

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

28th July 2016

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

1. Welcome, Introductions

GE welcomed everybody to the eleventh 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).

GE welcomed Mourad Khaddoumi as a guest from SP Energy Networks.

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_11_1_Agenda_P28 WG_Meeting 11_28.07.16_v1

[Document reference: Presentation_P28 WG_Meeting 11_28.07.16_v1.2]

[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 without amendment.

[Document Reference:

P28 WG_Paper_11_2_P28 Meeting Minutes and Actions_09 06 16_v1.0_Draft_Issued]

ACTION 11.1: Publish the approved P28 minutes meeting no. 10 09.06.16 on the DCode website (GE)

GE presented an update on the actions from the last meeting.

[Document Reference: P28 WG_Paper_11_3_Update_P28 Meeting Minutes and 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 10.2 and 10.3 NIE and ENW were not able to provide historical flicker data [Document Reference: Slide 8 in Presentation_P28 WG_Meeting 11_28.07.16_v1.2]

Action 10.4 KL has collated historical flicker data for some 100 sites in SPEN with various operating voltages and types of load connections [Document Reference: P28 WG_Paper_11_11_P28_historicalFlicker_pres 2 & P28 WG_Paper_11_12_P28 review group flicker at sites with site names 28.07.2016]

Action 10.5 FG has provided historic background flicker data for 26 substations at 132 kV, 275 kV and 400 kV operating voltages [Document Reference: P28 WG_Paper_11_10_NGET-Flicker Summary History-1]

Action 10.6 GE confirmed that Paper_9_8 had been amended to incorporate comments from JD and had been uploaded to the P28 WG webpage.

Action 10.7 GE communicated a summary of feedback received from FG. No meeting of the IEC Committee Working Group looking at revision of IEC 61400-21 has been held to date and the extent of the revision not known. FG would contact the Chair of the IEC Committee Working Group for an update on status.

Action 10.8 GE confirmed this action had been addressed in P28 WG_Paper_11_21_Scenarios for Flicker Allocation Under Stage 3]

Action 10.10 GE presented a summary of the responses received from AH and SM on the proposed flowchart in Paper 10_17 Flicker sub-WG_Presentation (slide 3). This included proposed amendments to the Stage 1 assessment process proposed by AH. [Document Reference: P28 WG_Paper_11_4_Stage 1 Process_modified and P28 WG_Paper_11_5_Action 10.10_UKPN Response] [Document Reference: Slide 12 in Presentation_P28 WG_Meeting 11_28.07.16_v1.2]

Action 10.11 Purpose, scope and objectives for the P28 accompanying Technical Report have been drafted [Document Reference: P28 WG_Paper_11_16_ToR ETR for P28]

Action 10.12 The list of causes of voltage swell have been updated.

Action 10.13 GJE presented the responses to the definition of swell in BS EN 50160 [Document Reference: P28 WG_Paper_11_5A_Response FG to Action 10.13 & P28 WG_Paper_11_6_Action 10.13_Voltage Swell Definition]. No other comments were made.

Action 10.14 GE confirmed that FG report RVC Limits-1-1 had been allocated P28 WG_Paper_10_19. GE stated the responses received from the P28 WG are presented in P28 WG_Paper_11_5 [Document Reference: P28 WG_Paper_11_5A_Response FG to Action 10.13]

PTh asked whether it was correct to apply the limits to the phase with the largest voltage change and whether this is correct for measuring Pst. KL pointed out that the values of Pst will differ slightly depending upon whether the voltage is measured between phase and earth or between phases.

ACTION 11.5: Provide flicker data from a site with different measurement connections (KL)

Action 10.16 JD confirmed, that despite checking, no flicker data from RES was available for their UK solar site.

Action 10.17 GE updated the P28 WG on discussions with Nicola Waters regarding availability of data from solar sites showing changes in background flicker under cloud cover changes

[Document Reference: Slide 15 in Presentation_P28 WG_Meeting 11_28.07.16_v1.2]

Action 10.18 and 10.20 A response from SSc had been received on flicker measurements under cloud cover changes. Data from 3 x 33 kV PV sites in WPD has not shown flicker to be a problem under these conditions. SSc expectation is that the slow ramping up/down of current caused by clouds will serve to reduce Pst. Each site is rural with relatively low fault level so should be representative

[Document Reference: Slide 16 in Presentation_P28 WG_Meeting 11_28.07.16_v1.2]

ACTION 11.2: Ask SSc for details of which WPD site has power quality issues (JD)

MH suggested approaching NW to ask what sites had been connected and how calculated data compared with measured data. There was interest to know whether modelling and calculations of flicker for the Primrose PV sites were carried out in-house or by a third party consultant.

