRT.</p>	<p>a) Indeed, generating unit family definition shall be included when made available by the concerned expert group. Regarding the use of certificates see the answer to EFAC below.</p> <p>b) This clarity concerning the SPGM definition is considered a detail and can be considered following a stakeholder proposal submitted in due course of the full-fledged public consultation planned for September.</p> <p>c) The current wording of Article 14.6.b requires from the relevant system operator (RSO) to specify the schemes and settings necessary to protect the network and not the PGM internal protection schemes. The latter are in the hands of the PGM owner that is required to coordinate them with the RSO.</p> <p>d) This is considered a detail and can be considered following a stakeholder proposal submitted in due course of the full-fledged public consultation planned for September.</p> <p>e) idem</p> <p>f) idem</p>
<p>Energie-Nederland</p>	<p>Yes</p>	<p>Overlap with existing codes should be addressed. The Connection Codes should focus on connection requirements only. It should not cover operational or market aspects as such aspects should be covered in the System Operation and Market Codes. Therefore the whole Title III of the Demand Connection Code (articles 27-33) should be reconsidered or even removed. Also article 15.6 e) of the RfG should be removed or at least reconsidered. TSOs should not determine min or max ramp rates and certainly not in a connection code.</p>	<p>Potential overlaps will be addressed in the course of the amendment of the GC NCs. System users’ capabilities are in the scope of the grid connection as the safe and secure power system operation cannot be left to market forces only.</p>

1.11 Additional policies proposed by stakeholders

DSO Entity with CEDEC, E.DSO, Eurelectric and GEODE	Yes	<p>We do not see any reference to the ongoing work regarding certification harmonisation and the use of equipment certificates throughout Europe for the smaller power generating modules. We think this would support the market and lower the barriers for connection to the EU grids.</p> <p>We also suggest the inclusion of standardised grid user interfaces, i.e. equipment that should guarantee the proper bilateral communication between the grid and user appliances.</p>	Clarity regarding the use of equipment certificates throughout Europe shall indeed be in the scope of the policy paper – see response to EFAC below.
Iberdrola S.A.	No		
vgbe	Yes	<p>1. Due to the European Green Deal, the robustness of the electrical system will decrease with several consequences such as decreasing frequency stability and decreasing short-circuit power. A high RoCoF is a consequence of a system split due to the fading-out of synchronous generators. As stated in the workshop on 1 February 2022, this will become a major European problem for which European regulation is needed to provide definitions of the measurement method and precision, the withstand capability threshold, the tests or simulations. Several countries want to impose values above 1 Hz/sec where ENTSO-E declared that a RoCoF above 1 Hz/sec is not manageable and where DNV-KEMA declared in its study for EirGrid that some synchronous PGMs cannot withstand a RoCoF of 1.5 Hz/sec and almost all synchronous PGMs cannot withstand a RoCoF of 2 Hz/sec.</p> <p>2. vgbe proposes to modify the reactive power requirements of PGMs to more realistic values.</p> <p>The shape and boundaries of the envelope in the current code are not realistic. The current code imposes the capability to inject additional reactive power at over-voltages and to absorb reactive power at under-voltages. Such extended capabilities will never be applied during</p>	<p>1. RoCoF details need to be specified in the RfG NC while such a level of detail does not belong to a policy paper.</p> <p>2. Considerations of the use of reactive power capabilities rest with the system operators.</p> <p>3. This issue was discussed extensively during the development of the RfG NC and Member States voted on the adoption of the voltage withstand capabilities. Standardisation should follow in response to the adoption of the EU wide binding rules.</p> <p>4. This issue is to be dealt with when amending the SO REGULATION.</p> <p>5. As explained already in the past two ESC meetings, detailed stakeholders' proposals should be submitted in due course of the full-fledged public consultation planned for September.</p> <p>6. idem</p> <p>7. Rather than the RfG NC it is the SO REGULATION that is regulating the system operation.</p> <p>8. Details of the site-specific requirements fall out of scope of the policy paper. If changes in the GC NCs are needed, relevant</p>

