EUTurbines

Meeting with ENTSO-e on Grid Connection Requirements

20 December 2011

Stuttgart, Germany

List of Subjects to be presented – Overview

Item	Subject	EUTurbines Comment Numbers
1	Definition (Glossary)	1, 2
2	Frequency range	3, 31
3	Frequency Response	8 to 15
4	Islanding, Black Start & Houseload	18 to 23, 37, 44
5	Auto reclose, ROCOF, Torsional Stress	4, 7, 16
6	Fault Ride Through	27 & 38
7	Excitation system/voltage range/reactive capability	32, 33, 35, 36
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Item 1: Definition (Glossary)
Presenter: Luca Guenzi, Turbomach

Refers to EUTurbines Comment 1 and 2

- Glossary has been extensively revised and extended throughout the revisions of the pilot code.
- From 2011-03-22 revision to the 2011-20-27 revision more than 20 changes can be counted including new definitions, modification and removal of existing ones.
- Definitions are extremely important to avoid misunderstandings and therefore the used wording shall be as much as possible explanatory. Examples if needed shall be added.
- Comments by EUTurbines refer to definitions present from the first release in the pilot code.

Item 1, Art.1: Definition (Glossary)

Refers to EUTurbines Comment 1 and 9

... Maximum Capacity - the maximum continuous Active Power which a Generating Unit can feed into the Network as defined in the Connection Agreement or as agreed between the Relevant Network Operator and the Power Generating Facility Owner …

- The Definition in the pilot code is a generic one and can be better codified to avoid misunderstandings.

- Pmax Definition is used, among others, for:
  - threshold generating unit Definition
  - Frequency Sensitive Mode, LFSM-O/U values Definitions
  - Maximum power capability reduction Definition when frequency drops
  - U-Q profile

Item 1, Art.1: Definition (Glossary)

Refers to EUTurbines Comment 1 and 9

... Maximum Capacity - the maximum continuous Active Power which a Generating Unit can feed into the Network as defined in the Connection Agreement or as agreed between the Relevant Network Operator and the Power Generating Facility Owner…

- Since Pmax is referred to generating unit EUTurbines gives the following indication
  - Max. capacity shall be referred to Active Power ISO condition and shall reflect to the configuration of the generating unit connected to the grid, in operation.
  - Pmax Definition for CCGT is problematic. Steam Turbine can be fed by multiple GT units. Therefore Pmax Definition where multiple generating units are present with different technologies shall be agreed.

Item 1, Art.1: Definition (Glossary)

Refers to EUTurbines Comment 2

… Minimum Operating Level - the level at which the Generating Unit can be operated continuously electrically, mechanically and/or thermally (as the case may be) in a stable manner.

Minimum Regulating Level - is the minimum Active Power that the Generating Unit can regulate down to …

- These two Definitions in the pilot code need additional clarification.
- MOL and MRL Definitions are used, among other, for:
  - Frequency Sensitive Mode, operating limit Definition
  - LFSM-U simulation

Item 1, Art.1: Definition (Glossary)

Refers to EUTurbines Comment 2

… Minimum Operating Level - the level at which the Generating Unit can be operated continuously electrically, mechanically and/or thermally (as the case may be) in a stable manner.

Minimum Regulating Level - is the minimum Active Power that the Generating Unit can regulate down to …

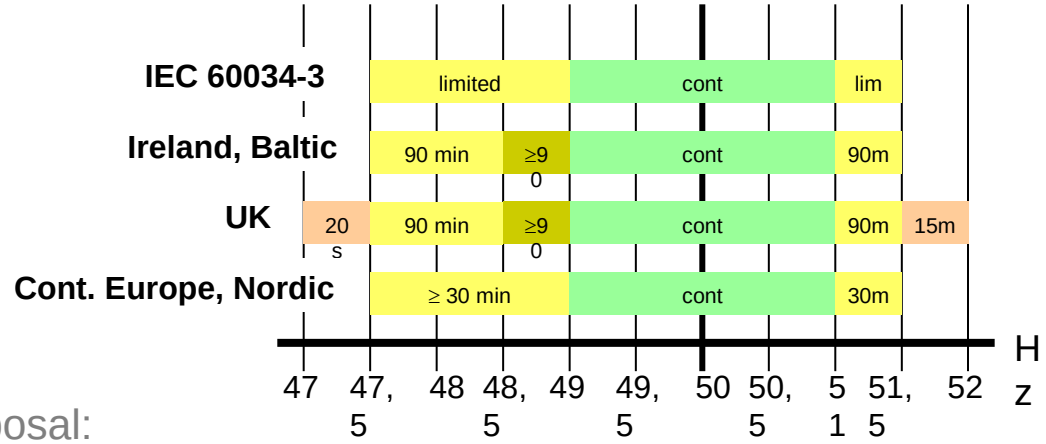
- Definition shall be suitable and have a meaning for different generating technology. Examples or clarification for generating technologies can help.
- It has to be clarified if "regulating" and "operating" related also to environmental aspects (emissions) and in this case what is prevailing
- It has to be clarified if "regulating" and "operating" are related to the ability of frequency response.
- Definitions seem to come from Great Britain Code, but only part of the Definition is implemented, why not the complete Definition?

