ENTSO-E Response to ERGEG consultation: Pilot Framework Guideline on Electricity Grid Connection

Brussels, 29 September 2010

1 GENERAL REMARKS

ENTSO-E welcomes the release of the Pilot Framework Guideline on grid connection (hereinafter FWGL) and the accompanying updated Initial Impact Assessment (hereinafter IIA) for public consultation. The process for the elaboration of Network Codes depicted in detail in Regulation 714/2009/EC is new and untested; this is certainly a first positive step in optimising the sequence of the respective tasks of ACER (ERGEG) and ENTSO-E.

As a general remark, one observes a certain inconsistency within the FWGL in the degree of detail of certain requirements without a clear justification for such a necessity. According to the related IIA a framework guideline should focus on **which** emerging issues should be solved, leaving the approaches on **how** to solve them to the related network code(s). This principle is not stringently followed by the present FWGL, e. g. with respect to demand response even financial sanctions for non-compliance are required, whereas the consequences of non-compliance are not mentioned for any other requirement.

At the same time, the FWGL is sometimes lacking precision (for instance it is mostly not clear on whom the respective responsibilities rest) and contain sometimes too demanding or challenging provisions (e.g. section 1.15 and 3.1.5).

The FWGL requests specific requirements for certain types of grid users, in particular:

- Large-scale intermittent generation
- Distributed generation
- Demand response

The assessment of these “specific” requirements reveals that they are indeed not specific. Most of the features addressed here should apply to all grid users instead. It remains unclear why they are addressed to specific kinds of grid users only. Moreover, one could derive the assumption that these requirements shall apply **only** to those specific grid users. It is on the contrary of prominent importance that the features which are inevitable for maintaining and preserving system security are equitably shared by all corresponding grid users.

A major point we would like to stress is that in these FWGL, the dual role of DSOs, first as network operators and second as system users is not explicitly mentioned. It is important to make this distinction as the corresponding network codes will have different impact to the DSOs.

Another point that ENTSO-E considers unclear is the specific chapter on demand response that seems to imply that it is an issue on its own. Demand response, albeit of great importance, must be treated within the context of load and DSO connection to the grid in order to have a comprehensive and consistent treatment of the underlying issues.

The wording of the third paragraph in the Scope of the FWGL is quite misleading because one could consider that the network codes should only be observed by TSOs (which won’t be the case, in particular if network codes are adopted in the form of regulations and if some provisions apply to other stakeholders) : “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 of Transmission System Operators (TSOs) or Distribution System Operators (DSOs) […]".
Also in the same paragraph, the references of the Directive 2009/72/EC are incorrect: Instead of Article 42 and 41.6, please refer to article 38 and 37 of said Directive.

Finally, the FWGL uses the term "should" (e.g. Section 2.3, 3.2.3), which leads to the question whether these sections are to be found in the network codes (in our opinion the term "shall" is more appropriate from a legal standpoint).

More specifically:

- **Requirement 1.1**

  The FWGL requires application of the Network Code(s) to existing users as well, if necessary after a transition period. The compliance of existing users shall be documented by ENTSO-E.

  Comments:
  - The FWGL requests compliance of all existing grid users; this, however, seems to contradict the statement of the corresponding IIA that in some cases application on existing grid users might be infeasible.
  - In particular, generation unit reinforcements to gain compliance can result in massive investments (e. g. a new generator). Therefore there needs to be a possibility that life-time non-compliance can be granted to existing grid users for single requirements.
  - The possibility and the time period needed to gain compliance is a very user-specific issue and will vary across Europe, if certain requirements (in particular parameters and thresholds) are specified on synchronous area or national levels. Therefore the definition of transition periods to gain compliance, as well as assessment and monitoring of compliance and granting of exceptions should be assigned on the level of the responsible network operator (which is usually the one the user is connected to) rather than to ENTSO-E, which has not the capacity and expertise to do this.
  - ENTSO-E proposes that existing users should demonstrate to which extent they can comply with the requirements and apply for exception to the responsible network operator in case of non-compliances.