1.11 Additional policies proposed by stakeholders

		<p>operations.</p> <p>3. The current version of the RfG NC imposes voltage withstand capabilities that are not described in international standards. Especially the requirement for 400 kV networks is not realistic by imposing 400 kV = 1 pu. A modification of international standards will take several years. An intermediate solution, acceptable for all stakeholders must be defined in the future RfG NC, for instance by specifying 380 kV = 1 pu as specified in the IEC standards. A harmonisation of the over-voltage ranges between all European synchronous areas (1.10 pu in table 6.2 of the current RfG NC) and the Baltic area (1.15 pu) is also needed.</p> <p>4. Using the classification of the RfG NC in the SO REGULATION creates unforeseeable difficulties. vgbe thinks that in some countries, the classification of PGMs is defined by operational considerations instead of connection considerations. This cross reference between both codes has to disappear.</p> <p>5. The recommendations of the common paper EUTurbines - vgbe should be inserted (see ESC of 22 September 2021)</p> <p>6. On 12 November 2013, KEMA has published a report regarding the requirements in the RfG NC.</p> <p>This report was submitted to the European Commission DG TREN with project number ENER/B2/151/2012. The recommendations are summarised at the pages viii – xv</p>	<p>proposals should be submitted in due course of the full-fledged public consultation planned for September 2022.</p> <p>9. Rather than the NC RfG it is the SO REGULATION that is regulating the system operation.</p> <p>10. Such level of detail falls out of scope of the policy paper. If changes are needed, relevant proposals should be submitted in due course of the full-fledged public consultation planned for September</p> <p>11. Indeed, this seem relevant, but does not merit a change in the policy paper. Such a statement could be added to the RfG NC following a proposal submitted in due course of the full-fledged public consultation planned for September 2022.</p>
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1.11 Additional policies proposed by stakeholders

		<p>of this report. Most recommendations are still valid today and need to be re-investigated in the context of the European Green Deal.</p> <p>7. Articles are needed in the RfG NC to safeguard grid users in case of abnormal grid characteristics such as voltage, frequency and grid stability. Voltages outside the imposed ranges at a normal state of the grid were reported by FNN-VDE and presented at the GC ESC of 9/3/2021. The PGM has the right to disconnect at such abnormal grid characteristics but what with the financial consequences of the non respect of the submitted power injection schedules? Such statement is missing in the ENTSO-E answer in the Issue Logger.</p> <p>8. As stated by the ISSM expert group, no requirements exist if a new synchronous PGM is developed in the vicinity of an existing HVDC terminal or near a large PPM. Potential interactions leading to sub-synchronous torsional oscillations are possible and need to be investigated. The statement in the Issue Logger that the local TSO has to solve this, has no European level playing field because EU regulation is missing.</p> <p>9. In order to increase the grid stability and robustness, the installation / operation of synchronous compensators is recommended. This kind of installations can be installed / operated by grid operators but also by grid users. They are not described in the current network codes. An appropriate description of the requirements for synchronous compensators and other grid stabilising installations is needed.</p>	
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1.11 Additional policies proposed by stakeholders

		<p>10. In the current version of RfG NC, Art. 45.7.b.(i) imposes to verify the reactive power capabilities in several operating points and each one during a period of time of 1 hour. This duration has technically spoken no added value and is considered as meaningless. vbge proposes to change this duration to 60 minutes for only one operating point and to 15 minutes for the other operating points. The operator of the PGM defines the moment of those tests.</p> <p>11. A clear statement in the RfG NC that all nuclear safety requirements for nuclear PGMs prevail over requirements of the electrical codes is needed.</p>	
PGE Polska Grupa Energetyczna S.A.	No		/
EUTurbines	Yes	<p>The CNC RfG and DC code shall include procedural improvement to facilitate the integration of new generating system.</p> <p>In the next generation of the RfG and DC code there shall be specific provision to facilitate the collection of information (single point of information), to improve as much as reasonable harmonization associated with requirements and compliance process, to facilitate compliance process in a reasonable and economical manner for all involved parties.</p> <p>Proposals have been discussed and elaborated during multiple workshop sessions with the cooperation of European Stakeholder members and are part of the GC ESC documentation.</p> <p>These proposals take into consideration the difficulties faces by the industry in adapting to rules that are news</p>	<p>We agree that the RfG and DC NCs could be improved in regard the transparency of the applicable rules and procedures. For this reason a new policy has been introduced in the paper.</p> <p>Regarding the RoCoF, see the answer to vgbe above.</p>

1.11 Additional policies proposed by stakeholders

		<p>for all involved parties and are based on first-hand experience.</p> <p>CNC RfG and DC are reference document for the industry, indication provided in CNC shall be also properly integrated by MSs (and TSOs), misalignment shall not be permitted.</p> <p>ROCOF requirement seems to become a relevant requirement. EUTurbine is interested in having this point elaborated in the next revision of the RfG. In particular limit values, interpretation and the fact that the limit value shall become a shared target value among manufacturer and System Operator in line with inertia containment policy requested by the SO REGULATION directive shall be subject to consideration.</p> <p>EUTurbine presented a position paper describing the different points that we would like to see elaborated in the next revision of the RfG</p>	
Edison S.p.A.	No		/
ČEZ, a.s.	No		/
Terna S.p.A.	No		/
BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.	No	<p>The policy paper presents the topics for which a review is needed. Yet, there is some irritation whether there are other processes going on which also work on a review of the Grid Connection Network Codes. It would be helpful if ACER and CEER could explain more precisely how the analysis and recommendations presented in the paper are linked to or based on the work of the European Stakeholder Committee (ESC) on Grid Connection.</p>	<p>There is no direct link to the GC ESC. As explained in the policy paper some of the policies base on the reports by different expert groups.</p>

