Minutes of the Twelfth Meeting of the ER P28 Joint GCRP and DCRP Working Group

8th September 2016

Held at the ENA, Dean Bradley House, 52 Horseferry Road, London, SW1P 2AF

1. Welcome, Introductions

GE welcomed everybody to the twelfth meeting of the ER P28 Joint GCRP and DCRP Working Group (WG) to review the case and proposed scope of review of ENA Engineering Recommendation P28 Issue 1 Planning Limits for Voltage Fluctuations caused by Industrial, Commercial and Domestic Equipment in the UK (P28).

Attendance, apologies and absences were noted (see Appendix B for Attendance List including member initials).

2. Address by the Chair

GE thanked the WG members for their contributions and presented the agenda (see Appendix C for Agenda)
[Document reference: P28 WG_Paper_12_1_Agenda_P28 WG_Meeting 12_08.09.16_v0.1]
[Document reference: Presentation_P28 WG_Meeting 12_08.09.16_v1]
[Document reference: COMPETITION ACT COMPLIANCE.docx]

In addition to the standard agenda items the purpose of the meeting was to review the status of the first draft of P28 Issue 2, to review the sub-WGs progress and to give feedback on their proposals.

The WG members were respectfully reminded of ENA requirements to adhere to The Competition Act Compliance - ENA Meetings – Best Practice Guidelines document which was attached to the agenda for this meeting.

There were no comments.

3. Update/Actions from Last Meeting

It was agreed the draft minutes were a fair and accurate account of the previous meeting and could be published in the public area of the DCode website subject to the amendments advised by SM in Paper 12-4.
[Document Reference:
P28 WG_Meeting Minutes and Actions_28 07 16_v1.0_Draft Issued]
[Document Reference: P28 WG_Paper_12_4_UKPN response]

ACTION 12.1: Publish the approved P28 minutes meeting no. 11 28.07.16 on the DCode website (GE)

GE presented an update on the actions from the last meeting.
[Document Reference: P28 WG_Paper_12_3_Update_P28 WG Actions]

GE noted the actions marked ‘Complete’ in the ‘Due by’ column had been completed and, where applicable, the number of the Paper was referenced.

Action 11.13 No comments had been received on the definition of Normal Operating Condition. GE stated this was an important consideration and asked the Measurements and Applications sub-WG to discuss and provide a formal response

Action 10.7 FG had received a revision of the wind turbine standard IEC 61400-21 and believed only general comments as opposed to technical comments had been provided by the UK. FG did not believe any of the amendments were relevant to flicker

Action 9.3 FG stated that simultaneous flicker measurements for a disturbing load at 275 kV in the South-West of England were complete and in raw data form. FG stated that he would share the results at the next P28 WG meeting when the data had been compiled and analysed

4. Terms of Reference (ToR)

[Document Reference: ER P28 WG_ToR_v2.2_Issued]

GE stated there had been no changes to the ToR. No comments were received from the WG.

5. Status of Phase 3 Revision

Project Plan

GE summarised the amendments to the Phase 3 Revision noting the program had not been changed since the last meeting of the WG. Submission of the 1st draft had been exceeded by 1 week and comments had been due back by the 1st September. [Document Reference: Slide 10 in Presentation_P28 WG_Meeting 12_08.09.16_v1]
GE asked those members of the WG that had not commented to provide comments to GE as soon as possible.

Comments received on P28 Issue 2 Draft_v1

[Document Reference: P28 WG_Paper_12_8_Comments Recd on P28 Issue 2 Draft]

GE summarised the comments received on the 1st draft of P28 Issue 2 as captured in Paper 12-8

The following points were captured from a discussion of the comments received.

- Use of the term “MV”
    - The WG agreed not to refer to the term “MV” in the main document. FG confirmed the same approach was being taken in the latest revision of EREC G5. Instead the term “LV” and the specific system operating voltages, e.g. 11 kV, 33 kV etc. will be used
    - The WG agreed to include a footnote in P28 Issue 2 to allow system operating voltages to be equated to the term “MV” used in relevant National and International Standards

- RVC Category 1
    - FG stated his belief that Category 1 events should still be in the table of proposed limits for RVC because the RVC characteristic is different to flicker. Published papers show that the standard flickermeter does not give the same results for regular RVC changes as for flicker. In addition, RVC changes by

their nature are rapid and do not affect users in the same way as flicker. Also RVC is not process related unlike flicker
    - GE stated that P28 Issue 2 needed to make clearer the distinction between RVC and flicker
    - DV highlighted that RVC was a shape factor in PD IEC/TR 61000-3-7 and that it would be interesting to see how the RVC limits compared to the maximum percentage voltage change for flicker in the flicker curves
    - The WG agreed that flicker was a repetitive event, whereas RVC should be considered a one-off event

