



Pilot Framework Guidelines on Electricity Grid Connection

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INFORMATION PAGE

Abstract

On 14 July 2010, ERGEG launched a public consultation on a pilot framework guideline on electricity grid connection (E09-ENM-18-04). The report outlined ERGEG's draft proposals following a request from the European Commission.

This document (E10-ENM-18-04) presents ERGEG's final proposals for the Pilot FG on electricity grid connection. It is accompanied by an evaluation of the responses to the consultation (E10-ENM-18-04a). The final framework guidelines are intended as input to ACER, which becomes fully operational on 3 March 2011.

Related Documents

CEER/ERGEG documents

- “ERGEG Public Consultation on the Draft Pilot Framework Guidelines on Electricity Grid Connection – Evaluation of Responses,” 7 December 2010, Ref: E10-ENM-18-04a, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_CONSULT/CLOSED%20PUBLIC%20CONSULTATIONS/ELECTRICITY/Pilot%20Framework%20Guideline%20Electricity%20Grid%20Connection/CD/E10-ENM-18-04a_EGC-FG_EoR_7-Dec-2010.pdf
- “ERGEG Guidelines of Good Practice on Electricity Grid Connection and Access“, ERGEG, 10 December March 2009, Ref. E09-ENM-16-04, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_CONSULT/CLOSED%20PUBLIC%20CONSULTATIONS/ELECTRICITY/GGP%20Electricity%20Grid%20connection%20%20Access/CD/E09-ENM-16-04_GGP-GridConnection_10-Dec-09.pdf
- “Implementing the 3rd Package: next steps”, CEER/ERGEG, 18 June 2009, Ref. C09-GA-52-06a, http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_ERGEG_PAPERS/Cross-Sectoral/2009/C09-GA-52-06a_Implementing_3rdpackage_18-Jun-09.pdf

External Documents

- Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0055:0093:EN:PDF>
- Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0001:0014:EN:PDF>
- Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0015:0035:EN:PDF>

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Scope

These Framework Guidelines (FG) apply to grid connection of all kinds of grid users (generators, consumers and Distribution System Operators, DSOs).

These framework guidelines were elaborated based on the related Initial Impact Assessment (IIA, Ref E09-ENM-18-03) and the selected preferred policy options from this IIA. The Initial Impact Assessment should be read and elaborated in parallel to these framework guidelines, whereas the chapters of the framework guidelines are in line with the corresponding objectives and policy options of the Initial Impact Assessment.

The network code(s) adopted according to these framework guidelines will be applied by electricity Transmission System Operators (TSOs), taking into account possible public service obligations and without prejudice to the regulatory regime for cross-border issues pursuant to Article 42 of Directive 2009/72/EC and of the responsibilities and powers of regulatory authorities established according to Article 41(6) of Directive 2009/72/EC.

The network code(s) adopted according to these framework guidelines will be evaluated by the Agency (ACER), taking into account their degree of compliance with the framework guidelines and the fulfilment of the objectives: maintaining security of supply, supporting the completion and functioning of the internal market in electricity and cross-border trade including delivering benefits to the customers and facilitating the targets for penetration of renewable generation.

Within the context of these FG, the term 'network' or 'grid' refers to both transmission and distribution. Moreover, the following definitions apply:

- **Grid Users** – All users connected to the transmission and distribution grid – generation (all technologies), demand (including responsive demand) and distribution system operators (DSOs - as grid users connected to the transmission grid or to another).
- **System Operator (SO)** – including the TSO and DSO, in their roles and responsibilities to implement and enforce the relevant grid connection code(s).
- **Commissioning** – the process of verification of new users' installations compliance with the specifications and requirements provided for grid connection before starting operation of these installations. The verification should include, inter alia, the revision of documentation, verification of the requested capabilities of the new facility by practical tests and simulation studies and revision of actual measurements during trial operation.
- **Compliance Monitoring** – the process of verifying the capabilities of grid users during normal operation and, after relevant modifications, of confirming that the technical capabilities are maintained.

Due to the close relations between a number of issues related to grid connection and system operation, the following criteria have been applied in deciding whether to deal with a specific issue in these FG or in the System Operation FG:

- if an issue involves active participation by a grid user, it is addressed in these FG;
- if an issue affects only SOs, with no role for the grid users, it is addressed in the System Operation FG.

- Where an issue is relevant to both grid connection and system operation, it is at least mentioned in both FG and where necessary also specified in more detail. Some redundancy might emerge from this approach, but priority has been given to not omitting any important aspects.