1.11 Additional policies proposed by stakeholders

ENTSO-E	Yes	<ul style="list-style-type: none"> • Requested behaviour outside a defined requirement of the NC • Compliance monitoring • RoCoF withstand capability • Automatic connection/reconnecting to the network after an incidental disconnection • Fault-ride-through requirements • Connection requirements on periodical data exchange, linked with operation requirements • Robustness of automatic control outside capability • Robustness of PGM in islanded or weak network mode • LFSM-U and LFSM-O priority, response time and threshold • Frequency response insensitivity and delays • FSM, frequency ranges and droop • Black start capability, island operation and quick re-synchronization • Voltage ranges and voltage stability • Active power forced oscillations • High-voltage-ride-through • Extension of frequency range (system splits) • Short circuit requirements (DC NC) • Load frequency demand disconnection (input signal, 	<p>As explained already in the past two ESC meetings, detailed stakeholders proposals should be submitted in due course of the full-fledged public consultation planned for September 2022.</p>
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1.11 Additional policies proposed by stakeholders

		functional capabilities, and application) <ul style="list-style-type: none"> • Power quality • Grid Forming Capabilities 	
Eurelectric	Yes	<p>We do not see any reference to the ongoing work regarding certification harmonisation and the use of equipment certificates throughout Europe for the smaller power generating modules. We think this would support the market and lower the barriers for connection to the EU grids.</p> <p>For instance, identical frequency withstand requirements for generators, since presently there are different settings, according to the country, for generator frequency withstand which should be revised as the frequency throughout a synchronous area is identical, and so should be the requirements. This is one of the causes that there are multiple generator national certificates and contributes to a barrier in the internal market.</p> <p>We also suggest the inclusion of standardised grid user interfaces, i.e. equipment that should guarantee the proper bilateral communication between the grid and user appliances. For example there should be a Type A Generator to DSO communication standardisation, since although the network code already establishes the right of the DSO to communicate with type A generators (typically for emergency switch off) more advanced capabilities require a digital communication to take full advantage of the data and control capabilities supported by modern inverters. It is our opinion that this topic should be addressed in a RfG revision. Communication standard could be proposed by EU DSO Entity and approved by ACER.</p>	<p>Clarity regarding the use of equipment certificates throughout Europe can indeed be in the scope of the policy paper – see response to EFAC below.</p> <p>Nevertheless, a harmonisation of requirements is not objective in itself. Some flexibilities need to remain in order to allow for Member States specificities be considered at national level.</p> <p>Standardised grid user interfaces could pose a hurdle to innovation and the efficient use of various competing technologies.</p> <p>In accordance with Article 3 of the NC RfG, the relevant system operator shall refuse to allow the connection of any power-generating module which does not comply with the requirements set out in this Regulation and which is not covered by a derogation granted by the regulatory authority, or other authority where applicable in a Member State. Nevertheless, the wording of the concerned article can yet be improved to clarify the circumstances when a disconnection of the non-compliant PGM is possible.</p> <p>It is unclear as to what other individual approaches are needed; however, detailed proposals should be submitted in due course of the full-fledged public consultation planned for September 2022.</p>

1.11 Additional policies proposed by stakeholders

		<p>Generator Life-Long compliance – There should be a topic of the code on how to ensure code compliance during the power plant life cycle addressing topic such as firmware updates, observation needs for incident analysis, penalties for infringement (specially for type A, B and C where the current code displays no penalties while for type D it is clear that the infringement can lead to disconnection).</p> <p>We should ensure that there is an individual approach to certain technologies allowed, such as pumped-storage hydro mentioned in detail below, but also other low-carbon technologies such as nuclear (e.g. regarding reactive power).</p>	
REScoopEU	Yes	Barriers that renewable energy communities face when trying to obtain a grid connection.	Rather than barriers, clear connection requirements represent enablers to RES.
EDF	Yes	EDF considers that the issue of RoCoF should be among the issues identified to be addressed. As stated during the workshop organized by ENTSO-E on 1st February, this shall become a major issue for the European electrical system due to the increase of the amount of non-synchronous machines and the subsequent decrease of inertia. European regulation is needed to provide a clear framework regarding RoCof withstand capability, measurement methods and simulations methods.	RoCoF details need to be specified in the NC RfG while such a level of detail does not belong to a policy paper. Detailed proposals should be submitted in due course of the full-fledged public consultation planned for September 2022.
IFIEC Europe	Yes	IFIEC Europe understands that a possible new Network Code on Demand Side Flexibility is currently under development and will participate to these discussions, but wants to highlight that it is important that a level of coherence and consistency is maintained between all network codes, in particular on the topic of demand side response which is also covered by market codes as well as the system operation guideline insofar as other	In general, providers of the demand response should ensure the reliability of services offered to system operators for grid security. Hence, it is necessary that the network codes set the minimum technical requirements.