ACTION 11.3: Ask NW whether Primrose Solar did the flicker calculations or was it a third party consultant? (GE)

Action 10.19 PTh provided some comparisons for mag inrush for different transformer types

[Document Reference: P28 WG_Paper_11_7_Practical Modelling of voltage fluctuations due to transformer Inrush_PTh]

[Document Reference: P28 WG_Paper_11_8_Pauwels_Inrush Current information_v5]

[Document Reference: P28 WG_Paper_11_9_Inrush_Nordex_MM03122_2800kVA_33kV]

GE made the Measurements sub-WG aware of the various measurement aspects in P28 Issue 1, where the P28 WG would be grateful for their opinion.

ACTION 11.4: Measurements sub-WG to review P28 measurement aspects of P28 clarifying further work necessary (PTh)

Action 9.15 GE updated the P28 WG on the clarification received from transformer manufacturers via BEAMA on how magnetic inrush is impacted by new transformer designs. BEAMA members' view is that the Eco Design Regulation generally reduces inrush current, but where this is a critical factor utilities should contact the transformer supplier. This response was expected given lower loss transformers have cores with larger cross-sectional areas.

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

GE summarised the amendments to the Phase 3 Revision noting the program had been extended by 6-8 weeks as agreed. The deadline for the submission of the 1st draft has been exceeded by 1 week [Document Reference: Slide 20 in Presentation_P28 WG_Meeting 11_28.07.16_v1.2]

GE ask 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 confirmed 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

The WG agreed that P28 Issue 2 would be a stand-alone document but would avoid repeating requirements in National and International Standards, which could cause issues keeping track of changes when these Standards are updated (JD). There was discussion whether examples of different voltage change waveforms types should be included in P28 Issue 2 or cross-referenced. DV preferred a pragmatic approach that would keep P28 short and concise. The option of putting examples in the accompanying ETR was discussed. No firm conclusion was reached by the WG.

GE requested comments from the P28 WG on the first working draft of P28 Issue 2 by the 1st September 2016.

ACTION 11.6: Provide comments on first draft of P28 report by 01.09.16 (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**

DV presented an update on the progress made by the Flicker Assessment & Limits sub-WG

[Document Reference: P28 WG_Paper_11_20A_Flicker Sub-WG MoM]

[Document Reference: P28 WG_Paper_11_20B_Flowchart_Stage 1-3 Assessment_v0.1]

[Document Reference: P28 WG_Paper_11_20C_Flicker Level Assessment_V4]

A summary of the issues raised by the sub-WG and discussion in the meeting were as follows:

- DV responded to the questions posed by GE in Item 6 of P28 WG_Paper_11_20A. KL discussed the need for a connectee to approach the DNO for advice if they are unsure about the value of source impedance
- DV reviewed the flowchart in P28 WG_Paper_11_20B. There was general agreement that P28 should be clear whether Stage 1 applies to individual equipment or an LV installation. Irrespective the limit of $P_{st} = 1$ must not be exceeded
- The flowchart should be amended so that “LV Connection” is replaced with “LV Equipment”. Also add option for the customer to contact the DNO if the source impedance is greater than 0.5Ω
- There was general agreement that the Stage 1 assessment process provides good guidance for residential type customers and encourages manufacturers to comply with flicker limits. It is important that this addresses future changes to an installation including new technologies (e.g. battery storage, PV etc.). KL stated it promoted conformance to equipment Standards but may not address flicker from the installation as a whole and that this should be made clear in the flowchart