Structure

The IIA is the basis for the issues covered in these framework guidelines, in particular the IIA chapters on objectives and preferred policy options. The provisions in the FG are structured in the following sections:

- Governance issues
- Minimum requirements for connection of all grid users
 - Adaptation of existing arrangements to the network code
 - Special requirements for critical grid situations
 - Testing and verification
 - Compliance, monitoring and enforcement
- Real-time (and other) information exchange
 - General provisions for information exchange
 - Real-time information sharing
 - Specific requirements for information and communication between TSOs and DSOs
- Additional requirements on specific classes of grid users

Governance issues

Whereas the provisions in these FG apply only to aspects of grid connection, the provisions for governance presented below in relation to the framework guidelines and respective network codes apply to all framework guidelines and network codes and as such are an integrated part of all the framework guidelines.

i. Development of Network Codes (NC)

- a. In line with the provisions in Regulation (EC) 714/2009 (Regulation) on preparing the NC, all relevant documents and minutes of meetings related to the consultations and preparatory work shall be made publicly available by ENTSO-E.
- b. Before adopting the NC, ENTSO-E shall indicate how the observations received during the consultation have been taken into consideration. It shall provide reasons where observations have not been taken into account.
- c. While developing the NC, ENTSO-E shall ensure proper involvement of the DSOs where they are affected.

ii. Entry into force of the NC

- a. The NC shall contain a description and the roadmap (time plan) for the implementation of its provisions, starting from the formal approval.
- b. The NC shall contain rules, procedures and a description of practical implementation tools for ensuring conformance of the national codes with the provisions in the NC.

iii. Derogations of grid users and/or SOs to the NC

- a. The NC shall contain the procedures to identify possible derogations to the NC itself.
- b. ENTSO-E shall create and maintain, with the involvement and support of national TSOs, the register of derogations to the NC affecting cross-border and market integration issues with all relevant information and documents in order to justify the derogation itself.
- c. Derogations to the NC are communicated to and approved by the Agency.

iv. Infringements to the NC

- a. ENTSO-E shall monitor, with the involvement and support of national TSOs and DSOs, the application of the dispositions of the NC. It will identify infringements and responsibilities and immediately inform the affected National Regulatory Authorities (NRAs) and where necessary also the Agency.
- b. The NC shall contain the procedures to be applied by ENTSO-E in case of infringements of the NC, including infringements by TSOs and / or DSOs.

v. Amendments to the NC

- a. In line with the requirements in Art. 7(1) through 7(3) of the Regulation, on amendments of network codes, the NC shall contain a specification of the amendment procedure taking into account that:
 - i. Draft amendments to the NC may be proposed to the Agency by any stakeholder who is likely to have an interest in that network code, including ENTSO-E, NRAs, TSOs, system users and consumers. The Agency may also propose amendments on its own initiative.
 - ii. The Agency shall consult all stakeholders. Following that process, the Agency may make reasoned proposals for amendments to the Commission, explaining how such proposals are consistent with the objectives of the NC.
 - iii. The Commission may adopt, taking account of the Agency's proposals, amendments to the NC.

vi. Overlapping with other network codes

- a. The NC shall contain the procedures in order to manage situations of overlapping provisions between the network codes developed by ENTSO-E.

vii. Relation with national codes for grid connection

- a. Recognising the importance of the appropriate relation and interaction between the EU-wide grid connection codes and the national codes, it is important to bear in mind that, in line with the requirements in Art. 8(7) the Regulation, the network codes shall be developed for cross-border network issues and market integration issues and shall be without prejudice to the Member States' right to establish national network codes which do not affect cross-border trade.

viii. Monitoring

- a. ENTSO-E shall set up a procedure to periodically review the NC.
- b. ENTSO-E shall monitor and analyse the implementation of the NC and its effect on the harmonisation of applicable rules aimed at facilitating non-discrimination, effective competition and the efficient functioning of market integration.
- c. ENTSO-E shall report its findings to the Agency and shall include the results of the analysis in its annual report.
- d. ENTSO-E shall make available all information required by the Agency to fulfil its tasks.

ix. Definitions and references

- a. The NC shall contain a section with a glossary and definition of words and expressions adopted.

- b. The NC shall contain a section with the list of all relevant security standards/regulations at European level to be adopted by grid users and SOs to comply with the NC provisions.
- c. The coherence of the two sections above with all the network codes to be developed by ENTSO-E must be guaranteed.