ACTION 12.2: Arrange a joint meeting of the Flicker and RVC sub-WGs to consider whether there is an appropriate transition from RVC event frequency to flicker (GE)

- RVC Category 4
    - PTh discussed a site where the PCC would be changed from 33 kV to 132 kV and there was opportunity to measure voltage changes from groups of transformer energisations over one day. This will allow a check of the proposed RVC limits

ACTION 12.3: Update the P28 WG with results of groups of transformer energisations to be carried out by Nordex in the next 3 weeks (PTh)

    - GE and DC confirmed that the DCode, in particular the '10% rule', would need to be revised in light of the proposals in P28. There would be opportunity for comments as part of that consultation process
    - There was a discussion concerning under voltage protection settings applied to wind turbines and their ride through capability for a 12% RVC event. PTh pointed out that modern controllers would respond quickly to a RVC event and would remain connected but would attempt to mitigate the voltage change by exporting reactive power. DV did not believe there was an issue for the proposed RVC limits. FG confirmed that the RVC sub-WG had considered this issue but had not identified a problem. GE suggested this should be addressed in the ETR that will accompany EREC P28 Issue 2

- Normal Operating Conditions
    - The WG agreed that for LV systems the minimum fault level should not consider the outage of any part of the system
    - The practicality of a connectee considering outage scenarios on the 11 kV network was discussed. The WG agreed this would be impractical and that the DNO should advise a minimum fault level and maximum fault level to be used for the purposes of carrying out Stage 2 studies
    - It was agreed that the Stage 3 assessment process may require specific outage scenarios/configurations to be considered
    - The suitability of using the DNO Long Term Development Statement (LTDS) was discussed. It was agreed this would be of limited benefit as it is too generic
    - DV stated that the Flicker sub-WG has been tasked with summarising the requirements for data exchange between system/network operators and applicants for all stages of assessment
    - FG highlighted that the latest draft of EREC G5 provides a calculation table for simple assessment; if an applicant doesn't comply then more detailed information is provided by the TSO/DNO
    - Is there a deminimis fault level? GE stated that it may be possible to provide simple rules of thumb similar to the tables in EREC G5 depending on the fault level information that is provided by TSOs/DNOs. Providing normal

minimum fault levels for networks may be difficult, particularly where distributed generation (DG) is connected to the network
- PJ highlighted the work of the G74 WG that was looking at fault level studies and whether there were aspects relevant to the P28 WG

ACTION 12.4: Each DNO to advise their current process for providing fault level data to applicants and the type of fault level data provided (All)

ACTION 12.5: Advise the ENA Engineering Report that addresses how DG should be considered for security of supply and fault level purposes (GE)

ACTION 12.6: Define the elements of Normal Operating Condition for each voltage level and summarise in a table for the WG to consider (GE)

ACTION 12.7: Liaise with the Chair of the G74 WG to determine whether it is possible to have deminimis fault levels (GE)

GE reminded the P28 sub-WGs to review sections of P28 Issue 1 that are relevant to their ToR and to feedback whether requirements are:

- obsolete and can be removed
- relevant but need revision
- relevant and do not need revision

GE reconfirmed that the drafting team were ensuring:

- any relevant aspects from P28 Issue 1 were being incorporated into Issue 2
- any relevant aspects from BS EN Standards were being incorporated

ACTION 12.8: Provide comments on first draft of P28 report as soon as possible (All) [See P28 WG_Paper_11_22_ENA_EREC_P28_Issue 2_2016_Draft_v1_Working]

6. Reports from sub-WGs

6.1 Flicker Assessment & Limits sub-WG

Stage 1 Assessment Process

[Document Reference: P28 WG_Paper_12_9_Stage 1 Assessment Process]

GE summarised Paper 12-9, which discusses how a disturbing installation should be assessed under Stage 1 as opposed to individual LV equipment. In summary, GE believes BS EN 61000-3-11 can be used to address multiple items of the same equipment but not assessment of multiple installations under Stage 1. GE advised that he was awaiting comments from AH on this. DC advised that a revised draft version (CDV) of IEC 61000-3-11 (which will eventually replace the current version of the BS EN) had been published and should be reviewed in this light.