- DV explained the justification for the 100 A supply aspect of the flowchart. GE confirmed this criterion is included in the current draft of ENA P28 Issue 2 (see page 28)
- AE stated he was uncomfortable with a limit of 75 A as this was too high for DNOs not to be involved in assessment
- GE pointed out where do MV and HV connections enter the assessment process for Stage 2? It was agreed the flowchart should make this clear
- GE pointed out that the flowchart is specific to the assessment process under Stage 1, 2 & 3. Another flowchart, similar to that in ENA P28 Issue 1 is required to show the overall process for P28 compliance
- MH raised a good point about what fault level would be used in Stage 2 - would this be from the Long Term Development Statement (LTDS). It was agreed that this needed to be clarified and stated separately
- SM made the point about what is considered “high background flicker” and when would a connection be taken to Stage 3 because of it? There should be alignment with the revised G5. It was agreed that further consideration needs to be stated in P28 concerning what to do in the event of known background flicker issues

ACTION 11.7: Consider how a disturbing installation is covered in the P28 flowchart see Paper 11_20B (AH)

ACTION 11.8: Consider replacing ‘LV Connection’ with ‘LV Equipment’ in the P28 flowchart see Paper 11_20B (AH)

ACTION 11.9: Assist Flicker sub-WG with reviewing LV installations in the P28 flowchart see Paper 11_20B (KL/AE/SM)

- DV made some salient points regarding Paper 11_20C and the application of Figure 4. There was discussion about how voltage change applies to flicker perception. DV proposed that P28 Issue 2 should follow the IEC flicker curve and the ‘cut-off’ in the current P28 Issue 1 is believed to be conservative. Also that we should allow different voltage change characteristics/waveforms and how these convert to the Pst step voltage change curve. This would allow more leeway as flicker for these waveforms is not as severe as the step changes in P28 Issue 1. Some members of the group pointed out that the current P28 was relatively simple to apply. Notwithstanding, the P28 WG agreed that some guidelines on the process of applying relevant voltage characteristics/waveforms would be helpful in practice rather than theory. GE confirmed that the assessment method and alignment with flicker curves/characteristics would be included in the draft of P28

ACTION 11.12: Document risks/benefits of the current P28 Issue 1 flicker curve and the proposed IEC flicker curve see Paper 11_18 (DV)

6.2 Voltage Step Change sub-WG

GE stated that nothing had been received from the Voltage Step Change sub-WG since the last meeting. Some comments had been received from FG on the definition of VSC, which would be covered in the progress report from the RVC sub-WG (see Section 6.3).

6.3 Rapid Voltage Change sub-WG

The latest RVC limits in Paper_11_18 were discussed
[Document Reference: P28 WG_Paper_11_18_RVC Limits-2-0]

MH clarified that only the limits for Category 1 very frequent events had been changed, which were based on the P28 Issue 1 Fig 4 Pst = 0.5 curve. MH also clarified that the voltage change using the pre-event voltage as the base has been chosen. This is different to the position of the VSC sub-WG. The discussion that took place is summarised below:

- JD pointed out that this excludes Stage 3 type assessments - is this sensible and should the fact limits are based on Pst = 0.5 curve be challenged? DV stated that the approach being advocated was established practice for RVC. KL stated that voltage complaints tend to occur at Pst = 0.8 for LV networks
- There is clearly overlap between RVC very frequent changes and flicker - where should the line be drawn and should Category 1 in fact be stated?
- JD also pointed out that the limits for Category 2 may be unnecessarily restrictive
- There was some reluctance in the WG to move beyond the frequency of changes in the Pst = 0.5 curve for Category 1 and 2 events without further data as there had been no known issues with customer complaints. If a greater level of disturbance is to be allowed then the considerations need to be clearly documented and evaluated
- JD discussed the consequence of failing to comply with limits would be visual nuisance. GE highlighted that although flicker from lighting may be perceived as being less of an issue with certain types of modern lighting, the relevant IEC Committee has stated the flicker curve will not be changed in the short term

ACTION 11.10: Explain the justification of using Category 1 events see Paper 11_18 (FG/SSc)

ACTION 11.11: Explain the justification of using Figure 4 for Category 2 events see Paper 11_18 (FG/SSc)

There was discussion on the need for the normal operating condition to be suitably defined. GE highlighted that the current issue of P28 is vague on this matter. There was concern that the IEC definition of normal operating condition may be too onerous compared with P28 Issue 1. There was discussion whether a condition that occurs more than 5% in one year is appropriate?