1.11 Additional policies proposed by stakeholders

		<p>balancing and services for system operators are concerned. IFIEC Europe also refers to some its comments below on this specific topic, as it considers the current focus in the NC DCC on those demand facilities providing demand response services to system operators as a hindrance rather than a benefit. IFIEC Europe is of the opinion that such elements should be covered directly and only in the specifications and requirements of the products to provide (voluntary) services to the system operators and not in the connection codes and this to ensure that on the one hand these requirements are kept agile in light of evolving system needs and on the other hand avoiding that demand facilities would have to invest in (often expensive) capabilities under the connection codes which could become obsolete whenever system needs evolve or even more perversely not offer capabilities to system operators in order to avoid such costs.</p>	
<p>VDMA Power Systems</p>	<p>Yes</p>	<p>Consideration of a harmonized certification approach and product family grouping will be required in the scope of amendments pending the recommendations of the expert group. This is a significant topic not only for manufactures but also for grid operators, test institutes and other stakeholders, as an EU wide harmonized reasonable and economical compliance process will help to facilitate the integration of decentralized energy resources.</p> <p>MW limits between the types A, B, C and D should be harmonized EU wide, as well as the provisions for SPGM type classification</p> <p>(individual generating unit rating vs. total installed capacity).</p> <p>Based on the experience done by manufacturers along the past year it is recommended to include specific points</p>	<p>Clarity regarding the use of equipment certificates throughout Europe can indeed be in the scope of the policy paper – see response to EFAC below.</p> <p>Clarity as to the SPGM classification is considered a detail and can be considered during the amendments to the NCs following the proposals submitted in due course of the full-fledged public consultation planned for September 2022.</p> <p>Although desired, a harmonisation of requirements is not objective in itself. Some flexibilities need to remain in order to allow for Member States specificities be considered at national level during the implementation. Nevertheless, the area of harmonisation of types B, C and D PGMs requirements is included in the revised Policy Paper.</p> <p>We agree that the RfG and DC NCs could be improved in regard the transparency of the applicable rules and procedures. For this reason a new policy has been introduced in the Policy Paper.</p>

1.11 Additional policies proposed by stakeholders

		<p>that facilitate how the manufacturer shall design their unit to meet to the different requirements within the different MS in Europe and improve the procedure for connecting generating units to the electrical system.</p> <p>The main points recommended to be included are:</p> <ul style="list-style-type: none"> - Single Focus Point for Information (all information associated to requirement and compliance process shall be made available in a single focus point that shall be kept updated - Single repository for Information (all information associated to requirements and compliance process shall be made available in a single repository that shall be kept updated constantly) - Adoption of generating unit family definition - Focus on the harmonization of the requirements as much as reasonable through the application / adoption of recognized technical standards (European, national, international e.g. EN 50549) - Permits the use of type tests, of unit certificates and of simulation using validated models to avoid unnecessary costs and simplify the connection procedure as much as reasonable 	<p>Generating unit family definition shall be included when made available by the concerned expert group.</p> <p>Application of the international standards indeed help harmonising the EU connection rules, but their adoption lies in hands of the Member States.</p> <p>Use of type tests is and should be promoted in the application of the EU connection rules.</p> <p>Regarding the RoCoF, see the answer to vgbe above.</p> <p>English translation of the requirements and compliance procedure would be beneficial and can be considered upon the stakeholders' proposal in due course of the full-fledged public consultation planned for September.</p> <p>The enforcement of the applicable EU connection rules lies with the Member States. In case of incompliance the European Commission can launch an infringement process. It shall be noted that in the case of non-exhaustive requirements of the GC NCs, there is some room for national specificities.</p>
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1.11 Additional policies proposed by stakeholders

		<ul style="list-style-type: none"> - Permits to complete the testing process (e.g for type certification,....etc.) during commissioning activities - ROCOF requirement shall be considered in the next revision of the regulation. In particular ROCOF definition shall be updated (ROCOF is associated to a specific time interval). ROCOF limit values shall be also considered shall become a shared target value both for manufacturers and System Operator. ROCOF value definition shall be in line with inertia containment policy requested by the SO REGULATION directive. - English translation of the requirements and compliance procedure in addition to the national language can significantly help European manufacturers when designing their product and prepare for compliance assessment. - Ensure that grid code released in member states are aligned and do not exceed (without an appropriate derogation process) the requirements as defined in the European regulation. 	
Falck Renewables	No		
SolarEurope	Yes	<p>The compliance process should be further harmonized with the overall objective of finding a good balance between effort and sustained quality in the field, also in future mass applications. Utilization of standardization and automation is a key measure here (Standardized framework of capabilities and related equipment certificates and - e.g. for type A and B – digitized and</p>	<p>Clarity regarding the use of equipment certificates throughout Europe can indeed be in the scope of the policy paper – see response to EFAC below.</p>