ACTION 12.9: Send GE revised draft of IEC 61000-3-11 for review (DC)

MH asked whether Independent Network Operators (IDNOs), were bound by the assessment process in P28. For example: would IDNOs have to ensure compatibility with BS EN 61000-3-11 for multiple heat pump equipment in a block of flats? The WG agreed this was a good point and wished to seek clarification whether IDNOs would be bound to comply with requirements in P28 Issue 2.

MK subsequently confirmed that IDNOs are bound by the DCode and hence will be required to comply with requirements in P28 Issue 2.
ACTION 12.10: Ask Dave Overman of GTC for clarification whether IDNOs are bound to comply with requirements in P28 Issue 2 (GE)

Paper 12-10 Flicker Curve and Action 11.12

GE informed the WG of the work that had been carried out by DV regarding the difference between the flicker curve in Figure 4 of P28 Issue 1 and the flicker curve in BS EN 61000-3-3
[Document Reference: P28 WG_Paper_12_10 P28 Issue 1 Flicker Curve and Action 11.12]

FG pointed out that the percentage differences between the two flicker curves are negligible. DV stated that he would be happy to retain Figure 4 as it is used for a simplified assessment of flicker due to step voltage change events against the Stage 2 limit of P_{st} = 0.5.

DV clarified that the P_{st} = 0.5 curve in Figure 4 of P28 Issue 1 had been derived from the IEC flicker curve P_{st} = 1 curve by halving the voltage change magnitude. DV had confirmed this was correct by running a study through a flickermeter simulator (see results in Paper 12-10).

There was discussion in the WG whether it was still appropriate to use Figure 4 for the Stage 2 assessment. It was agreed this was rational and would give a conservative result, as is the case now (compared with the IEC flicker curve), but that Figure 4 would need to be redrawn and capped at 3% voltage change at 600s.

FG confirmed that the RVC limits in Category 2 (up to 3%) comply with the Figure 4 curve in P28 Issue 1.

It was agreed that it would be a useful exercise to take the RVC shape factor and apply it to the IEC Pst = 1 curve to assess the proposed RVC limits against the flicker curve.

ACTION 12.11: Check the RVC proposed limits by applying the relevant shape factor in PD IEC/TR 61000-3-7 to the Pst = 1 curve (DV & FG)

Action 11.9 Assist Flicker sub-WG with reviewing LV installations in the P28 flowchart

KL had emailed comments to GE with respect to Action 11.9 on the 7th September 2016. The WG discussed the following points:

- Application of Note 1, Note 2 and Note 3 in BS EN 61000-3-11
    - The WG generally agreed that these notes applied and that, with reference to option a) and option b), a competent installer could connect LV equipment without reference to the supply authority (DNO) providing the supply capacity and/or actual system impedance have either been declared to, or measured by the user/installer
    - The WG agreed this does not absolve the user/competent installer from complying with the requirements of BS EN 61000-3-11 or from being required to take action should the DNO find the requirements of BS EN 61000-3-11 haven't been met
    - MH asked about self-points of connection and whether an Independent Connection Provider (ICP) would be required to comply with the requirements of P28? GE stated he believed ICPs would be bound by EREC

G81 Competition in Connections Framework that is believed to reference P28 and the DNO specific Annexes. MH pointed out that it will be the user/customer who will be responsible for ensuring compliance not the ICP

ACTION 12.12: Confirm whether a self-point of connection carried out by an Independent Connection Provider (ICP) would be required to comply with the requirements of P28 (GE)

- The WG agreed that reference to 100A relates to the amperage of the supply fuse

ACTION 12.13: DNO representatives to consider Note 1 [Page 15 of BS EN 61000-3-11] and whether, given all PME supplies are ≤ 0.35 ohms, equipment tested against a service current supply capacity of ≥ 100A per phase can be connected without a conditional connection, i.e. without the consent of the supply authority (DNO Reps)

- Item 2 Maximum Voltage Changes
  - The WG discussed the limit of 3% step voltage change. The higher maximum voltage changes in BS EN 61000-3-11 relate to volt drop measured at the supply terminals and not the Point of Common Coupling (PCC). The WG did not believe the current 3% limit for step voltage change should be changed when measured at the PCC

- Item 3 Multiple Equipment
  - Annex A of BS EN 61000-3-11 was discussed and it was agreed that suitable words would be required in P28 Issue 2 to explain how multiple items of similar equipment in an installation should be assessed