Item 2: Frequency Range
Presenter: Ulrich Tomschi, Siemens

Refers to EUTurbines comment 3

Art. 12, 2 b): **Limited operation times**

- ≥ 30 minutes requirements <48.5 Hz: operational time is very long, risk of heating up of generators
- operation above 51,5 Hz outside IEC 60034-3 standard. Design changes might be necessary.



- EUTurbines proposal:
  - Active power reduction shall be permitted in non-continuous ranges in order to protect unit
  - Achieve harmonization between IEC standard and draft network code.

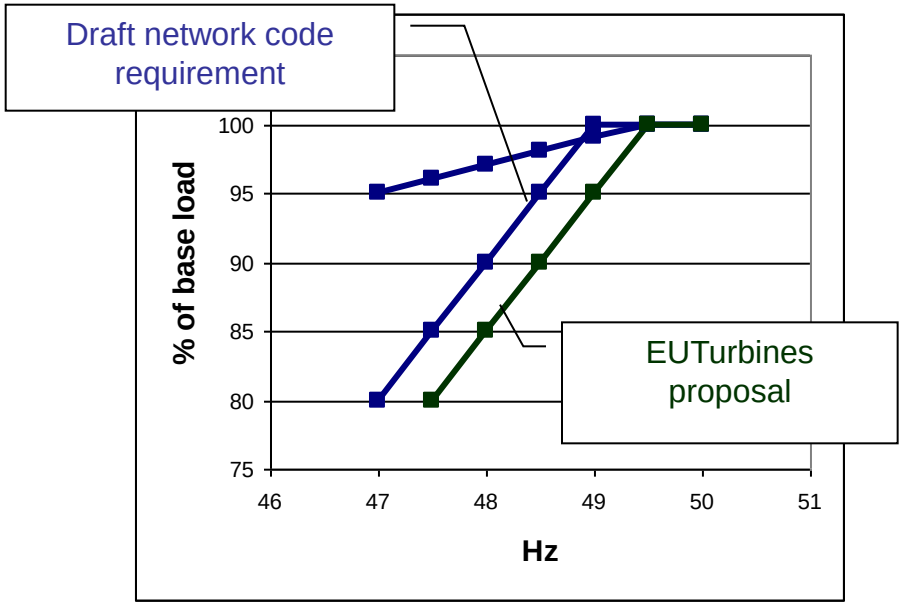
Item 2: Frequency Range
Base load at low frequencies

Refers to EUTurbines comments 31

Art. 12, 2 b): **Allowed output loss at low frequencies**

- Conflict with physical behaviour of gas turbine which is strongly dependant on ambient temperature
- Requirement forces gas turbines to develop expensive fast acting power augmentation measures
- Reserves must withheld for very rare situations and are lost for normal flexible operation
- Consequence: less efficiency, higher cost, contradiction to network code objective
- Risk: no realistic test available, therefore limited reliability of such measures
- Consequent risk of plant trip jeopardizes grid stability more than output loss but with sustained operation!

- EUTurbines proposal for minimum requirement:
  - 100% output down to 49,5 Hz, if required by TSO
  - allowed linear output reduction to 80% at 47,5 Hz
  - this reflects current capabilities and avoids risk
  - real plant capability can be submitted to TSO for consideration
  - clear minimum requirement instead of range



Item 3: Frequency Response

Refers to EUTurbines comments from 8 to 15

11, Art 9, 2 c) 7) range of FSM, Table 4

- Worst case 10% within 4s currently is not state of the art and should not be part of the minimum requirement range.
- Proposal: The dynamic requirement shall not exceed 10% of Pmax within 10s (current UK requirement)

15, Art 9, 2 g) 1) FSM real time monitoring

- Signal "range of frequency response“ not clear. Reference to droop and df required.

Parameters	Ranges
Active Power range related to Maximum Capacity (frequency response range) $\frac{\lvert\Delta P_1\rvert}{P_{max}}$	2 – 10 %
Initial delay t_1	≤ 2 seconds
Full activation time t_2	~~64~~ – 30 seconds

Table 4: Parameters for full activation of Active Power Frequency Response resulted from frequency step change (explanation for figure 3).

Black Start

Refers to EUTurbines comments 18 and 19

18, Art 9, 4 a) 2) **Black Start: network energization**

- Energization or synchronization implies a load step which should be done only within continuous frequency and voltage ranges.
- Proposal for amendment:
  - "The Generating Unit shall be able to energise a part of the Network**, which has to be agreed between TSO or DSO and Generator Unit operator in terms of load requirements,** upon instruction from the relevant Network operator ...and voltage limits **defined in Art. 10 for Type D generators, for unlimited time periods of operation respectively."**

19, Art 9, 4 a) 3) **Black Start: block load**

- Not any load step with the consequent frequency change can be controlled in any load range of the generator. This requirement has to be limited acc. Art 45, 4 b) 3).
- Proposed wording:
  - … in block load **within the capability of the generation technology, up to 10% of Pmax and limited to 50 MW**
  - control frequency… within the whole Active Power output range **from houseload level to a level agreed between TSO/DSO and Power Generating Facility;**
  - …within one island**. Details of the respective control concept is within TSO / DSO responsibility.**
  - **Black start and Island mode operation shall be considered as not normal condition of operation and therefore environmental requirements shall be considered second priority.**

Islanding

Refers to EUTurbines comments 20 and 21

20, *Art. 9, 4 b) 2):* **Deloading to any point in the P-Q-Capability diagram**

- Fast deloading to a point below a minimum load (determined by technology) will not be possible. Risk of damage or trip.