- **Requirement 1.2**

  It is stated that the FWGL and the related network codes shall not lift the obligations under international technical standards etc. The FWGL does not, however, include input with respect to what happens in case of conflict.

- **Requirement 1.3**

  It should be stressed that provisions for generation units connected to DSOs which affect TSOs are related to the preservation of system security. This applies not only to generation units but in general to all grid users.

- **Requirement 1.5**

  Instead of "… shall set out **how** the TSOs must define …" it should be "… shall set out **that** the TSOs must define …".

- **Requirement 1.6**

  It is stated that existing contractual agreements should be adapted, "regardless of whether the relevant contracts or general terms of conditions provide for such an amendment." The alignment of the contracts with the provisions of the network code will be facilitated if network codes are adopted as regulations (and

not as directive or decision). If network codes become regulations, they will be directly binding to anybody and therefore alignment of the contracts with TSOs should and could be made ”automatically” (provided however that we foresee a certain period of time to adapt the provisions of the contracts). Nevertheless, as regulation would apply to anybody (not only TSOs), TSOs shouldn't bear the liability for amending these contracts. Therefore we propose to replace Section 1.6 by the following: ”If relevant, clauses in contracts and/or relevant clauses in general terms and conditions relating to the connection of grid users to the electricity grid shall be amended by a fixed time limit after the entry into force of the network code”.

The section raises serious concerns in respect to the economic consequences and possible expropriation questions from users who will be forced to make changes to existing installations. One consequence of this could be that the bar will be set too low in order to avoid such consequences.

- **Requirement 1.9**

  Instead of “Connection requirements and **procedures** for reconnection …” it should be “Connection requirements and **requirements** for reconnection …”. **Procedures** are considered to be an operational issue and should be covered by operational Network Code(s).

- **Requirement 1.11**

  The responsibility for compliance testing should not only be assigned to generation units, but to all grid users.

- **Requirement 1.12**

  ENTSO-E endorses the approach to define the contents of compliance verification at the TSO/DSO level. This goes in line with our position on requirement 1.1 that compliance verification of existing users and exemptions should be determined by the responsible network operator (or accredited entities if so required by national legislation). Moreover, requirement 1.12 should address to all grid users and not restrict the verification to the point of time of commissioning of grid connection. Compliance verification monitoring can also be performed in the planning and construction stage, as well as repeatedly throughout the lifetime of a grid connection, depending on the specific requirement and the method applied for verification (e.g. simulations or practical tests).

- **Requirement 1.15**

  Before commenting on the requirement, it must be stated that according to our opinion it does not fit to the headline “Testing and Verification”.

  The “alignment” work will only be possible once some information/guidance on the way the network codes will be adopted (by way of regulation or directive) becomes available. It should be clear in the FWGL which legal tool the Commission will use to make the network code binding (this will influence the drafting of the code because regulations are not drafted in the same way and with the same level of precision as directives, since regulations are directly applicable).

  Eventually it is not clear what should be covered by the network code at EU level and what should be in the scope of the national/regional codes. Unfortunately no input to this rather challenging question is provided.

- **Requirement 1.16**

  This requirement contradicts to requirement 1.12. In 1.12 it is said that “**TSOs and DSOs** must define transparently the contents of the verification within the appropriate scope.”, whereas 1.16 says “**The network codes** must define clear and transparent criteria and methods for compliance monitoring …”.

Furthermore, the statement is rather open and does not give much guidance to how this shall be done: (inspection, self assessment or?) and it neglects the role of National Regulatory Authorities, especially in case of conflict between TSO/DSO and users.

- **Requirement 1.17**

  It is not clear by *whom* the regular reviews are to be applied.