1.11 Additional policies proposed by stakeholders

		<p>harmonized processes and tools for parameterization of the PPMs.</p> <p>Additional key area #1: Providing a more precise and consistent framework on compliance mechanisms</p> <p>Problem definition:</p> <p>ENC RfG provides a quite vague framework on compliance measures: equipment certificates are introduced but not defined with respect to system's boundaries (i.e. equipment's definitions), certification principles & scope or evaluation schemes. Consequently, the practical benefit of these certificates for the conformity assessment on PGM level remains unclear and certification has been introduced in only a few member states, while manufactures and project developers are struggling with unclear and varying (hence, cost-intensive) compliance requirements.</p> <p>Meanwhile, stakeholders have elaborated good definitions, practises and examples within the former EG Compliance and gave input to two IGDs on this issue. The ongoing EG HCF is expected to provide even more recommendations on harmonised measures on equipment certificates in terms of general certification principles, modelling and family definition. Hence, a future ENC RfG should make benefit of these results and provide clear definitions, general principles and recommendations on how to support the application of equipment certificates on grid code compliance in Europe and - more over - support their acceptance.</p> <p>Recommendations:</p> <p>* Provide a precise reference, that equipment certificates have to be issued according to EN ISO/IEC 17065 on product certification, hence relying on a well defined and accredited certification programme indicating its scope, a</p>	
EFAC	Yes		ACER agrees to amend the draft Policy Paper as recommended by EFAC.

1.11 Additional policies proposed by stakeholders

		<p>product's specification and defined evaluation schemes.</p> <ul style="list-style-type: none"> * Incorporate the definitions already elaborated within the IGD on compliance directly into the ENC RfG * Take into account the recommendation to be expected by EG HCF on general certification principles, modelling and family definition * Give a recommendation to member states, that have not elaborated own accredited certification programmes, to accept certificates that are based on the existing and accredited certification programmes (that is NTS/Spain and FGW-TR8/Germany; to be an outcome of EG HCF) * Where applicale, substitute the compliance testing provision of ENC RfG, Title IV, Chapter 2ff by references to EN 50549-10 (to be expected by end of 2022) * Introduce the option of prototype declarations (to be an outcome of EG HCF) <p>Additional key area #2: Striving for more harmonisation also on Type B & C level</p> <p>Problem definition:</p> <p>As already identified within the policy paper, paragraph 18, for PGM type A requirements, the national implementations of ENC RfG lack a broad harmonisation of requirements. However, the same is true for PGM type B and C requirements: requirements are exceeding the span provided for non-exhaustive requirements or even the definition of exhaustive requirements; requirements for type C PGMs are shifted down to type B PGMs and for type C/D PGMs respectively; additional requirements</p>	
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1.11 Additional policies proposed by stakeholders

		<p>like HVRT or on system perturbation have been introduced that are not addressed by ENC RfG. The study https://op.europa.eu/en/publication-detail/-/publication/7ff90e84-dae0-11eb-895a-01aa75ed71a1/ provides a comprehensive overview on the respective coherence and incidence levels.</p> <p>Recommendations:</p> <ul style="list-style-type: none"> * A more coherent scheme for type definitions (A-D) should be elaborated in general. * For those national implementations, that have extended the ranges given by the non-exhaustive requirements of RfG NC, these extensions should either be caught-in by a stringent negotiation beforehand or the ranges of non-exhaustive requirements within the NC should be enlarged by defaults. The same shall apply to those national implementatton of exhaustive requirements, tthat however deviate rome those definitipnes given in the ENC RfG (catch them in or strictly forbid any deviations). * Some of the additional requirements already implemented in the national grid codes, that, however, are not part of the RfG NC, should be addressed directly by a future RfG NC. This applies especially for provisions on type A level, but also for type B and C PGMs. Focus could be laid on requirements such as OVRT, voltage or Q-control modes. Here, the European Standard EN 50549-1/2 may provide a suitable framework. * The European commission should provide tenders for performing relevant studies on the impact of these additional requirements. These studies shall serve as a reliable technical basis to set the framework in the RfG NC with additional requirements. 	
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1.11 Additional policies proposed by stakeholders