Proposed amendment (acc. current UK requirement):

- ... but at least a load reduction of 45% of its Maximum Capacity shall be possible. **Deloading below 55% of Maximum Capacity can be agreed in a connection agreement but should not be below the minimum operating level.**

21, *Art. 9, 4 b) 2):* **Detection of island situation and required change over behaviour**

- Island detection and island control concept is not clear enough

Proposed amendment:

- "The method for identification of island operation or parallel operation condition shall be determined by and agreed with the TSO, as well as any other required characteristics of the island control differing from interconnected operation."
- A detection logic based on switchgear positions or other grid status information could also be a future option and should not be excluded.

Houseload operation

Refers to EUTurbines comments 22 and 23

22, *Art. 9, 4 c) 2):* **Triggering of houseload operation** *(new definition in current draft)*

- "The Generating Unit whose minimum re-synchronization time after its disconnection from any external supply exceeds 15 minutes shall be designed for tripping to houseload from any operating points in the P-Q Capability Diagram without using any switchgear position signal for identifying houseload operation"
- Small Power generating units use always the switchgear position for triggering islanding on houseload condition.
- **Logic based on switchgear position therefore should not be excluded.**
- **Method of detection for triggering houseload to be defined by the TSO**

23, *Art. 9, 4 c) 4):* **Manual intervention after tripping to house load**

- *"Manual intervention by the Power Generating Facility Operator is prohibited within the first 3 minutes after tripping."*
- *Intervention with e.g. Water/Steam cycle for stabilization should not be prohibited.*
- *Reason for this requirement not clear*
- *Proposed amendment: delete this sentence*

Item 4 : Islanding & Black Start

Refers to EUTurbines comments from 18 to 23, 37 & 44

37, *Art. 12, 4 a) 2):* **Speed control / power control**

- *Speed control in some synchronous machines will only be active when not connected to theinterconnected network and if requested by TSO / DSO control philosophy requirements*
- *For some turbine technologies the speed or power control are not present (eg pressure control for steam turbine).*

44, *Art. 45, 4 b) 3):* **Block loading simulation**

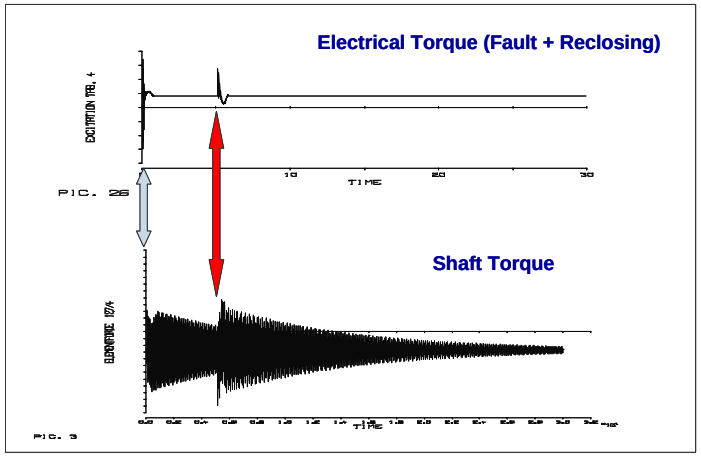
- *"the Generating Unit has regulated load connections in block load with a maximum size of 10% of Maximum Capacity of the Generating Unit without frequency dropping dynamically by more than 1Hz in the Isolated Network."*
- *The generating unit should be allowed to use its complete frequency range (i.e. more than 1 Hz) dynamically for load connections in isolated network.*
- *Load step shall be limited up to 10% Pmax* and limited to 50 MW (see comment 19).*

Item 5: Auto Reclosure
Presenter: Peter Norris, Alstom

Refers to EUTurbines Comment 7

To be added:

- Auto-reclosures need supervision by a synchro-check relay and maybe even synchronizing is necessary.
- Out-of-phase 3-phase reclosure shall not be allowed. With Out-of-phase we means phase angle typically greater than 30° .
- Machine preservation shall be considered a first priority for grid reliability / availability.



Article 8, Para 2a)

With regard to auto-reclosures, the Responsible Network Operator shall have the right to request single-phase auto-reclosures on Generating Unit supply lines (radial connection of one or more Generating Units to the public network) and single-phase or three-phase auto-reclosures on meshed Network lines to be withstood by Generating Units without tripping.

IEEE Std C.5013-2005 recommends that the manufacturer be consulted and a possible unit specific study be performed.

Item 5: Torsional Stress and Line switching

Refers to EUTurbines Comment 16

- This requirement needs a thorough investigation to provide a proper response. This is a new requirement and Current technologies have not considered up to now such needs.