- **Requirement 2.1**

  Provisions for information exchange are required between TSO and TSO. Irrespective of its relevance, this is not a grid connection issue. To our understanding grid connection relates to connection of generation facilities, distribution networks and end customers to TSO and/ or DSO networks. The relationships including information exchange between TSOs are to be dealt with in system operational codes. Concerning grid connection of generation facilities, distribution networks and end customers, it should be stated that TSOs support each other, if there exists a mutual impact.
  Furthermore, no fallback procedure is addressed in case an agreement cannot be reached.

- **Requirement 2.3**

  It remains unclear whether the Network Code(s) shall just provide for the obligation of network operators to publish information for grid connection application or whether the network code(s) themselves shall define the respective procedures. The wording should be improved in order to point out the objective. ENTSO-E believes that a harmonisation of grid connection application procedures and of criteria for granting grid connections would improve transparency and equitable treatment of grid users. Grid access issues can only be addressed in network code(s) once the objectives of the corresponding framework guidelines are known. Therefore we do not share the view that they shall be included in a network code for grid connection procedures at this stage.

- **Requirement 2.4**

  The term “framed on a European basis” is unclear.

- **Requirement 3.1.1**

  Requirements for protection devices are not the appropriate solution for system integration and interoperability of large-scale intermittent generation. In order to achieve this integration whilst maintaining system security the related technical features will have to be provided by these generation facilities. Some of the most important ones are listed in requirement 1.2. The capabilities necessary from the system security point of view do not differ significantly from those that are required from conventional generation facilities. The objective of the provisions in network code(s) shall be therefore to require those capabilities from large-scale intermittent generation as well. Protection schemes and devices will have to be designed in order to support and facilitate the required capabilities. In detail, the technical solution may differ according to the generation technology, but technical solutions are not in the scope of the framework guidelines, which focus according to the IIA on **which** emerging issues should be solved, leaving the approaches on **how** to solve them to the related network code(s). Therefore the FWGL should not address protection devices. Moreover, if this requirement is maintained, it would not be clear why it would be a specific requirement for large-scale intermittent generation only, because the protection schemes and devices for all other grid users should have the same objective.

- **Requirements 3.1.2 – 3.1.6**

  It cannot be understood why these requirements shall be addressed only to large-scale intermittent generation, because there are not specifics related to this type of generation. In our point of view these requirement shall apply to any type of generation facilities and partially even to any kind of grid user.

  In particular, concerning requirement 3.1.6 it should be reminded that ENTSO-E is only responsible for "monitoring and analyzing the implementation of the network codes" (art. 8.8 Regulation 714/2009/EC), hence it is questionable if it has the "powers" or "tools" to impose "corrective measures" (which is not defined in the FWGL) at national level.

- **Requirements 3.2.1 – 3.2.6**

  These requirements deal with the TSO – DSO relationships, in particular the information exchange and the managerial authorities. ENTSO-E in general endorses these requirements, but we consider them to be applied in a general way without limiting the scope to distributed generation. We do not see any specific requirements for distributed generation here.

- **Requirement 3.2.7**

  This issue is already covered requirement 2.6 in a more general way as 2.6 deals with all type of grid users. Therefore requirement 3.2.7 is considered obsolete.

- **Requirement 3.2.8**

  Requirements for protection schemes will not primarily solve the issue addressed here. The technical feature needed is fault-ride-through capability, which is already requested by requirement 1.2. Therefore requirement 3.2.8 is considered obsolete.

- **Requirement 3.2.10**

  It will be impossible to describe situations where island operation of distributed generation can occur, because this depends on fault situations in the TSO/DSO systems and cannot be clearly specified. Furthermore we have some doubts whether it is a corss-border issue to be dealt with in a network code.

- **Requirement 3.3.1**

  Responsibility for compliance is not a specific requirement for demand response. The issue is already covered by requirement 1.16. Therefore requirement 3.3.1 is considered obsolete.