6.2 Voltage Step Change sub-WG

GE updated the WG with respect to a telephone conference call held between GE, RB and FG to discuss the proposed definition for steady state voltage. GE stated the outcome from the conference call was captured in an update to Paper 11-19
[Document Reference: P28 WG_Paper_11_19_Proposal for Steady State Voltage _Updated]

In summary, the difference between the definition of steady state voltage for RVC and step voltage change was discussed. RB pointed out the significance of defining steady state voltage after 5s and that the SVC sub-WG believed this was the best approach. FG pointed out that 5s was also used in the SQSS but did not fully understand why 5s was chosen. GE stated that steady state voltage should not be time dependent and should be based on the end of the event, where there is no noticeable voltage change as a result of that event. The WG discussed the difference between repeatable step voltage changes and flicker, which may not be a step voltage change characteristic and, which may not be a defined time intervals. MH pointed out that SSc may have some useful input into this debate. FG pointed out that for planning purposes the measurement of step voltage change was not time dependent.

GE summarised the outcome from discussions:

- For the purposes of planning and determining maximum step voltage change defining steady state voltage by a 5s period after the event is not relevant
- No appreciable voltage change before the start and at the end of the event (however long this happens to be) effectively defines steady state voltage

- There should not be two different definitions of steady state voltage for assessing RVC or SVC
- For assessing compliance by measurement in the field a maximum voltage gradient method may be appropriate for determining steady state, i.e. two separate definitions - one for planning and one for measurement

ACTION 12.14: Discuss the proposal within the SVC sub-WG that steady state voltage should be defined by the beginning and end of a voltage change event irrespective of time (RB)

GE suggested that the proposal to maintain nominal voltage as the basis for expressing % step voltage change be put on hold until the RVC sub-WG had reconsidered (see Section 6.3). However, GE pointed out that various EMC Standards used the nominal voltage as the basis for % voltage change.

6.3 Rapid Voltage Change sub-WG

Use of Pre-Event Voltage or Nominal Voltage

GE stated that prior to the meeting the Chair of the RVC sub-WG had agreed to reconsider whether it is appropriate to use pre-event voltage as opposed to nominal voltage for setting percentage RVC limits.

ACTION 12.15: Reconsider whether it is appropriate to use pre-event voltage as opposed to nominal voltage for setting percentage RVC limits (FG)

Comments on Proposed RVC Limits

Members of the RVC sub-WG present, acknowledged the comments received from TNEI regarding the proposed RVC limits and agreed to provide a formal response [Document Reference: P28 WG_Paper_12_13_TNEI Comments RVC Limits]

ACTION 12.16: Provide a formal response to the comments raised by TNEI regarding the proposed RVC limits (FG)

The RVC sub-WG asked GE to contact TNEI to clarify details (loads, generation connected etc.) about the DNO system study project mentioned in Paper 12-13, where a step change of approximately 3% was found to cause a voltage step change of more than 4% at the 33 kV terminal of the BSP.

ACTION 12.17: Contact TNEI for details (loads, generation connected etc.) about the DNO system study project mentioned in Paper 12-13, where a step change of approximately 3% was found to cause a voltage step change of more than 4% at the 33 kV terminal of the BSP (GE)

MH asked whether GE could reissue an email from MH to GE concerning remanence to the RVC and SVC sub-WGs.

ACTION 12.18: Reissue an email from MH to GE concerning remanence to the RVC and SVC sub-WGs (GE)

RVC and Flicker Alignment

Following discussion whether RVC and flicker overlap in terms of frequency of event, the WG agreed that RVC is defined by the voltage change characteristic and, as such, there is not a simple delineation.
Notwithstanding, it was agreed that representatives from the RVC and Flicker sub-WGs should hold a joint meeting to resolve common issues and align, as far as practicable.

6.4 Measurements & Specific Applications sub-WG

Responses Papers 12-5 & 12-6

GJE presented a summary of feedback received from PTh and KL on measurement aspects in P28 Issue 1 that need to be incorporated in P28 Issue 2.
[Document Reference: P28 WG_Paper_12_5_MEASUREMENT EXTRACTS FROM P28 ISSUE 1_KL]
[Document Reference: P28 WG_Paper_12_6_ MEASUREMENT EXTRACTS FROM P28 ISSUE 1_PTh]

The significance of the highlight text is as follows:

- Green signifies 'still valid'
- Red signifies 'obsolete'
- Grey signifies 'needs further consideration'

FG stated that measurement using a Class A flickermeter was required as this class of flickermeter ensures voltage fluctuations are not double counted. For example: a voltage dip event does not contribute to flicker.

