Report from the Expert Group 'Mixed Customer Sites with generation, demand and storage and definition of system users' (EG MCS)

Robert Wilson, Chair of EG MCS

12th Grid Connection European Stakeholder Committee Meeting

13 December 2018, Brussels

EG MCS structure

Chair: ENTSO-E, Robert Wilson
Vice-Chair: CEDEC on behalf of the DSO associations, Paul de Wit

Expert group: Mixed customer sites with generation, demand and storage, and definition of system users (EG MCS)

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Problem Statement

On 11 June 2018, the Grid Connection European Stakeholder Committee (GC ESC) decided to establish an Expert Group (EG) to clarify the requirements on mixed customer sites (MCS), where these could be a combination of generation, demand and/or storage facilities. The creation of this EG was proposed by ENTSO-E to elaborate on connection network code (CNC) issues which had been raised by stakeholders during CNC implementation. The ENTSO-E proposal was based on the findings of a stakeholder survey to identify priority topics.

Target (objectives)

The objectives of the EG MCS are:

- to provide clarification regarding the application of the Network Code on Requirements for Generators (NC RfG) Demand Connection Code (NC DC) and HVDC (NC HVDC) to MCS with generation, demand and storage (to the extent that storage might in future be classed as separate from generation or demand);
- identify differences and similarities of mixed customer sites which are CDSOs and non-CDSOs;
- in the context of MCS:
  - assess types of MCSs to be considered;
  - to assess the MCS case against the current definition of system users, found in the Directive 2009/72/EC;
  - to review the definitions of Synchronous Power Generating Module (SPGM)/Power Park Module (PPM); and
  - to provide clarification in terms of the type A-D categorisation or applicability of RfG for mixed or novel sites addressing cases such as:
    - mixed generation only sites where a small PGM (e.g. PV) is installed within the connection site of a larger generator;
    - small PGMs connected to a ≥110kV network due to unavailability of lower voltage connection points
    - combined heat and power generating facilities connected at ≥110kV (where type A-C would be excluded from certain RfG requirements)
    - clarification on arrangements for point of connection to TSO, DSO or CDSO if that will determine the voltage of connection and therefore 'type'

Task description

Mixed customer sites with generation and demand are subject to CNC (NC RfG, NC HVDC and NC DC). Furthermore, as set out by Article 6 of NC RfG and Article 5 of NC DC, specific provisions apply to industrial sites.

- clarification on arrangements for point of connection to TSO, DSO or CDSO if that will determine the voltage of connection and therefore 'type'

Note – added by group at 1st meeting but not in version approved by ESC on 14/9/18

Public space

EG MCS

Mixed customer sites with generation, demand and storage, and definition of system users.

Annex

Internal EG space

EG MCS

new document or drag files here

All Documents ••• Find a file

Name

- archive (non-exhaustive)
- Examples and Additional references
- Kick-off meeting_181019
- RfG classification
- Specific equipment types_combinations
- webinar_181119
- 180914 Annex_Expert_Group_MCS_final draft
- 180914_GC ESC_EG MCS_notes from preparatory call
- EG MCS_contact list

EG MCS meetings

- 19 October 2018 kick off meeting
- 19 November 2018, webinar
- **17 December 2018, webinar**

- 33 listed members
- 14 different representative organizations
- 50 – 67% participation of members
- >90% participation of organizations

- Overall good collaboration among the members, with useful discussions
- The exchanges reveal the importance of the topic and the complicated aspects that includes
- Good inputs in accordance with follow up actions
- Common space (SharePoint) and emails are used to provide inputs
- Workplan continues as agreed with no changes foreseen at the moment

Discussion to date – RfG 'type' voltage criteria

- RfG was intended to apply in relation to machine size:

  Extract from RfG 'Whereas' recitals:

  (9) The significance of power generating modules should be based on their size and their effect on the overall system. Synchronous machines should be classed on the machine size and include all the components of a generating facility that normally run indivisibly

- The default voltage criteria (connection at >110kV = automatic type D regardless of size) was according to ENTSO-E introduced to encourage connection at appropriate voltages for the size of the machine, and acknowledging that connection at a higher voltage will impact the transmission system more directly so a lack of machine performance will be more likely to lead to socialisation of increased operational costs
- Generally economics dictates that larger machines connect at higher voltages hence the voltage criteria is – for straightforward connections - usually academic