- For design of turboset shaft the frequency and amplitude of such torsional disturbances needs to be known (steps amplitude, how many times, how frequently happens, etc).

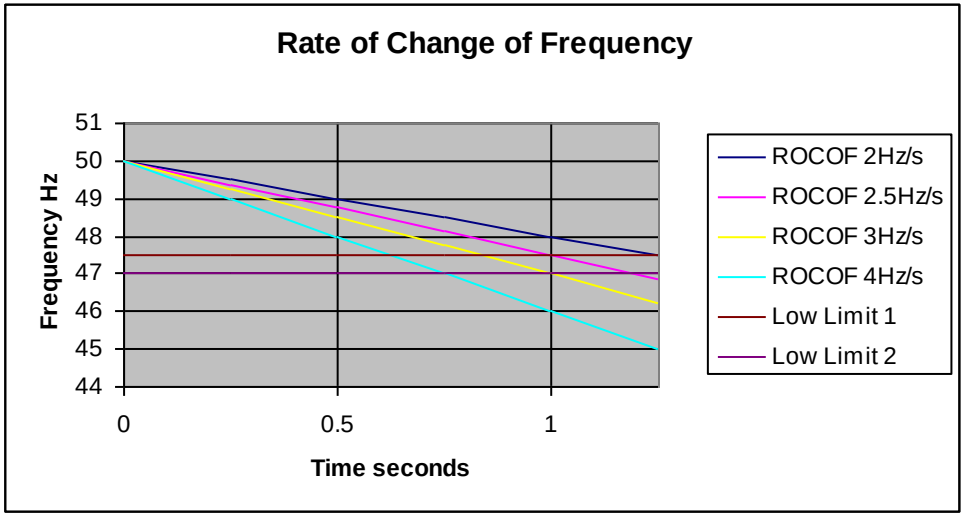
Article 9, 3b)

With regard to torsional stress, the Generating Units shall be designed in a way that shaft torsional stress which may be excited by transient Active Power steps up to 50 % of its Maximum Capacity are considered a routine part of normal operation and shall be taken into account when specifying the shaft characteristics.

Item 5: Rate of Change of Frequency

Refers to EUTurbines Comment 4

- ROCOF>2Hz/s for 1.25s would take operation outside the specified frequency range, therefore unit would trip.
- ROCOF up to 2Hz/s is acceptable.
- ROCOF > 2Hzs, manufacturer to be consulted.



Article 7 Para 1b)

With regard to the rate of change of frequency withstand capability, the Generating Unit shall not disconnect from the network due to rates of change of frequency up to 2 Hz/s. Any rate of change of frequency of 2 Hz/s or above shall be withstood by Generating Units for at least 1.25 seconds without disconnection from the network other than triggered by loss of mains protection. The frequency shall be measured using 100 ms average.

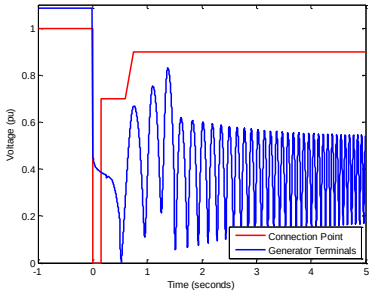
Item 6: Fault Ride Through 1/2
Presenter: Peter Norris, Alstom

Refers to EU Turbines Comments 27 & 38²

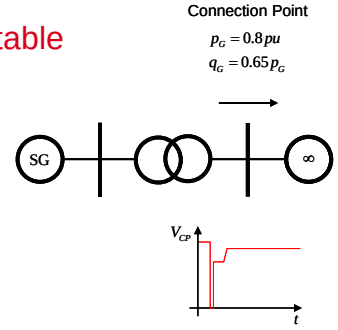
The Voltage profile is not a realistic condition. Interpretation of the curve is not clear.

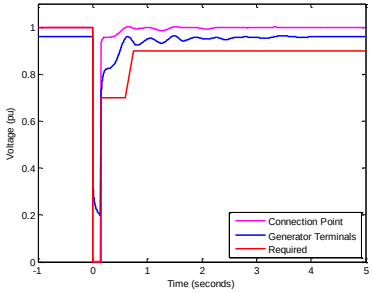
a) course over time of one specific fault?

b) plot of data pairs each representing a fault?

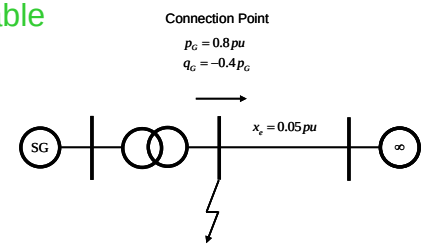


a) Unstable





b) Stable



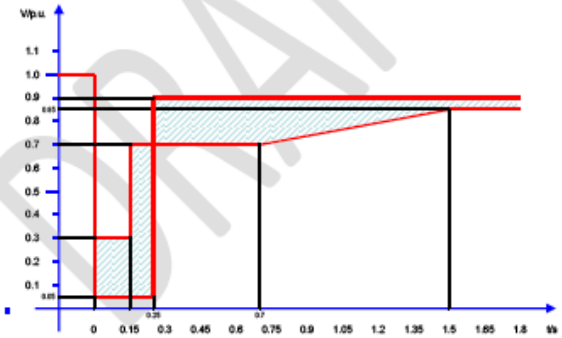


Figure 5 – Fault ride through profile of a Synchronous Generating Unit connected at voltage levels below 110 kV. The diagram represents the boundaries for a voltage-against-time profile by the voltage at the Connection Point, expressed by the ratio of its actual value and its nominal value in per unit before, during and after a fault. For the meaning of the shaded area see Article 11 paragraph 3 subsection a) point 2.