Westnetz GmbH	Yes	<p>The future NC RfG and NC DCC should better respect and address the needs of DSOs. For example it might be necessary to fulfil the needs of local grids first instead of supporting system needs like frequency. Only a running and connected distribution grid can support the transmission system (compare RfG (article 14, 5c) to VDE-AR-N 4110 (chapter 8.1)). Additional to that the different distribution grid levels have different needs like for protection, communication, static and dynamic voltage support, grid-forming, anti-islanding, (re)active power controllability. These have to be respected where necessary.</p>	<p>If DSO-specific requirements are needed, relevant proposals should be submitted in due course of the full-fledged public consultation planned for September 2022.</p>
ENEL SpA	Yes	<p>A. The definition of involved parties, roles and responsibilities. For instance, all technical requirements defined in the RfG and DCC (now and in the future), shall to be harmonized and coordinated with technical specification directly established in the standard documents (like IEC or CENELEC). Similarly, it should apply also for the certification process and so on . Probably RfG could be integrated or improved providing a general requirements and specifications, about the functions of reactive power control. At now, this aspect seems to be missing</p> <p>B. There is a minor, but important point missing in the RfG proposed changes: the reactive mode control for Type B PPM. Article 21.3.d sets technical requirements for the Type C PPM about the reactive power controls modes. However, Article 20 (Type B) only specifies “with regard to reactive power capability, the relevant system operator shall have the right to specify the capability of a power park module to provide reactive power” and does not include any specification about the “reactive mode control”. It seems obvious that Article 21.3.d (or similar) would be included in Article 20 for Type B PPM. On the contrary, the PPM won't be able to provide the reactive power.</p>	<p>A. Standardisation should follow in response to the adoption of the EU wide binding rules, not vice versa.</p> <p>B. Function of reactive power control can be considered during the full-fledged public consultation planned for September 2022.</p> <p>C. Interpretation of maximum capacity can indeed be harmonised based on the stakeholder proposal during the full-fledged public consultation planned for September 2022.</p> <p>D. Hybrid installations are deemed in the scope of the policy on “<i>Technical requirements for mixed customer sites with generation, demand and storage</i>”.</p> <p>E. Grid forming capabilities are deemed in the scope of the policy on “<i>Advanced capabilities for grids with high penetration of DER</i>”. Relevant clarifications have been made in the Policy Paper.</p>

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		<p>C. Maximum capacity harmonization of standalone power generating modules and hybrid installations -</p> <p>Enel Group, as developer and owner of several power generating modules in Europe and used to deal with several TSO/DSO and public administrations for their connection to national networks, observe that the definition of the maximum capacity in RfG is not interpreted in a harmonize way by the relevant entities and authorities. It is very common to see different interpretations between European countries, and between different entities and authorities in the same country. The value referred to maximum capacity is a key data for applying and verifying grid code requirements, such value shall not be the object of debates and should not be frequently updated during the grid connection procedure, as it is unfortunately the case nowadays.</p> <p>D. Hybrid installations.</p> <p>Nowadays many developers start to process combined power generating modules composed of mixed existing or new generations + in some cases storages (e.g. solar park + wind park + battery storage).</p> <p>The definition of maximum capacity of these installations shall be clear and harmonized in RfG for all the sector (entities/authorities/power generating developers). To enable the potential benefit of such installations (i.e. the the possibility to obtain higher synergy/capabilities by the combined installation compared if to the ones of standalone installations and/or saving development costs), it is important to define clear connection rules regarding the different ways to combine, meter, and connect to the grid the different technologies inside the installation.</p>	
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		<p>E. Grid forming requirements.</p> <p>Nowadays many developers start to process installations with grid forming technology. It is important:</p> <ul style="list-style-type: none"> • To define the concept of Grid forming in RfG • To analyze if the existing grid code requirements shall be revised for this technology and/or to implement new specific requirements <p>In different countries, TSO/DSO is starting to review those requirements at national level without any European harmonization and clear definition. For the DSO note please refer to point 36</p>	
CogenEurope	Yes	<p>The CNC RfG and DC code shall include procedural improvements to facilitate the integration of new generating systems.</p> <p>Key recommendations for additional areas to be covered:</p> <ul style="list-style-type: none"> - Single Focus Point for Information: all information associated to requirement and compliance process shall be made available in a single focus point that shall be kept updated - Focus on the Harmonization of the requirements as much as reasonable through the use/adoption of recognized technical standards (European, national, international) 	<p>We agree that the RfG and DC NCs could be improved in regard the transparency of the applicable rules and procedures. For this reason a new policy has been introduced in the paper.</p> <p>Certain harmonisation of requirements for type B and C PGMs is indeed needed. Thus a new policy is included in the paper.</p> <p>Use of type tests is and should be promoted in the application of the EU connection rules.</p> <p>Generating unit family definition shall be included when made available by the concerned expert group.</p> <p>Regarding the use of certificates see the answer to EFAC above.</p> <p>English translation of the requirements and compliance procedure would be beneficial and can be considered upon the stakeholders' proposal in due course of the full-fledged public consultation planned for September 2022.</p>