However:

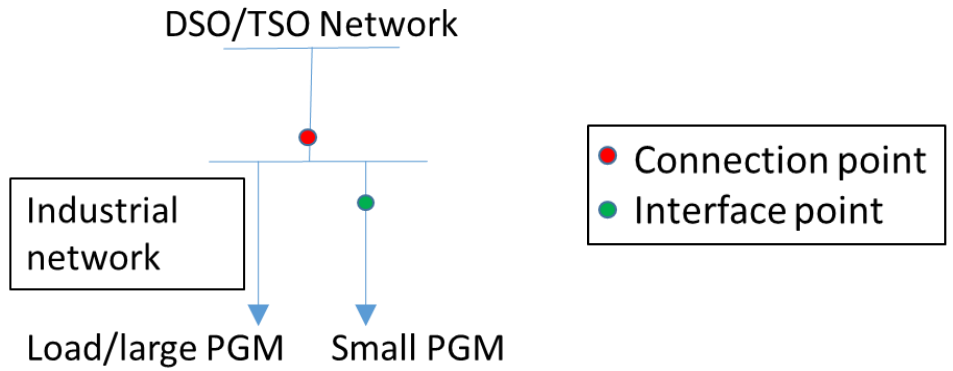
- In mixed site connections (eg a PV installation in association with a larger generator or small CHP within a large industrial complex) this can lead to a disproportionate level of requirement on small plant where this becomes classed as type D due to the voltage at the site connection point
- Some geographical issues are not accounted for – where a lower voltage connection is simply not possible or economic (eg hydro in remote mountainous locations)

Agreed to present possible solutions to ESC and seek guidance

Possible Solutions

The Mixed Customer Sites EG has considered this issue and discussed a number of options:

- Define an ‘interface point’ within a larger complex and use this rather than the overall connection point to set and establish all RfG requirements including the voltage that determines the RfG ‘type’ of the generator
- Use the interface point only in determining the voltage for use in establishing the RfG ‘type’ of the generator (ie RfG requirements still generally apply at the connection point)
- Change the voltage level of the default criteria to 220kV which then captures only transmission connections
- Remove the type D voltage criteria completely



Points to consider:

- **Should private and public networks be treated differently?**
- **If ‘type’ thresholds are relaxed by revising the voltage criteria, would further operational costs need to be socialised?**
- **How will an interface point be defined? What visibility will the TSO/DSO have of performance within a connection site? Could compliance be established?**
- **What technical issues could arise from determining requirements at an interface point?**
- **Will the solution work in all cases?**

Interface Point – technical considerations

Fault Ride Through

- FRT requirements apply to type B power generating modules for faults on the transmission system, and to type D power generating modules for secured faults on the system (although in practice these conditions will usually be identical)
- The minimum voltage profile for a fault that needs to be ridden through is defined by the TSO within certain parameter ranges and is done separately for type B and D
- A reclassified generator (previously type D now type B or C typically) would now only need to ride through faults as per the type B requirement
- The most important parameter for FRT is the impedance of the network between the fault and the generator. Specifying the FRT requirements for transmission faults at the connection point to the system, which is also the nearest point to the transmission network, allows this to be monitored more easily