The WG agreed that P28 Issue 2 should recommend that any data 'flagged' by the flickermeter is carefully reviewed and any external events that contribute to flicker, such as network faults, are removed.

There was agreement within the WG that the phase with the worst measured flicker should be used for any flicker assessment.

It was agreed that supplementary information to support measurement and interpretation of data should be included in the ETR that will accompany P28 Issue 2.

Responses Papers 12-7 Comparison of Phase versus Line Voltage Measurements

[Document Reference: P28 WG_Paper_12_7_ Comparison of Phase-V-Line Measurements]

KL briefly summarised the key points from Paper 12-7, which concludes the following:

- There was little difference found between flicker values measured at a 33 kV substation when simultaneously measured via a star connection and a delta connection (voltage transformer output)
- LV flicker should be measured between phase and neutral conductors (as LV customer equipment will, in the main, see these variations)
- Flicker above LV should be measured between phases, i.e. line voltages, via a delta connected voltage transformer

The WG agreed that there was no requirement to specify measurement via a particular type of voltage transformer connection.

FG confirmed that measurement connections for RVC were consistent with those for flicker.

Responses Papers 12-14

[Document Reference: P28 WG_Paper_12_14 Flicker Comparison 95th & 99th Percentile]

GE presented a summary of key points from Paper 12-14:

- SPEN have started trending P_{st} and P_{lt} flicker data from fixed substation power quality monitoring recorders
- Measurements from 22 locations, mainly 11 kV network at primary substations across England, Scotland and Wales
- Some data goes back to 2014
- Analysis of measurements does not suggest flicker is changing significantly over time
- Flicker levels (P_{st} and P_{lt}) at 126 sites, in the main, are within planning limits

KL confirmed that measurements are taken over a one week period.

KL pointed out the differences between the 95th and 99th percentile measurements, where the 99th percentile measurements are considerably higher than the 95th percentile. GE stated that the philosophy of EMC co-ordination was based on 95th percentile. FG pointed to BS EN 50160 Issue 2015, which defines flicker severity limits as needing to be within a limit 95% of time over a period of a week.

The WG agreed, there may be circumstances, where 99th percentile measurements may be justified for measurement periods less than one week. Notwithstanding, any deviations from requirements in current Standards would need to be justified.

The WG discussed whether compliance against flicker planning limits should be assessed for each weekly measurement period using 95th percentile measurements or whether assessment can be over a longer period. The WG agreed that compliance should be assessed based on 95th percentile measurements of flicker severity measured over each week, i.e. over 10 weeks of measurement, each week of measurements should comply with the planning limits not the P_{st} for the 10 week measurement period.

ACTION 12.19: Check P28 Issue 1 references to flickermeter and measurements to establish the basis of percentile measurements and whether this complies with current standards (GE)

6.5 Drafting sub-WG

GE presented a summary of progress made by the Drafting sub-WG
[Document Reference: Presentation_P28 WG_Meeting 12_08.09.16_v1 slide 20]

- Progress continues to be made with general non-technical aspects including terms and definitions
- Technical aspects
    - Amendment of Stage 1 process for assessing flicker
    - Further work being carried out on Measurements and Specific Applications sections with respect to including relevant aspects from existing P28 Issue 1
    - Re-ordered Section 7 Measurements
    - Further work on the Stage 3 assessment

- Development of operating conditions for assessments
- Other sections in development working through P28 WG decisions and P28 Issue 1

GE highlighted the Author Notes in the document that require particular consideration by the P28 WG. It was agreed that GE would work closely with each sub-WG to close out outstanding issues in preparation for 2nd draft.

ACTION 12.20: Work closely with each sub-WG to close out outstanding issues in preparation for 2nd draft (GE)

The WG had no particular comments.

7. Review Papers and Proposals from WG

Responses Papers 12-15A & 12-15B

[Document Reference: P28 WG_Paper_12_15A_LED lighting and potential health concerns]
[Document Reference: P28 WG_Paper_12_15B_LED lighting and potential health concerns]

MH stated that Papers 12-15A and 12-15B captured the latest knowledge concerning the potential health effects from human exposure to flicker. Whilst the conclusions from this research were of most benefit to designers of luminaires and certain power electronic equipment, the WG agreed that potential health concerns from flicker should be referenced in the 'Introduction' section of P28 Issue 2 and that some guidance to mitigate potential health effects, particularly for abnormal operating conditions, may be appropriate.