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		<ul style="list-style-type: none"> - Allow the use of type tests, of unit certificates and of simulation using validated models to avoid unnecessary costs and simplify as much as reasonable the connection procedure - Adopt of generating unit family definition - Permits to complete the testing process (e.g for type certification etc.) during commissioning activities - English translation of the requirements and compliance procedure in addition to the national language can help European manufacturers when designing their product - Ensure that grid codes released in MSs are aligned (and do not exceed without an appropriate derogation process) the requirements as defined in the European regulation <p>(A draft for recommendations proposal has been jointly prepared by EUTurbine and VGB based on the result of multiple workshops. The draft recommendation is publicly available on the GC ESC website).</p>	<p>The enforcement of the applicable EU connection rules lies with the Member States. In case of in compliance the European Commission can launch an infringement process. It shall be noted that in the case of non-exhaustive requirements of the GC NCs, there is some room for national particularities.</p> <p>(Stakeholders shall submit their concrete amendment proposals (legal texts accompanied with adequate justification) during the full-fledged public consultation planned for September 2022.)</p>
WindEurope	Yes	<p>(1) After the release of NC RfG and DCC in 2016, national connection rules have been adapted and established the non-exhaustive requirements at national level which led to large variety of requirements across the EU. Lessons learned from this implementation must be considered and a mindful minimisation of non-exhaustive</p>	<p>(1) Certain harmonisation of requirements for type B and C PGMs is indeed needed. Thus a new policy is included in the Policy Paper.</p> <p>(2) Generating unit family definition shall be included when made available by the concerned expert group.</p>

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		<p>requirements must be driven. Definitions of non-exhaustive requirements need to be aligned across the EU at an adequate level of detail. This will be crucial for a better level playing field in the EU and will drive significant benefits for consumers.</p> <p>(2) The revision should investigate NC improvements and seek for stakeholder suggestions on how to harmonise and simplify certification procedures. An Expert Group has been ongoing (Harmonization of Product Family Grouping and Acceptance of Equipment Certificates in European Level - EG HCF) since the beginning of 2022, will its recommendations be considered?</p> <p>(3) The revision should consider and clarify the role of international standards (mainly CENELEC and IEC) in the NC development and implementation. Gaps between NC requirements and standards are growing (e.g. voltage range requirement as per NC RfG and relevant equipment standards) and several definitions missing in the current NCs could be covered by the ones already suggested in international standards. ENTSO-E and the standardisation bodies have made serious efforts to bring their work together but it seems that a more targeted effort is needed to improve the NC requirements.</p> <p>(4) A good example is the grid compliance process and its link to IECRE. Member States introduce country specific grid compliance certification requirements which makes it extremely complex and costly for technology suppliers and asset owners (with a direct impact on grid integration costs for consumers) to monitor and assess these requirements, perform relevant tests and simulations and certify according to varying requirements. IECRE and the work of WG010 should serve as a baseline.</p> <p>(5) Another crucial point is the need for the updated NCs to clarify requirements and procedures in assets where different facilities/technologies share the same grid</p>	<p>(3) The hierarchy of the rules is deemed sufficiently clear already. The EU-wide binding rules always prevail. Nevertheless, there is room for improvement of the network codes.</p> <p>(4) Providing a more precise and consistent framework on compliance mechanisms is indeed needed. See the answer to EFAC above.</p> <p>(5) Policy on Mixed Customer Sites follows and advocates the improvement of the rules as proposed by the concerned expert groups. Any further detailed suggestions can be submitted in due course of the full-fledged public consultation planned for September 2022.</p> <p>(6) The provision of ancillary services is out of scope of the grid connection NCs.</p> <p>(7) Grid forming capabilities are deemed in the scope of the policy on “<i>Advanced capabilities for grids with high penetration of DER</i>“. Relevant clarifications have been made in the Policy Paper.</p> <p>(8) Any detailed amendment proposal can be submitted in due course of the full-fledged public consultation planned for September.</p>
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		<p>connection. The recommendations in the Policy Paper about Mixed Customer Sites and Storage do not seem to address combined renewables power plants with or without storage or renewables co-located with storage. Requirements for renewables sharing the same grid connection with storage (where storage is not connected only for self-consumption but as an autonomous unit directly supplying power to the grid) must be explicitly described in the NC. This should include the co-location of renewables with short- and long-term storage, EV charging stations, large heat pumps and of course electrolysers. Both new combined assets and existing assets being hybridised must be covered.</p> <p>(6) Ancillary services must be addressed also from the grid compliance point of view. Details provided in question 33.</p> <p>(7) Advanced capabilities/grid forming. Details provided in question 33.</p> <p>(8) The EG CROS has identified the need for NCs to assess system tolerance on (active, reactive) power oscillations caused by DC connected systems. This issue might be even more relevant in the case of AC connected system and should be considered in the revision.</p>	
<p>EUROPGEN Grid Codes Working Group</p>	<p>Yes</p>	<p>Consideration of a harmonized certification approach and product family grouping will be required in the scope of amendments pending the recommendations of the expert group. This is a significant topic for manufacturers.</p> <p>Clarification is required on FRT requirements, reactive power capability and voltage requirements – if these are applicable at the point of connection (PoC) or at</p>	<p>Regarding the use of certificates see the answer to EFAC above. Generating unit family definition shall be included when made available by the concerned expert group.</p> <p>Any detailed amendment proposal can be submitted in due course of the full-fledged public consultation planned for September 2022.</p>