- **Requirement 3.3.2**

  We do not agree that sanctions for not providing reactive power outside an agreed range are addressed here with relation to demand response. For none of the other requirements in this framework guideline the consequences of non-compliance are addressed. It is therefore inconsistent to require economical sanctions here, and from the ENTSO-E point of view the consequences of non-compliance should be covered by the respective network code(s).

- **Requirement 3.3.4**

  Requirement for emissions, voltage quality, etc. are not specific to consumptions, but have to be met by all kind of grid users. Furthermore such values are well defined by international standards and European and national legislation. We consider this requirement obsolete.

- **Requirement 3.3.5**

  We do not agree that financial compensation for participation in demand response is addressed here. For none of the other requirements in this framework guideline the financial compensation for providing certain servives are addressed. It is therefore inconsistent to require financial compensation here, and from the ENTSO-E point of view the remuneration of providing certain services should be covered by the respective commercial network code(s).

- **Requirement 3.3.6**

  Responsibility for compliance is not a specific requirement for demand response. The issue is already covered by requirement 1.16. Therefore requirement 3.3.6 is considered obsolete.

Question 1:
Are there additional major problem areas or further policy issues that should be addressed within the Grid Connection Framework Guideline ?

The problem areas and policy issues are well covered within the FWGL and the IIA. However, and as detailed in other parts of this report, it is important to clearly distinguish the operational measures to be taken from the grid connection requirements, having in mind forthcoming framework guidelines and codes in operational security, especially concerning Objective #2 of the FWGL. Furthermore commercial issues with regards to grid access and sanctions for non-fulfillment of requirements should be clearly separated from the grid connection code as well.

ENTSO-E is in agreement with the policy choice to promote an EU-wide, and possible further, grid connection requirements; in the Framework Guidelines, this policy choice must be further detailed to define the co-existence of national codes and the ENTSO-E code and that not only in the case of large-scale intermittent generation.

Finally, the issue of a "quantified impact analysis (costs, organization, etc.)" should be carefully examined and stated unambiguously. ENTSO-E is not in a position to deliver such large scale assessment, primarily because this must be covered in the Initial Impact Assessment of policy options, provided that the network code choices are well prescribed by the Framework Guidelines. Limited access to relevant data is also contributing to ENTSO-E's assessment of this requirement as impractical.

Question 2:

Q2. What timescale is needed to implement the provisions after the network code is adopted? Is 12 months appropriate or should it be shorter or longer?

The implementation of the provisions has to be considered from several points of view and it should be distinguished between the legal enforcement, the amendment of existing national legislation and codes and the application to "new" and "existing" power generating facilities, respectively grid users in general:

1. **Legal enforcement of the provisions of the Network Code**
   The clauses of the Network Code become legally effective instantaneously with the adoption of the code by the EC. From this moment on these provisions prevail over member states national provisions in case of conflicting clauses.

2. **Amendment of existing national legislation and codes**
   Whereas the provisions of the Network Code become themselves effective with the adoption of the codes, these provisions will most likely call for an amendment of existing national legislation and codes for those requirements that need to be detailed on a national, respectively a network operator level. This process will need an unacquainted period of time, because the required procedures will differ between the member states. It is assumed that 36 months after adoption of the code by the EC may be required to establish to complete legal framework consisting of the Network Code and the corresponding national provisions.

3. **Application to "new" power generating facilities/ grid users**
   The provisions of the Network Code should apply to "new" power generating facilities/ grid users comprehensively without any delay. A power generating facility or other grid user installations should considered as "new" if they do not exist or have not been contracted bindingly with the relevant manufacturers as of the date of enforcement of this network code.