1 Minimum requirements for connection of all grid users

- 1.1 The network code(s) shall identify and consider appropriately those standard minimum requirements that must be complied with by all (including existing) grid users.
- 1.2 A quantified analysis of the impacts (costs/benefits, organisation, etc.) of those requirements on the existing grid users shall be made beforehand. If the applicability to the existing grid users can only be achieved after a transitory period, a procedure to evaluate the applicability to existing users shall be described in the network code(s). Where the benefits are not clear or are marginal, the respective minimum requirements should not need to apply in the case of existing users.

The criteria for determination of exceptions and for the definition of significant users (i.e. relying on the defined set of parameters which determine the degree of impact of these users on the system) also need to be specified in this documentation.

When referring to DSOs, the network codes shall be specific on whether the distribution grid and DSO are addressed in their capacity as the connected user of the transmission grid or in their capacity as the SO.

- 1.3 Whereas the framework guidelines and the related network code(s) have a prevailing character with regard to the relevant international technical standards and regulations, they shall not lift the obligations set forth by such standards and regulations. The network code(s) shall define the physical connection point between the grid user's equipment and the network to which these FG apply. Furthermore, the network code(s) shall define the requirements in relation to the relevant system parameters in order to contribute to secure system operation of grid users including:
 - Frequency and voltage parameters;
 - Requirements for reactive power;
 - Load-frequency control related issues;
 - Short-circuit current;
 - Requirements for protection devices;
 - Fault ride through capability; and
 - Balancing capabilities and provision of ancillary services.
- 1.4 The network code(s) must set out all provisions necessary for grid users that are connected to the DSO but that also affect TSOs (e.g. feeding energy up to the transmission grid, size (operation mode/fuel type) of unit influencing the need for reserve capacity, etc.) which must be agreed upon with the TSO and DSO.
- 1.5 The network code(s) shall set out how the TSOs (and where applicable involving also the DSOs) must define the technical requirements related to frequency and active power control and to voltage and reactive power management. Technical rules set at the synchronous system level for operational security shall be in line with these requirements. Those rules shall be aligned as far as technically possible throughout the EU and beyond the synchronous area borders.

- 1.6 The minimum standards shall be defined for each type of grid user (i.e. conventional, distributed or intermittent generation, demand response users, or DSOs) and take into account the voltage level at which the grid user is connected to the grid. Where a particular class, technology, size or location of a grid user is not deemed significant in terms of impact on the system, a procedure shall be defined within the NC, according to which a derogation from the minimum standards can be accepted.

Adaptation of existing arrangements to the network code

- 1.7 SOs shall amend all relevant clauses in contracts and/or relevant clauses in general terms and conditions relating to the connection of grid users to the electricity grid, in accordance with the terms of the network code. The relevant clauses shall be amended by a fixed time limit after entry into force of the network code. This requirement shall apply regardless of whether the relevant contracts or general terms and conditions provide for such an amendment. The detailed technical provisions for the transition from the national to the European network codes shall be further elaborated on in the respective codes.

In order to reach a smooth transition to European-wide harmonisation, a step-wise approach shall be pursued in the adaptation of the existing arrangements and the application of the new provisions to the already connected grid users.

Special requirements for critical grid situations

- 1.8 The network codes must define:
 - Situations in general (e.g. which kinds of network faults, which electrical distance) and
 - Possible deviations of significant parameters (e.g. voltage, frequency) in detailthat generation units must withstand, while remaining connected to the grid, in terms of specificities of the generation unit.

The network codes must also define minimum conditions for (re)connection to the grid in disturbed/critical operating state.
- 1.9 The network code(s) shall set out how generation units must be able to execute their control activities in normal and in alert (disturbed) operating states, whereas specific parameters for operation outside these operating states will be agreed individually between generation units and SOs.
- 1.10 Coordination requirements and procedures for reconnection after tripping must be defined transparently in the network code(s) for the different parties involved including especially their different roles and responsibilities.
- 1.11 For the following services, the network code(s) shall set out the minimum requirements for those generators which are providing them (services) on a contractually agreed basis:
 - House load operation including the minimum duration of house load operation;
 - Black start; and

- Island operation.