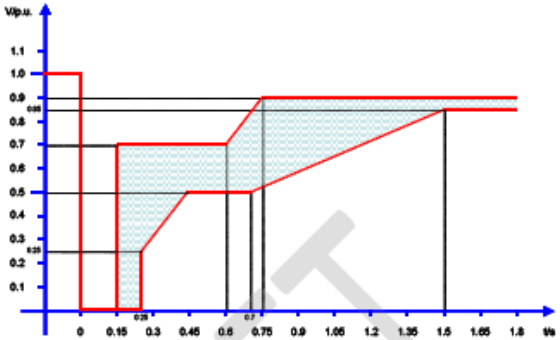


Figure 7 – Fault ride through profile of a Synchronous Generating Unit connected at voltage levels at 110kV or above. The diagram represents the boundaries for a voltage-against-time profile by the voltage at the Connection Point, expressed by the ratio of its actual value and its nominal value in per unit before, during and after a fault.

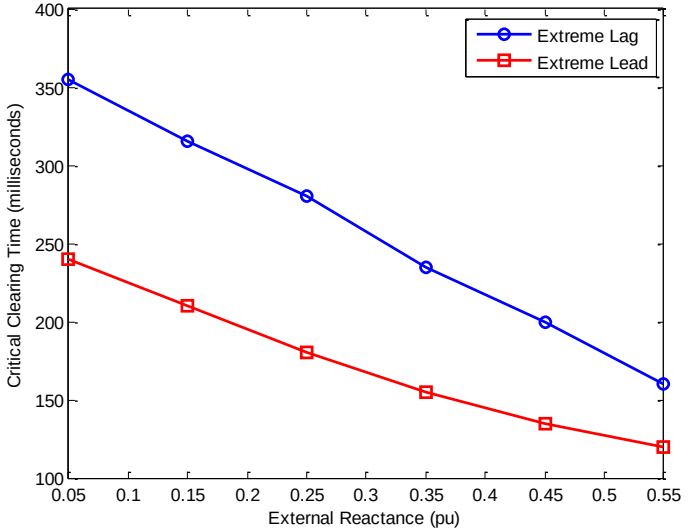
- We recommend interpretation b) as in the GB Grid Code

Fault Ride Through 2/2

Refers to EU Turbines Comments 27 & 38

- Normal fault clearing time for primary protection for close up fault should be less than 150 ms.
- Clearing time longer than this can be critical.
- Conditions at Pcc has a big influence on the stability of the system.
- The Pcc shall be prevalent against the installed generating unit, otherwise where the grid is weak it shall be expected the generating unit could not remain stable.
- The TSO should have a responsibility to define reasonable and normal pre conditions at the Pcc, extreme and abnormal conditions should not be considered.

Example showing variation in CTC with external reactance and generator operating point.



Item 7, Art. 10: Voltage variation ranges
Presenter: Luca Guenzi

Refers to EUTurbines Comment 26
Table 5.1 and 5.2

- Voltage range tables have been present and commented since first issue of the pilot code.
- Power generating facilities can cope with such voltage ranges at point of connection, where step-up transformer with OLTC can be introduced. ENTSO-E accept this solution in the FAQ, but there is no explicit indication in the new revision. Standard Generators are not compatible with the required values unless with special design.

Synchronous Area	Voltage Range	Time period for operation
Continental Europe	0.80 pu – 0.85 pu	30 minutes
	0.85 pu – 0.90 pu	60 minutes
	0.90 pu – 1.05 pu	Unlimited
	1.05 pu – 1.0875 pu	To be determined by each TSO under the conditions and within the existing national framework, and respecting principles of transparency, publicity and non-discrimination, but not less than 60 minutes
	1.0875 pu – 1.10 pu	60 minutes
Nordic	0.90 pu – 1.05 pu	Unlimited
	1.05 pu – 1.10 pu	60 minutes
Great Britain	0.90 pu – 1.05 pu	Unlimited
	1.05 pu – 1.10 pu	20 minutes
Ireland	0.90 pu – 1.05 pu	Unlimited
Baltic	0.88 pu – 0.90 pu	20 minutes
	0.90 pu – 1.10 pu	Unlimited
	1.10 pu – 1.15 pu	20 minutes

Table 5.1: This table shows the minimum time periods each Generating Unit has to operate for voltages deviating from the nominal value at the Connection Point without disconnecting from the network. (The voltage base for pu values is between 300 kV and 400 kV.)