4. **Application to "existing" power generating facilities/ grid users**
   The provisions of the Network Code should apply to "existing" power generating facilities/ grid users after and to the extent compliance to them has been proven. A power generating facility or other grid user installations should considered as "existing" if they do exist or have been contracted bindingly with the relevant manufacturers as of the date of enforcement of this network code. In particular for existing facilities the compliance procedures may need a significant period of time, because data procurement, studies and practical performance test will have to be carried out. It should be taken into account that a considerable workforce will be involved both on the grid users' and on the network operators' side to perform such compliance procedures, which have to be newly established in most of the member states. It is assumed that, only for the large power generation facilities connected to the transmission grids, this process will require a timescale of at least 36 months. Proving compliance requires that the complete legal framework consisting of the Network Code and the corresponding national provisions is known and established. There this process can overlap only to a limited extent with the necessary amendments of national legislation and codes.

Question 3:
Should harmonisation of identified issues be across the EU or, perhaps as an interim, by synchronous area?

The appropriate kind of harmonisation cannot be determined generally but has to take into consideration the objective and the content of a specific requirement. The necessary degree of harmonisation can be identified by the extent of the system-wide impact of each requirement.

Requirements which aim for market integration and grid connection procedures should be harmonised on EU level in order to facilitate access to the IEM at an equitable level in each member state.

For the most important mandatory requirements with relevance to system security a common level of methods and principles is necessary and a common agreement on specific parameters and settings shall be endeavoured. The requirements with relevance to system security should be harmonised for each synchronous area with in the EU, as each synchronous area forms the entity for which system security as a whole has to be preserved and maintained by the respective TSOs belonging to this area. The relevance to system security is characterised by criteria that have system-wide impacts and are intended to prevent system-wide emergency situations or even black-outs. For example, in particular criteria related to the system frequency such as operation of generating units in over- or under-frequency conditions or disconnection of generating units in case of deviations of the frequency from its nominal value, or frequency limits for indefinite nominal active power supply can be identified in this category.

For requirements with less wide-spread impact it is assumed that a mutual agreement on methods and principles provides sufficient standardisation. At least it is ensured that the same issues are covered by each TSO within a synchronous area. Individual methods/principles and parameters/settings to achieve the same target are acceptable. Moreover it is important, that from the system security point of view it is even necessary that requirements are sufficiently flexible to enable consideration of national or regional aspects. For example the provision of reactive power largely depends on regional system characteristics. Therefore it is reasonable to entitle TSOs to define the range of reactive power capability for generation units on a TSO level. On the higher level of a synchronous area, the maximum and minimum limits of such a range should be determined.

It should further be considered that an EU network code will not replace future national codes and legislation. Moreover the EU network code and national codes and legislation, as well as bilateral agreements between network operators and grid users will interact in the following manner:

- National codes / national legislation or bilateral agreements must **refer unambiguously** to the standards and measures set in the ENTSO-E network codes
- **Definitions** in national codes / national legislation or bilateral agreements **shall not differ** from the ENTSO-E network codes
- ENTSO-E network codes **specify standards** that national codes / national legislation and bilateral agreements **must observe**
- National codes / national legislation **may contain** additional standards which are not part of the ENTSO-E codes only if the ENTSO-E codes **allow for** additional standards1
- Bilateral agreements **may contain** additional standards which are not part of the national codes / national legislation only if the national codes / national legislation **allow for** additional standards

This principle of subsidiarity will result in the following scheme of bindingness of provisions in EU network codes:

- Pan-European standards/measures with **mandatory** parameters/values
  - ➲ *Standards/measures and parameters/values are binding for network operators and grid users addressed by the standard/measure*
- Pan-European standards/measures with **specific mandatory** parameters/values **for synchronous areas**
  - ➲ *Standards/measures and parameters/values are binding for network operators and grid users addressed by the standard/measure in each synchronous area*
- Pan-European standards/measures with **maximum/minimum** parameters/values
  - ➲ *Standards/measures are binding for network operators and grid users addressed by the standard/measure*
  - ➲ ***Mandatory** parameters/values **shall be determined within the admissible ranges** by national codes / national legislation*