Testing and verification

- 1.12 The network code(s) shall set out a responsibility for production units to test their compliance with the requirements defined for the connecting installation, including electrical safety.
- 1.13 The specifications and requirements for the new generation units must be verified before commissioning of grid connection. TSOs and DSOs must define transparently the contents of the verification within the appropriate scope.
- 1.14 The possibility of repeated verification by request from TSO and/or DSO after commissioning has to be fixed in the network code(s).
- 1.15 Revision of measurements from actual operation shall be specified in the network code(s) in order to prove compliance with the specifications.
- 1.16 In order to achieve a common European approach, the network code(s) must define how a coherent and coordinated alignment between the EU and national grid codes can be ensured.

Compliance, monitoring and enforcement

- 1.17 The network codes shall describe the procedure for evaluating applicability to the existing users and method for determination of “significant users”. This evaluation shall be done by ENTSO-E subject to consideration of the interests of all relevant parties during the public consultation. The criteria for evaluation, transition period and exemptions shall also be described in the respective network code. The network code(s) shall set out evaluation criteria by which a quantified analysis can be made (costs/benefits, contribution to secure system operation, organisation, etc.) of the impact of application of the minimum requirements on all (including existing) grid users. This analysis will be carried out by the system operator (TSO or DSO) to which the grid users are connected.
- 1.18 The network code(s) shall define the transition period within which grid users have to apply the changed rules and standards. The transition period must be consulted upon among relevant stakeholders. Different transition periods for compliance can be set for new and existing users and also for different aspects of the network codes’ requirements. The network code(s) shall set out the principles behind setting the transition period for grid users; system operators will be responsible for evaluating the applicability to grid users and determining an appropriate transition period.
- 1.19 The network code(s) shall require that any exceptions to the minimum standard are recorded by the system operators. Moreover, the reasons for exception and the its consequences need to be defined in a separate “exceptions” documentation, to be created and maintained by the TSOs. The criteria for determination of exceptions and for the definition of significant users (i.e. relying on the defined set of parameters which determine the degree of impact of these users on the system) shall also be specified in this documentation. This documentation will be subject to review and approval by the affected National Regulatory Authorities and the Agency. This separate documentation

complementing the code(s) shall be maintained and updated accordingly. The timeline (i.e. expiration of the transition period) for achieving applicability to the existing grid users shall be a subject of regular compliance monitoring and enforcement.

- 1.20 The network codes must define clear and transparent criteria and methods for compliance monitoring, including e.g. the regularity of testing (one-time, periodic). Also the responsibilities for compliance monitoring and enforcement need to be well defined and the SOs entitled to impose the fulfilment of, and monitor the compliance with, the defined connection requirements.
- 1.21 Regular reviews shall be applied in order to prove compliance with the specifications set initially.
- 1.22 Regular monitoring and, if necessary, corrective measures in case of detected discrepancies between the national and European codes shall be foreseen in the network code(s).
- 1.23 The NC shall always require the SOs to optimise between the highest overall efficiency and lowest total cost for all involved actors. In that respect, it must be ensured within the requirements of the network code that whatever the cost-sharing scheme is (e.g. in case of ISO, OU TSO or ITO) the cost split follows the principles of non-discrimination, maximal transparency and assignment to the real originator of the costs.

2 Promoting (real-time and other) exchange of information between parties and improved coordination

General information

2.1 The network code(s) shall set out the procedures and requirements to coordinate and ensure information sharing between:

- TSO and TSO;
- TSO and DSO; and
- TSO or DSO and significant generation and consumption units.

These procedures and requirements shall be in accordance and agreement of all affected parties.

2.2 The network code(s) shall define a harmonised standard according to which information shall be provided for grid connection at the connection point by TSO and DSO and how this can be done. On the other hand, the network code(s) must define which information and technical data every significant generation unit or consumption unit has to provide to the TSO or DSO it is connected to and how this data shall be provided to ensure the operational security of the system.

2.3 The TSOs and DSOs shall be obliged in the grid connection code(s) to publish and transparently communicate the detailed procedure for the initiation of new connection including among others required documents, timing, methodologies, responsibilities, etc. This information shall also address the relevant grid access issues, which will be dealt with in more detail in the future grid access framework guidelines.

2.4 Information exchange between TSOs and DSOs about the commissioning of significant generation and consumption units has to be framed on a European basis. This implies that criteria (e.g. a minimum installed capacity to be informed about) must be agreed by adjacent TSOs and DSOs for defining units as significant.

Real-time information sharing¹

2.5 Information exchange provisions must include specifications for an efficient coordinated system with access to real-time information. The network code(s) must define these provisions in a sufficient level of detail and must specify at which level more details shall be set (e.g. national codes).