Art. 10 Voltage variation ranges

Refers to EUTurbines Comment 26

Table 5.1 and 5.2

- The concern of EUTurbines is that according to the tables the Plant will be sometime oversized. EUTurbines propose that the maximum voltage level as minimum requirement shall be harmonized with EN 62271.

- Today the tables shows voltage indicated in p.u.. Proposal by EUTurbines is that Nominal voltage levels shall be indicated in kV instead, as in EN standard.

Synchronous Area	Voltage Range	Time period for operation
Continental Europe	0.80 pu – 0.85 pu	30 minutes
	0.85 pu – 0.90 pu	60 minutes
	0.90 pu – 1.115 pu	Unlimited
	1.115 pu – 1.15 pu	60 minutes
Nordic	0.90 pu – 1.05 pu	Unlimited
	1.05 pu – 1.10 pu	60 minutes
Great Britain	0.90 pu–1.10 pu	Unlimited
Ireland	0.90 pu – 1.118 pu	Unlimited
Baltic	0.80 pu – 0.90 pu	30 minutes
	0.90 pu – 1.12 pu	Unlimited
	1.12 pu – 1.15 pu	20 minutes

Table 5.2: This table shows the minimum time periods each Generating Unit has to operate for voltages deviating from the nominal value at the Connection Point without disconnecting from the network. (The voltage base for pu values is between 110 kV and 300 kV.)

Art. 10 Voltage Variation Ranges

Refers to EUTurbines Comment 26

Table 5.1 and 5.2

- 27.10.2011 Pilot Code Revision shows some modification from previous, including adding P.U. voltage in the Definition chapter. EUTurbines maintains its comment which is of much more clarity.
- Combined voltage/frequency variations shall be limited.
- EUTurbines proposal is that V/F variation shall be in accordance with IEC 60034 standard.
- See ENTSO-E reply page 64: values under investigation by ENTSO-E.

Art. 12, 3 Type C Voltage Stability, d) Excitation System Specification

Refers to EUTurbines Comment 32

"... that limit the bandwidth of the output signal. The bandwidth shall be limited to ensure that the highest frequency of response cannot excite torsional oscillations ..."

- The AVR controller gain can be limited, but the time constant of the step response answer depends on the time constant of the machine field winding only. Bandwidth is normally controlled by PSS rather than from AVR.
- PSS is only specified for type D machines

Art. 12, 3 Type C Voltage Stability, d) Excitation System Specification

Refers to EUTurbines Comment 32

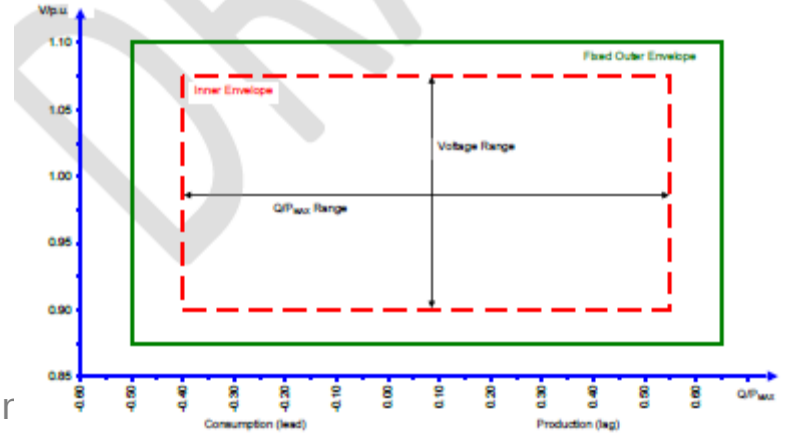
- an under excitation limiter. The under excitation limiter shall also prevent the Generating Unit … when the Excitation System is under manual control.

- Manual mode is understood that no closed loop control of the reactive power or voltage is in place. Therefore fixed underexcitation limit apply.

Art. 12, 3 Voltage Stability, e) Reactive power capability and U-Q/Pmax-profile

Refers to EUTurbines Comment 33

Figure 6 and Table 6



- The requested variation in the figure 6 are possible only where on-load tap changers are installed on step-up transformers.

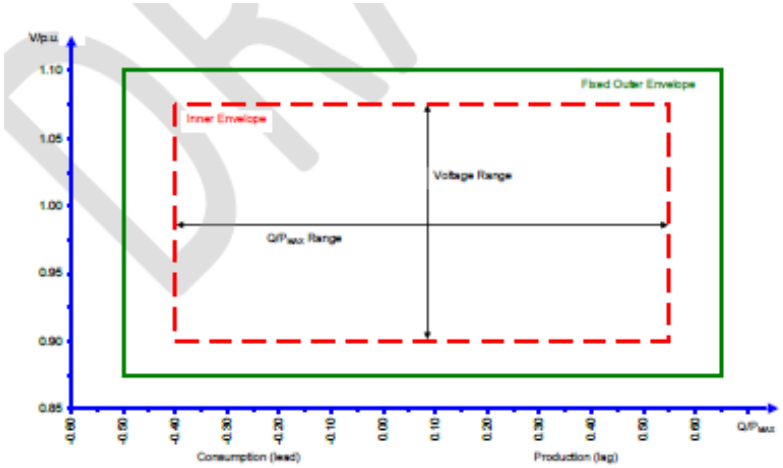
- The Figure 6 is applicable for type C generating ur voltage<15kV) type C units do not have a step-up transformer between the generating unit and connection point to the grid. Present (red) curve cannot be accepted in such cases. We recommend therefore that this requirement should be applicable for type D units only or the limits to be modified.