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		<p>PGU terminals. If the PGU is certified at its terminals can a certificate be used to state compliance at the point of connection (PoC) provided the voltage difference and losses are negligible between the PGU terminals and the PoC.</p> <p>Request explicit clarification that certificates for higher types be used on lower types. For example, if a genset is certified for Type C the same certificate can be used in Type B and Type A applications without the need for additional certificates.</p>	
VDE FNN	Yes	<p>The NC RfG 2.0 should better address the needs of distribution grids and DSOs. Only a running and connected distribution grid can support the transmission system. A different prioritisation for protection and control systems are defined in NC RfG Article 14, 5c and in the rule VDE-AR-N 4110 (Chapter 8.1) for Germany. Each grid level has different requirements for protection, communication, static and dynamic voltage protection, grid-forming as well as anti-islanding. This must be sufficiently taken into account in the revision of the NC RfG.</p> <p>The compliance process should be further harmonized in cases where the requirements are the comparable. The overall objective is to find a good balance between effort and sustained quality in the field, also considering future mass applications. The utilization of standardization and automation is a key measure in this case, i.e. standardized framework of capabilities and related equipment certificates and - for type A and B – digitized and harmonized processes and tools for parameterization of the PPMs.</p>	<p>The current wording of Article 14.6.b requires from the relevant system operator (RSO) to specify the schemes and settings necessary to protect the network and not the PGM internal protection schemes. The latter are in the hands of the PGM owner that is required to coordinate them with the RSO.</p> <p>Providing a more precise and consistent framework on compliance mechanisms and harmonisation of certification processes are indeed needed. See the answer to EFAC above.</p> <p>Any detailed amendment proposal can be submitted in due course of the full-fledged public consultation planned for September 2022.</p>

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		<p>As long as required by NC RfG, certification processes and requirements should also be harmonized. It is expensive and time consuming when different countries in the EU create their own certification process (and details of requirements). If a national implementation of the RfG requires PGM and/or PPM certificates, these should follow unified international standards.</p> <p>It should be avoided that System Operators require certification for a general compliance with NC RfG. Certification is performed by a certified, independent entity and ensures that a device under test (e.g. a PGM) meets defined requirements. A certification for "RfG in general", which in key technical requirements is non-exhaustive, would be extremely difficult to achieve. The NC RfG 2.0 shall state clearly, that a certification can be made and/or required as an option only with regard to a national implementation of the NC RfG, including in particular detailed requirements for non-exhaustive requirements.</p> <p>FRT should be required only if the PPM is in an operational status that allows to cover e.g. auxiliaries consumption during and shortly after the FRT event. Hence FRT and FFCI should only be required if $P_{actual} > 5\%P_{nominal}$. PPM for wind and solar plants operate frequently at $P_{actual} \ll P_{nominal}$. For the optimum use of a site and energy maximization it makes sense, that e.g. a WF can also operate, during periods of reduced wind resources.</p>	
German Federal Ministry for Economic Affairs and Climate Action	Yes	<ul style="list-style-type: none"> • Clarification of the Member State's right to establish stricter requirements at national level. • Harmonised provisions for grid forming behaviour of 	By way of the hierarchy of law, even in case a Member State imposes a stricter requirement the EU-wide binding rules always prevail. However, it shall be noted that in the existing framework,

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		<p>PGMs and demand units including storage.</p> <ul style="list-style-type: none"> • Determination of harmonised provisions on ramping requirements to diminish deterministic frequency deviations. • Review of the requirements for coordination between DSOs and TSOs, e.g. with regard to voltage control. • Extension of the scope of the connection codes and introduction of requirements applicable to demand units including storage. • Consequences for connection codes following the system split incidents in 2021 and ENTSO-E's analysis on that topic. 	<p>non-exhaustive requirements of the GC NCs leave some room for national specificities.</p> <p>Grid forming capabilities are deemed in the scope of the policy on "<i>Advanced capabilities for grids with high penetration of DER</i>". Relevant clarifications have been made in the Policy Paper.</p> <p>Any detailed amendment proposal regarding coordination between system operators can be submitted in due course of the full-fledged public consultation planned for September 2022.</p> <p>Storage is deemed in the scope of the policy on "<i>Technical requirements for storage</i>".</p> <p>ACER and ENTSO-E hold quarterly meetings on the implementation of the Expert Panel recommendations.</p>
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