- Pan-European standards/measures with **maximum/minimum** parameters/values **for synchronous areas**
  - ➲ *Standards/measures are binding for network operators and grid users addressed by the standard/measure in each synchronous area*
  - ➲ ***Mandatory** parameters/values **shall be determined within the admissible ranges in each synchronous area** by national codes / national legislation*
- Pan-European standards/measures with parameters/values **determined on a national/regional level**
  - ➲ *Standards/measures are binding for network operators and grid users addressed by the standard/measure*
  - ➲ ***Mandatory** parameters/values **shall be determined** by national codes / national legislation*

Question 4:
Should the requirements apply to existing grid users? How should it be decided? To which existing users should the requirements apply? How should timelines for transitional periods be set? Who should bear any costs of compliance?

a) Should the requirements apply to existing grid users?

Yes, if reasonably achievable:

- All existing grid users should be required to review the capability of their existing facilities and declare to the TSO/DSO any shortfalls item by item of the NC requirements.
- This should be done within a specified period of the NC effective date. As this is a large task, a reasonable period may be 3 years for the large power generating facilities only connected to the transmission grids. This period can reasonably start not before the complete legal framework consisting of the Network Code and the corresponding national provisions has been established.
- This review process in itself will ensure that the network operators obtain the necessary overview. It would also potentially support movement towards harmonised methodology of evaluating compliance issues.
- The end result will be transparency regarding non-compliance, at least for the network operators. The transparency could be extended, if the non-compliances were published.

The non-compliances should be formalised through “exceptions”.

b) How should it be decided?

The network operators, supported by a dialogue with the power generating facility operators, could make proposals for which non-compliance of existing grid users must be removed. This would need to be assessed for each requirement. The decisions, for removing each non-compliance, would be based on broad categories of relative cost and benefit per unit of capacity (MW):

- Cost / ease by which non-compliance can be removed being categorised according to:
  - Low: minor cost items, e.g. such as reprogramming control facilities
  - Medium: moderate costs, e.g. replacing control facilities
  - High: major costs, e.g. replacing or significant modification to main grid user installations
- Value of removing non-compliance similarly categorised:
  - Low: Minor value, such as capability not of great value in that location, main value equal treatment/avoid precedence.
  - Medium: Modest contribution to security of supply or provide improvement for effective balancing services
  - High: Critical to security of supply, either locally, for the control area or for the synchronous area
- ENTSO-E initially at European level (and where appropriate by in each synchronous area) could provide a general guidance on evaluation of the above cost benefit, which could then be implemented and refined in context of local value by each network operator.
  - This should predominantly be a qualitative analysis.
  - The effort required to do a rigorous quantitative analysis (frequently very complex) is not justified and could in many cases be more costly than making the modifications.
  - Items categorised as low on cost combined with high in value would definitely be required.
  - Items categorised as high in cost combined with low in value would definitely not be required.
- The decisions from the above should be open to information exchange with and challenge by representatives for users at EU level, at synchronous area level, at TSO level and possibly even at individual power generating facility level by the operators.
- An overzealous retro policy could have an undesirable effect of encouraging early closure of significant volume of power generating facilities, the capacity of which may be important in the ability overall to meet the demand and sustain competition in the market.
- For the non-compliances which it is decided not to remedy, the operators would then be formally exempted for the lifetime of the power generating facility.

- The modification projects could be managed via time-limited operational notifications or exceptions providing the framework for planning, procuring the solutions as well as demonstration of compliance on completion.
- Each power generating facility would be considered overall compliant even before implementing the modification, if it delivered the required improvements in accordance with the content and timeline of these notifications and in the meantime operated in accordance with any operational limitations defined in the notification.

c) To which existing users should the requirements apply?

See b) above. Selection should de made through qualitative cost benefit analysis.

d) How should timelines for transitional periods be set?