Art. 12, 3 Voltage Stability, e) Reactive power capability and U-Q/Pmax-profile

Refers to EUTurbines Comment 33

Figure 6 and Table 6

- Figure 6 diagram should only be applicable for frequency ranges of unlimited operation.



Art. 12, 3 Voltage Stability, f) With regard to Reactive Power capability below Maximum Capacity

Refers to EUTurbines Comment 35

… when operating at an Active Power output below the Maximum Capacity (P<Pmax), the Synchronous Generating Units of the Synchronous Power Generating Facility shall be able to be operated in every possible operating point in the P-Q Capability Diagram of the alternator of this Synchronous Generating Unit.

- Generating unit can operate between Pmin and Pmax, therefore EUTurbines propose to amend as follow:

  "With regard to Reactive Power capability....when operating at Active Power output below the Maximum Capacity (P<Pmax) and above the Minimum Capacity (P>Pmin).....or Refers to MOL/MRL depending on Definition of MOL and MRL as commented in the Definition chapter.

Art. 12, 3 Voltage Stability, f) With regard to Reactive Power capability below Maximum Capacities

Refers to EUTurbines Comment 35

Even at reduced Active Power output, Reactive Power supply at the high-voltage terminals of the step-up transformer to the voltage level of the Connection Point shall fully correspond to the P-Q-Capability Diagram of the alternator of this Synchronous Generating Unit, taking the auxiliary service power and the losses of the step-up transformer into account.

- EUTurbines propose to delete this sentence, since the requirements is self-evident or the requirements shall consider too many variables not sufficiently defined in the paragraph (auxiliaries consumption, trafo impedance, temperature). This requirements is not bringing any added value.

- The reactive power can be regulated on the synchronous generators within their capability curve.

- The synchronous generator capability curve is subject to variation depending from voltage level at generator terminals and temperature.

Simulation, models and testing

- Article 9 general requirements for type c units:
  At point 5. c) 1) and 2) about the simulation models we would like to point out that:
  - The TSO and DSO are responsible for simulation study at the point of connection.
  - The TSO and DSO should be responsible for transfer into the specific software format data and model.
  - Models and their purposes including the required protection functionalities must be clearly defined. Otherwise long clarifications will occur.
  - Models and Data format are provided as a block diagram preferably in accordance with known standard (e.g. IEEE model).
  - Sub-models for the different systems may be independent from each other.
  - Proprietary know-how policy and mandatory non-disclosure agreement shall be undersigned by TSO and DSO.

Item 8: Simulation, models and testing
Presenter: Raffaele Traverso, Ansaldo

- Article 45 compliance simulations for type c synchronous generating units:
- General note: are compliance simulations really necessary for LFSM and FSM when these will be extensively tested?
- 4. b) 3): In island operation the max capacity would correspond to the capacity of the prime mover capable to restore the system. In case of combined cycle with Gas turbine and steam turbine, only the gas turbine power to be considered for the max capacity.

Simulation, models and testing

- Article 46 compliance simulations for type d synchronous generating units
- With regard to the demonstration of the PSS system performances we suggest to limit the interval between 0.2 Hz and 2 Hz to avoid possible conflicts with the frequency control, in any case the specific frequency range to be damped has to be defined with the relevant DSO/TSO
- At point 2. c) 2) we suggest the following sentence: the PSS shall minimize the reaction to non-oscillatory admissible power changes in Interconnected System Operation due to a sudden load reduction of 40% of Maximum Capacity of the Generating Unit from 1p.u. to 0.6 p.u. within 3 seconds, to be specified in Connection Agreement or any other bilateral contracts.

Item 9 Comments for Industrial application by Presenter: Luca Guenzi, Turbomach

- Industrial turbines of small size (typically up to 25 MW) are generating units used for industrial purpose rather than for energy production.

- Example of Industrial application are:
  - Cogeneration,
  - Paper industry,
  - Breweries
  - Food industry
  - processes where the thermal production is as much important as the production of energy and is part of the industrial process

Comments for Industrial application

- the output power control can be driven by thermal needs.
- the output power can be related to pressure set point rather than a power set point (steam turbine).
- the generating groups can be installed to preserve the industrial process against grid perturbation permitting a safe transition of the industrial system in isolated mode (power generating facility auto consumption).

Comments for Industrial application

Answer to FAQ 8:

Why does the pilot code not consider specific conditions which may apply for some Power Generating Facilities, in particular in industrial sites?

The pilot code does not exclude the consideration of such specific conditions. But these conditions are of a site-specific or generation type-specific nature and cannot be covered by a general exemption from the application of single or all requirements of the pilot code for these Power Generating Facilities. Moreover it is necessary to have a closer look at these conditions on a case-by-case basis. Therefore the principle of derogation could apply.