Responses Papers 12-16

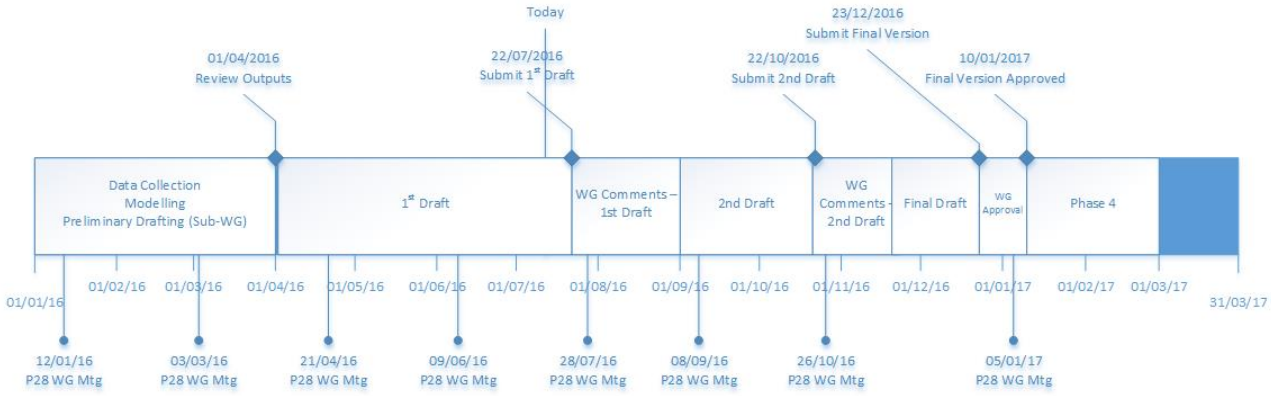
[Document Reference: P28 WG_Paper_12_16_Proposed Amendment to 61000-3-3 re LED luminaires up to 600W]
[Document Reference: Slide 22 in Presentation_P28 WG_Meeting 12_08.09.16_v1]

DC stated the proposed amendment to BS EN 61000-3-3 was at an advanced stage and was likely to be adopted without further changes. GE stated that the amendment was a relaxation of test requirements for LED luminaires, which suggests flicker effects from LED luminaires up to and including 600 W may not be as pronounced as previously thought. However, members of the WG noted the representations of the lighting industry and that without reviewing the evidence no particular conclusion should be drawn by the WG. Notwithstanding, the WG agreed the amendment had no particular impact on the draft of P28 Issue 2.

8. Project Plan

[Document Reference: Slide 10 in Presentation_P28 WG_Meeting 12_08.09.16_v1]

See discussion in Section 5 Status of Phase 3 Revision.



9. General Management/Administration

Arrangements for general management and administration had not changed since the previous meeting.

10. AOB

Query from DG Technical Forum

GE referred to the enquiry received from the DG Technical Forum regarding proposed limits
[Document Reference: P28 WG_Paper_12_12 DG Technical Forum Query]

The general consensus of the WG was that it would be inappropriate to share any proposals from the P28 WG at this stage given these proposals have not been fully agreed and drafted by the WG. In addition, any proposals subsequently agreed by the WG would need to be reviewed and agreed by the ENA Electricity Networks and Futures Group (ENFG) before being consulted upon more widely. Notwithstanding, it was agreed that any proposals documented in the approved Minutes of Meetings of the P28 Working Group were publically available via the DCode website.

The WG was surprised that the Solar Trade Association (STA) representative on the DG Technical Forum was not being briefed by the STA representative on the WG. This would be brought to the attention of Nicola Waters from the STA.

Membership

The following changes to membership were advised:

- SSE - Now rebranded as Scottish and Southern Electricity Networks
- DECC - Changed to Department for Business, Energy and Industrial Strategy
- NIE - Northern Ireland Electricity Networks

No other business was raised by members of the WG.

11. Date and Venue for Future Meetings

The following dates were agreed for future meetings:

- 26th October 2016
- 15th December 2016
- 26th January 2017

The venue for P28 WG meetings in 2016 and 2017 is Energy Networks Association, 6th Floor Dean Bradley House, 52 Horseferry Road, London SW1P 2AF.