2.6 The network code(s) must set the requirement for every significant generation and consumption unit to be able and obliged to provide the necessary real-time operational information to the DSOs and TSOs affected (where it is connected (TSO) or where the DSO it is connected to, is connected).

¹ Real-time information sharing refers to information which is also a subject of the Fundamental Electricity Data Transparency comitology guidelines. The purpose here is different, i.e. the information is primarily used by the system operators and not by market participants. The network code should take account of information already required as part of the comitology guidelines, and only set out requirements for data information that go over and above this. Moreover, real-time information is also relevant for System Operation FG and will also be dealt with there.

- 2.7 The network code(s) shall set the requirement for every significant generation or consumption unit to be able to receive and to execute the instructions sent by the TSO and/or DSO, on a contractual basis or in critical operating state.

Specific provisions for information and communication between TSOs and DSOs

- 2.8 The network code(s) shall set out necessary requirements and procedures to be followed by DSOs when connecting distributed generation to the grid.
- 2.9 The network code(s) shall set out that requirements and equipment for the connection point between networks of transmission and distribution system must be defined at the appropriate level of detail, specifying also if any additional provisions are foreseen e.g. in the national grid connection code. The network code shall also specify where these requirements shall be defined if they are not already covered by the network code.
- 2.10 The DSO shall be assigned responsibility for transposing the requirements set by the TSO (or DSO) and ensuring that generation and consumption units (and also other connected distribution networks) within the distribution network meet these requirements.
- 2.11 The network code(s) shall set a requirement on DSOs to execute (manually or automatically, depending on the purpose) the instructions given by the TSO. The TSO and the DSO shall agree how these instructions are delivered in practice. This applies also for those DSOs connected to another DSO network.
- 2.12 The network code(s) shall define the requirements for the interface between TSOs and DSOs, such as:
- voltage parameters; and
 - reactive power flow;
- considering the situation with distributed generation.
- 2.13 The network code(s) shall set out that the TSOs of a synchronous area among themselves and with the DSOs shall exchange all necessary information and data relating to distributed generation. The necessary information shall be clearly and transparently defined and agreed with the DSOs.

3 Connection regime for specific grid users

- 3.1 Where additional requirements beyond those defined in the minimum standards are required for a particular class, technology, size or location of a grid user, the network code(s) shall set out and justify these additional requirements.
- 3.2 Where the technical conditions justify it, the network code shall foresee special provisions concerning protection device setting for the large intermittent generation (e.g. wind, photovoltaic).
- 3.3 Where specific electrical or geographical conditions so require, additional national provisions could be defined beyond the provisions in the respective network code(s) for connection of wind generation. ENTSO-E shall ensure, in cooperation with the national TSO(s), compatibility of such national provisions with the EU-wide FG and network codes.
- 3.4 The network code(s) shall set out necessary requirements for protection schemes and in relation to Fault-Ride-Through capability with particular focus on distributed generation – because of its increasing importance and contribution to meeting demand - that shall aim at avoiding that a disturbance in the transmission grid leads to a tripping of distributed generation units, unless they are affected by such a disturbance.
- 3.5 The network code(s) shall set out necessary requirements and procedures to be followed when connecting a consumption unit to the grid, to enable demand response and / or participation of consumption units in other grid services, on a contractually agreed basis. The responsibility for the compliance of the equipment with the requirements set by the TSO and/or DSO shall be clearly with the consumption unit.

Additional provisions to be addressed within the scope of system operation

ENTSO-E shall ensure coherence and compatibility of the grid connection network code(s) with the following provisions, which are dealt with in the system operation FG.

- The network code(s) shall define the necessity of load shedding of distributed grid users and the situations when it can occur and be required.
- The consumption unit connected to the transmission network and where appropriate to the distribution network shall be equipped with an automatic load shedding system. In case the power system is in danger, SOs shall be able to use this system under transparent conditions approved by the NRA.
- Besides automatically-activated load shedding, there must be a possibility for the TSO and/or DSO to perform manual load shedding if operational security is endangered.
- Actions to be performed during critical operating states upon request by the TSO or DSO to restore the system to normal operating state may be agreed between consumption units and the SO responsible.

As indicated in Chapter 2, real-time information sharing refers to information which is also covered in ERGEG's Advice on Comitology Guidelines on Fundamental Electricity Data Transparency. The purpose here is different, i.e. the information is primarily used by the system operators and not by market participants. Moreover, real-time information is also relevant for the system operation FG and will be addressed there.