…The Power Generating Facility operator can request derogation from the Network Operator it is connecting to and this request will then be evaluated in relation to whether it is reasonable and justified. Depending on the result of this assessment a decision on granting derogation will most probably be made by the Network Operator. The network codes must provide a transparent and non-discriminatory derogation procedure.

Comments for Industrial application

- According to FAQ 8 the majority Cogeneration processes shall go through “Derogation Process”
- Frequently Industrial Power Generating Facility owner has no dedicated engineering or skilled technical department that can follow up a complex process of derogation
- Codification of precondition for derogation and acceptance criteria shall be defined and included in the code.
- Precondition shall list documentation requirements, the process shall be as much simple as possible.

Comments for Industrial application Conflictuality with Requirements

Generating Unit Categorization:

The categorization in chapter 1, art 3, point 2 of ENTSO-E Draft Requirements for Grid Connection Applicable to all Generator of 22nd March 2011 is mainly referred to Generating Unit definition and to Maximum Capacity definition (in the glossary of the same document).

In reality contracts with TSO and DSO are referring to imported/exported power at the point of connection rather than to the terminal of the generating unit.

The definition in such view shall be reviewed or categorization revised.

There is the possibility that the power generating facility is importing energy rather than exporting, therefore to be considered a load in terms of connection. Does it makes sense its contribution to sustaining the grid in case of fault?

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Frequency response requirements (ex. point 9.2.c.9)

9) While a frequency deviation persists power target regulation shall not have any adverse impact on the frequency response.

Frequency control in industrial plant can be conflictual with the industrial process and can affect it (ex. where power target is triggered by thermal response).

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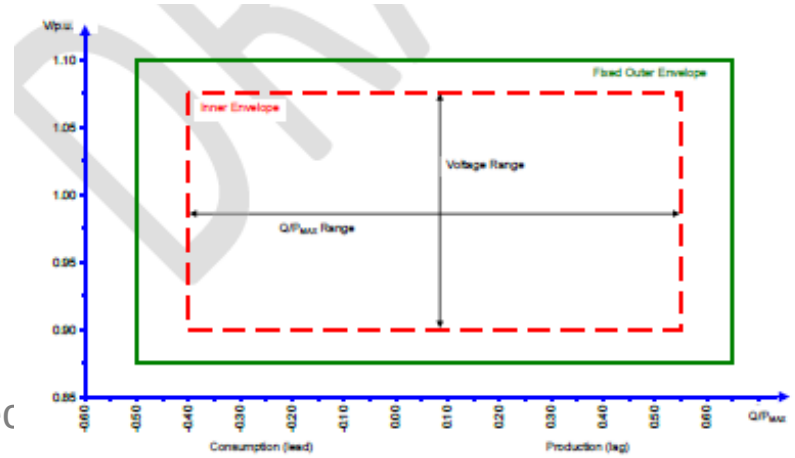
The structure of the present code does not make a clear distinction between power generating facility responsibilities. Mention shall be explicitly made in the code rather than in the FAQ.

Example: U-Q/Pmax Profile
The required ranges are so wide that standard generators characteristics cannot cope with them.



Installation of OLTC is considered a possible tec
but it is not common practice the use of such devices in small industrial plant.

Comments for Industrial application Conflictuality with Requirements

Typical connection diagram (eg Point 9.4.d)

Industrial generating units are frequently connected to existing distribution system and back-synchronization can depend on the existing configuration and logics. The description in the pilot code seems not to consider typical connection and requirements for small industrial configuration.

Example

- almost frequently happens that back-synchronization is foreseen on MV and Connection point is on HV.
- Houseload operation (houseload of power generating facility) detected through position of circuit breaker. Simple pre-condition for re-synchronization.

Comments for Industrial application Conflictuality with Requirements

Voltage ranges and OLTC on Auxiliary Trafo

Referring to FAQ 17,

“Possible measures for Power Generating Facility Owners to match different voltage ranges of international standards with ranges defined in the Requirements for Generators **...** It makes the voltage range requirements compatible for the generating unit and this is also the case for auxiliaries*, as auxiliary and standby transformers can also be equipped with on-load tap changers …*”

The presence of step-up transformer with OLTC in industrial plant is absolutely negligible therefore this is a major change. The presence of OLTC on auxiliary transformer of small size is a really special event.

Is not common practice nor standard production for small transformers (800 kVA, 630 kVA) to have OLTC, but even to have the possibility to mount it.

EUTurbines

Item 10: Other points

- How are comments to ENTSOe and the FAQ handled and what validity will they have?
- Establishment of technical interface with ENTSOe- how could this be done ?
- EUTurbines is interested in a Network Code as a Common set of Requirements. It is EUTurbines understanding that compliance with ENTSO-E code corresponds to comply with the majority of the requirements of TSOs and consequently DSOs code issued in Europe. Additional or different requirements from TSOs or DSOs shall be minor ones. More stringent requirements are possible but shall correspond to exceptional condition to be detailed and justified.

EUTurbines asks ENTSO-E to clarify this and would be pleased to revise Art. 6 .

THANK YOU FOR LISTENING

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