For non-compliances for which lifetime exception is inappropriate, the improvement implementation period should be established by the TSO following discussion with the operator taking due account of:

- Balance of cost and benefit for this item. The greater the net benefit the more urgency.
- Reasonable time required to implement changes, taking account of
  - Resource availability to implement the change.
  - Level of disturbance to production, e.g. in most cases allow time for next major planned overhaul.
  - Efficient overall use of resources.

e) Who should bear any costs of compliance?

All cost of the compliance work including the cost of demonstrating compliance through documentation, studies (where relevant) and testing should be borne by the power generating facility operator. Socialising this cost would complicate relationships and would risk the best subsidising the worst.

The cost of the network operators' and regulators' work in managing the compliance process however, should be socialised via network tariffs. This avoids complicating relationships and cost pressures leading to difficulties in providing equal treatment.

Question 5:
The framework guideline identifies intermittent generation, distributed generation and responsive demand as requiring specific grid connection guidelines. Is it appropriate to target these different grid users? How should the requirements for intermittent generation, distributed generation and responsive demand differ from the minimum requirements? Is there a need for more detailed definition / differentiation of grid users?

From a systems engineering approach the transmission and distribution system requirements to be covered by services delivered by the grid users and in particular generators are independent from the nature of the primary resource (intermittent or continuous) or, to a large extent, the point of connection (distribution or transmission). Whereas the future system requirements will be triggered significantly by the promotion of renewable generation and the corresponding change of the generation mix and patterns, they will have to be settled by close cooperation of all grid users.

Having in mind that according to the related IIA a framework guideline should focus on **which** emerging issues should be solved, leaving the approaches on **how** to solve them to the related network code(s) it is difficult to understand why the FWGL distinguishes between requirements for specific grid users. These concerns are amplified by the observation that these so called specific requirements are indeed not specific (see our comments on the individual requirements). To the extreme one could derive the assumption that these requirement shall apply **only** to those specific grid users releasing others from comparable obligations, which would jeopardize the objective of equitable treatment.

ENTSO-E considers that it will be necessary to distinguish between certain types of grid users more in detail on the level of network codes. In particular, for power generation facilities the grid connection technology has to be considered in order to take into account the inevitable different approaches to resolve the emerging issues identified by the FWGL, whenever it is not possible to specify a requirement regardless of the technology. For example, a reasonable distinction should be made in a network code between synchronous generators directly connected to the grid (mainly conventional power generating facilities) and so called power park modules with generators connected to the grid not directly, but through a converter (mainly renewable power generating facilities).

Question 6:
Is it necessary to be more specific regarding verification, compliance and reinforcement?

Taking into account the objective and the character of framework guidelines it is not necessary to be more specific regarding verification, compliance and reinforcement.

To improve the requirements and to ensure common understanding we recommend to clearly and explicitly distinguish commissioning from the compliance monitoring process and to outline the differences between them. Below you will find the proposal of definitions:

Commissioning – the process of verification of new users' installations compliance with the specifications and requirements provided for grid connection before starting operation of these installation. The verification should include amongst others the provision revision of documentations, verifying the requested capabilities of the new facility by practical tests and simulation studies, revision of actual measurements during trial operation.

Compliance Monitoring – the process verifying the capabilities of users during their normal operation and after relevant modifications to confirm that the technical capabilities are maintained.

Additionally we would like to emphasize TSO/DSO should be entitled to impose the fulfillment of the defined connection requirements and as well as the requirements of the corresponding national legislation and codes.

Question 7:
What are the key benefits and types of costs (possibly with quantification from your view) of compliance with these requirements?

As stated the objective of these requirements is *'to support 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.'*

The network codes on meeting these objectives will provide benefit to the entire EU community, whilst creating clarity and a more standardized set of requirements within technical limitations for years to come.