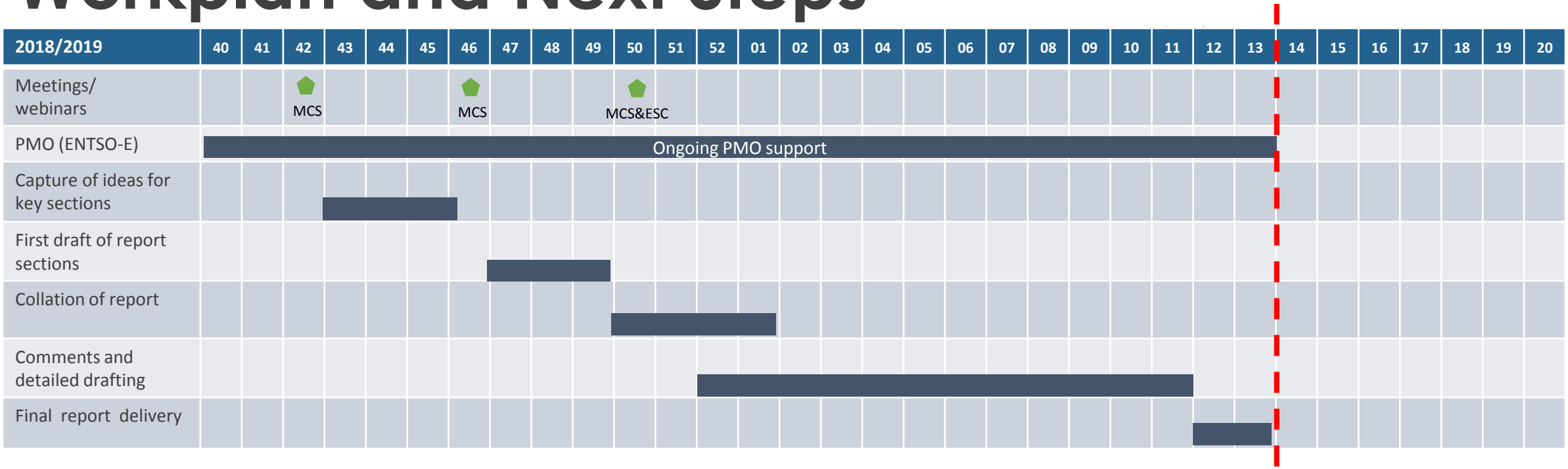
Reactive Range

- RfG art 17.2 for type B synchronous power generating modules sets out that the relevant system operator may specify reactive power requirements
- RfG art 18.2 (a) & (b) for type C synchronous power generating modules adds more detail to the reactive power capability expected at maximum capacity to be specified by the relevant system operator in coordination with the relevant TSO within the boundaries of a P-Q voltage envelope; and adds a requirement to compensate for any high voltage line or cable between the generator and its connection point, although this may be through compensation within the network so netting off between the generator and the gain of any cable
- Applying all RfG requirements at the interface point (and using this to establish compliance) would in some cases remove the requirement in type C to compensate up to the actual connection point but would resolve issues caused by a small generator being assessed for reactive requirements as part of a larger complex
- Only using the interface point to determine the type would instead retain unchanged the requirement to compensate up to the actual connection point, however without a pragmatic interpretation it would also retain the difficulties for a small generator within a larger industrial complex as the generator could not supply reactive power up to a power factor requirement set by the larger active load

Possible Solutions – preliminary assessment

Voltage Criteria Solution	Pro	Con
Use interface point for all	• Treats public/private networks identically • Solves issues with supply of reactive power across connection point	• Visibility of performance within a network to TSO/DSO • Possible legal issues in establishing an additional boundary • Doesn't solve geographic availability of LV issue
Use interface point – for type selection only	• Maintains visibility of performance to TSO/DSO • By generally leading to reclassification, reduces technical requirements for smaller generators	• Possible legal issues in establishing an additional boundary • Doesn't solve geographic availability of LV issue • Similar in outcome to removing the voltage criteria
Change the default criteria to 220kV	• Simple – minimum change to RfG	• Doesn't resolve issues with transmission connections constrained for geographic reasons • Doesn't solve case where a major industrial site is connected at 220kV+. Some examples of this in Germany.
Remove type D voltage criteria completely	• Simple in principle • Resolves all cases	• Simple but may be viewed as significant change to RfG. • Potentially lose incentive for selection of lower voltage connection for smaller generators • Possible socialisation of additional operational costs although this is difficult to quantify

Workplan and Next Steps



The next meetings of the group are as follows:

- **17 Dec 14:00-16:00** – webinar – to follow discussion at ESC, further progress actions, set responsibilities for preparation of material
- Further webinars are planned for Jan & Feb. These will aim to:
  - Jan – review of material, establishing a framework for the final report
  - Feb – put material together in draft
- It is planned to hold a joint physical meeting between the three expert groups established at the same time (ie with Storage and Pumped Storage Hydro EGs), probably in Feb/March
- Likely to be 1-2 webinars following this to finalise the report