Appendix A

ER P28 Joint GCRP & DCRP Working Group Meeting No.12

Summary of Actions from Current Meeting

Item	Action	Who	Due by
12.1	Publish the approved P28 minutes meeting no. 11 28.07.16 on the DCode website	GE	
12.2	Arrange a joint meeting of the Flicker and RVC sub-WGs to consider whether there is an appropriate transition from RVC event frequency to flicker	GE	
12.3	Update the P28 WG with results of groups of transformer energisations to be carried out by Nordex in the next 3 weeks	PTh	
12.4	Each DNO to advise their current process for providing fault level data to applicants and the type of fault level data provided	All	
12.5	Advise the ENA Engineering Report that addresses how DG should be considered for security of supply and fault level purposes	GE	
12.6	Define the elements of Normal Operating Condition for each voltage level and summarise in a table for the WG to consider	GE	
12.7	Liaise with the Chair of the G74 WG to determine whether it is possible to have deminimis fault levels	GE	
12.8	Provide comments on first draft of P28 report as soon as possible [See P28 WG_Paper_11_22_ENA_EREC_P28_Issue 2_2016_Draft_v1_Working]	All	
12.9	Send GE revised draft of IEC 61000-3-11 for review (DC)	DC	
12.10	Ask Dave Overman of GTC for clarification whether IDNOs are bound to comply with requirements in P28 Issue 2	GE	
12.11	Check the RVC proposed limits by applying the relevant shape factor in PD IEC/TR 61000-3-7 to the Pst = 1 curve	DV & FG	
12.12	Confirm whether a self-point of connection carried out by an Independent Connection Provider (ICP) would be required to comply with the requirements of P28	GE	
12.13	DNO representatives to consider Note 1 [Page 15 of BS EN 61000-3-11] and whether, given all PME supplies are ≤ 0.35 ohms, equipment tested against a service current supply capacity of ≥ 100A per phase can be connected without a conditional connection, i.e. without the consent of the supply authority	DNO Reps	
12.14	Discuss the proposal within the SVC sub-WG that steady state voltage should be defined by the beginning and end of a voltage change event irrespective of time	RB	
12.15	Reconsider whether it is appropriate to use pre-event voltage as opposed to nominal voltage for setting percentage RVC limits	FG	
12.16	Provide a formal response to the comments raised by TNEI regarding the proposed RVC limits	FG	

Item	Action	Who	Due by
12.17	Contact TNEI for details (loads, generation connected etc.) about the DNO system study project mentioned in Paper 12-13, where a step change of approximately 3% was found to cause a voltage step change of more than 4% at the 33 kV terminal of the BSP	GE	
12.18	Reissue an email from MH to GE concerning remanence to the RVC and SVC sub-WGs	GE	
12.19	Check P28 Issue 1 references to flickermeter and measurements to establish the basis of percentile measurements and whether this complies with current standards	GE	
12.20	Work closely with each sub-WG to close out outstanding issues in preparation for 2nd draft	GE	

Summary of Outstanding Actions from Previous Meetings

Item	Action	Who	Due by
11.3	Ask NW whether Primrose Solar did the flicker calculations or was it a third party consultant?	GE	In Progress
11.7	Consider how a disturbing installation is covered in the P28 flowchart see Paper 11_20B	AH	In Progress
11.8	Consider replacing 'LV Connection' with 'LV Equipment' in the P28 flowchart see Paper 11_20B	AH	In Progress
11.13	Consider whether the definition of Normal Operating Condition is too pessimistic in section 5.2.2 Planning Levels in the Issued Draft report P28 WG_Paper_11_22_ENA_EREC_P28_Issue 2_2016_ Draft_v1_Working	All	In Progress
11.16	Speak to Steve Hattersley, TNEI regarding IPSA simple inrush curve approach see Paper 11_7	PTh	In Progress
10.9	Ask SSc about the Stage 2 non-compliant route options	AH	Awaiting response from AH
7.29	Measurement & Specific Applications sub-WG to consider problem with defining flicker & harmonics when not in generating conditions	PTh	In Progress
6.12	Find out the high level cost of Stage 3 Assessment	GE	In Progress
5.8	Ask ENA what the formal mechanism is for obtaining access to data that has been gathered	GE	In Progress
4.14	Ask person who responded to Briefing Paper 1 regarding possible relaxation of planning limits for 'weak' networks with "hydro connections" to provide clarification of technical issue and more detail on flicker/RVC caused by these connections	GE	In Progress