This clarity will allow developers and manufacturers to maximize standardization and hence reduction in costs through standardization and economies of scale. Simultaneously system operators will be able to ensure through compliance with these requirements, their primary remit of security and quality of supply, practically and cost effectively. In particular, for conventional power generating facilities, it can be well expected that most of the requirements for grid connection to be provided by the network code(s) will be in line with requirements that have been developed over decades and are already common practice, thus not causing significant additional development and investment costs.

The costs of a failure of security of supply show the absolute criticality of effectiveness and enforcement of these requirements. The cost of energy not served typically runs into thousands of euros per MWh, a system blackout for a single day would cost the European economy billions of Euros.

Given the EU policy objective of increasing to at least 20% of energy from renewable sources, a trend that is likely to be set to continue, and the consequential need to rely on power sources on a pan-European level, and the networks that support them, the need to create robust requirements Europe wide has never been more important.

Question 8:
How should significant generation and consumption units be defined?

A general definition of significance would be inappropriate for the following reasons. A generation or consumption unit should be considered as significant whenever it is assumed to have impact on the objectives of the framework guideline and the corresponding network code(s) with regards to the respective requirements.

Whereas one objective is to set up provisions to preserve and to maintain system security in future, system characteristics have to be taken into account in this context. One characteristic of a transmission system and its underlying distribution system with impact on system security is, the present and the anticipated mix of power generating facilities and consumption units in size and number. Therefore in larger transmission systems, or respectively larger synchronous areas, a capacity value of generation or consumption units usually used as a threshold to define significance may be higher comparable to the threshold that is deemed appropriate for smaller systems.

In addition, the purpose of a single requirement has to be considered. For example, the objective of a requirement that provides for prohibiting the disconnection of generation units in a certain range of frequency is to prevent the simultaneous disconnection of such units in case of frequency deviation from its nominal value within this range. Because the critical parameter is the total capacity that would disconnect in such an event, the size of a single unit is irrelevant in this context.

The outcome of the above is that the significance of a generation or consumption unit with respect to the objective of the framework guideline and the corresponding network code should be defined by a threshold in terms of a capacity value by each TSO in order to be able to consider system characteristics appropriately. Moreover, this threshold can even vary for different requirements.

Question 9:
For what real-time information is it essential to improve provisioning between grid users and system operators? Do you envisage any problems such greater transparency? What are the costs (or types of costs) and benefits you would see associated with this?

TSOs need more information on generation as well as on drivers markedly contributing to imbalances between generation and consumption in the underlying distribution networks, in particular due to the significantly increasing amount of renewables and other distributed generation as well as the operation of large consumers with special behaviour. This information includes real-time measurements, but are no restricted to that and shall encompass amongst others:

- day-ahead generation schedules (if applicable) and/ or forecasts and corresponding changes/ updates
- information on (restrictions to) availability of power generating facilities
- real-time measurements of active and reactive power, frequency and voltage at the grid connection point

Furthermore the TSOs shall be entitled to send alert signals to distributed generation/consumption facilities indicating emergency states of the systems and to request changes in active power output in emergency situations including the right to shut down, especially of generating units. The re-connection of distributed power generating units after a disturbance to the system shall be subject to prior consent by the TSO as well.

The increased information exchange will support the preservation, maintenance and re-establishment of system security and provides the associated benefits to all grid users.

From the TSO perspective the main benefits are improvements in:

- assessment of the timely behaviour of the system
- real-time network security analysis and congestion management
- congestion and balance forecasts
- basis for market models and network planning

The main costs will occur to the development and establishment of appropriate technical solutions for an improved information exchange.

It could be argued that some of the aforementioned data are sufficiently covered by means of aggregated information, e.g. aerial generation. In this case it should be noted that e.g. aggregation of information for different generation sources is not applicable, furthermore only the fact of exchanging information in disaggregated manner will provide for the possibility of grid users to offer advanced and accountable energy products or system services to system operators.

We do not envisage any problems or adverse impacts on the IEM due to the greater transparency by improved information exchange because the gathered data are used for system operation purposes only and are subject to confidentiality regulations.