Summary of Completed Actions in Current Meeting

Item	Action	Who	Due by
10.7	Advise update on changes to the revision to IEC 61400-21 see email 12.07.16 and discussion on 20.07.16	FG	Complete
9.3	Arrange to carry out simultaneous flicker measurements over a period for a disturbing load at 275 kV in the South-West of England In progress - awaiting NG monitors	FG/AH	Complete
11.1	Publish the approved P28 minutes meeting no.10 09.06.16 on the DCode website	GE	Complete
11.2	Ask SSc for details of which WPD site has power quality issues None only LV domestic PV - Under investigation	JD	Complete
11.4	Measurements sub-WG to review P28 measurement aspects of P28 clarifying further work necessary see Paper 12_5 & Paper 12_6	PTh	Complete
11.5	Provide flicker data from a site with different measurement connections see Paper_12_7 (KL and PTh)	KL	Complete
11.6	Provide comments on 1st draft of P28 report by 01.09.16 See P28 WG_Paper_11_22_ENA_EREC_P28_Issue 2_2016_Draft_v1_Working see Paper_12_8	All	Complete
11.9	Assist Flicker sub-WG with reviewing LV installations in the P28 flowchart see Paper 11_20B See email from KL	KL/AE/ SM	Complete
11.10	Explain the justification of using Category 1 events see Paper 11_18 RVC Report	FG/SSc	Complete
11.11	Explain the justification of using Figure 4 for Category 2 events see Paper 11_18 RVC Report	FG/SSc	Complete
11.12	Document risks/benefits of the current P28 Issue 1 flicker curve and the proposed IEC flicker curve see Paper 11_18 see Paper_12_10	DV	Complete
11.14	Set up teleconference call involving RVC and SVC sub-WGs to discuss Paper 11_19 to discuss what aspects they agree on and where there are differences identify an acceptable compromise see Paper_11_19 UPDATED	GE	Complete
11.15	Send PTh the word version of P28 report to comment on measurements aspects in section 7 see Paper 12_5 & Paper 12_6	GE	Complete
11.18	Set up a P28 WG meeting early December 2016 15th December	GE	Complete

Appendix B

ER P28 Joint GCRP & DCRP Working Group Meeting No.12

Attendance List
8th September 2016 ENA Office, London

Attendees:

Name	Initials	Company
Matthew Ball	MB	Ofgem
Roshan Bhattarai	RB	Northern Powergrid
Adrian Ellis	AE	Scottish & Southern Electricity Networks
Forooz Ghassemi	FG	National Grid
Mark Horrocks	MH	HVMS
Peter Johnston	PJ	NIE Networks
Mark Kilcullen	MK	Department for Business, Energy and Industrial Strategy
Ken Lennon	KL	SP Energy Networks
Peter Thomas	PTh	Nordex
Peter Twomey	PTw	ENW
Davor Vujatovic	DV	VandA Engineering Services
David Crawley	DC	ENA
Gary Eastwood	GE	Threepwood Consulting Ltd
Michelle Chambers	MJC	Threepwood Consulting Ltd

Apologies:

Joe Duddy	JD	RES Group
Andrew Hood	AH	WPD
Steve Mould	SM	UKPN
Nicola Waters	NW	Primrose Solar
Tony Headley	THe	BEAMA
Sridhar Sahukari	SS	Energy UK

Absences:

Appendix C

ER P28 Joint GCRP & DCRP Working Group

Meeting No.12

To be held at ENA, 6th Floor, Dean Bradley House, 52 Horseferry Road, London, SW1P 2AF

on Thursday, 8th September 2016, 10:30 – 15:30

Agenda

Fire Procedure

1.	Welcome, introductions, Competition Act Compliance	**GJE**	**10:30**
2.	Address by the Chair	**GJE**	
3.	Update/actions from last meeting	**GJE/ALL**	
4.	Terms of Reference (ToR)	**GJE/ALL**	
5.	Status of Phase 3 Revision	**GJE/ALL**	
6.	Reports from sub-WGs • Progress • Issues for discussion with Main WG	**GJE/ALL**	
7.	Review Papers and Proposals from WG	**ALL**	
8.	Project plan	**GJE**	
9.	General management/administration • On-line repository requirements • Consultation process • Support requirements	**GJE**	
10.	AOB	**ALL**	
11.	Future meetings • Dates • Agenda items		**15:30**

Lunch will be provided at 12:30.

For location of venue and map visit:
http://www.energynetworks.org/info/find-us/map.html

Please advise any special access and/or dietary requirements as soon as possible to:
michelle.chambers@threepwoodconsulting.com