JD and MH discussed what Ofgem's view would be on normal operating conditions and what would be considered reasonable. MH stated the issue with ensuring that vulnerable customers (with medical conditions that make them more susceptible to flicker) are not adversely impacted by higher levels of flicker. MH highlighted IEEE work on potential health concerns with flicker. JD highlighted that these consideration were involved and possibly outside the scope of the P28 review.

ACTION 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 (All) [P28 WG_Paper_11_22_ENA_EREC_P28_Issue 2_2016_Draft_v1_Working]

Paper_11_19 was briefly discussed
[Document Reference: P28 WG_Paper_11_19_Proposal for Steady State Voltage]
which summarises the differences in position on steady state voltage between the RVC sub-WG and the VSC sub-WG. In summary, the RVC sub-WG believes it is better to have a single reference voltage in P28 Issue 2 but some further discussion to reach a consensus is required. It was agreed the RVC and VSC sub-WGs should have a telecom discussion to debate the points.

ACTION 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 (GE)

6.4 Measurements & Specific Applications sub-WG

See 'Papers and Proposal from WGs' below in section 7.

6.5 Drafting sub-WG

GJE presented a summary of progress made by the Drafting sub-WG
[Document Reference: Presentation_P28 WG_Meeting 10_09.06.16_v1 slides 25-26]

- Progress continues to be made with general non-technical aspects
- Incorporated comments from JD
- Technical aspects
 - Issued latest working Draft_v1 [Document Reference: P28 WG_Paper_11_22_ENA_EREC_P28_Issue 2_2016_Draft_v1_Working]
 - RVC clauses complete - subject to amendment
 - Flicker Stage 1 complete - subject to amendment
 - Need to develop complete Section 6 'Assessment' – operating conditions for assessments being drafted
 - Some work being carried out on Measurements and Specific Applications with respect to including aspects from existing P28
 - Other sections in development working through P28 WG decisions and P28 Issue 1
- Author Notes
 - Normal 3% limit for steady state step voltage change – will Figure 4 of P28 Issue 1 still be used (i.e. capping of 3% step voltage change)
 - Example of Stage 2 assessment?
 - Application of BS EN 61000-3-5 to equipment > 75 A per phase
 - ENA ER P28 Issue 1 Addendum 1 contains motors that can be connected DOL without agreement of the network operator. Is this still valid and is BS EN 60034-12 relevant?
 - How does Appendix F in P28 Issue relate to new flowchart (i.e. 3% limit)

GE highlighted the Author Notes in the document that require particular consideration by the P28 WG.

The WG had no particular comments.

7. Review Papers and Proposals from WG

Measurements & Specific Applications Sub-WG

On behalf of the Measurements & Specific Applications Sub-WG, PTh had submitted Paper 11-7 and Paper_11-17.

[Document Reference: P28 WG_Paper_11_7_Practical Modelling of voltage fluctuations due to transformer Inrush_PTh]

[Document Reference: P28 WG_Paper_11_17_Flicker Events at Wind Farm Pst]

PTh explained that voltage fluctuations as modelled could vary depending upon the point on wave when the transformer is energised and the difference in voltage between the phases.

PTh highlighted that P28 Issue 1 requires the largest voltage change in one phase to be considered but some consultants take an average of the voltage change across all three phases. GE recommended the Measurements & Specific Applications Sub-WG review

Section 7 of P28 Issue 1 and feedback any comments regarding amendments that are required for measurements in P28 Issue 2.

ACTION 11.15: Send PTh the word version of P28 report to comment on measurements aspects in section 7 (GE)

PTh highlighted that a simple approach could be developed in IPSA to address these issues and provide a more accurate result. PTh has asked TNEI what can be achieved.

ACTION 11.16: Speak to Steve Hattersley, TNEI regarding IPSA simple inrush curve approach see Paper 11_7 (PTh)

The findings and conclusions from Paper_11_8 and Paper_11_9 were noted.

[Document Reference: P28 WG_Paper_11_8_Pauwels_Inrush Current information_v5]
[Document Reference: P28 WG_Paper_11_9_Inrush_Nordex_MM03122_2800kVA_33kV]

PTh highlighted that the high values of Pst in Paper 11_9 were found to coincide with operation of a tapchanger. This highlighted the need to carefully evaluate spikes in Pst.

Responses Paper 11-10

[Document Reference: P28 WG_Paper_11_10_NGET-Flicker Summary History-1]

GE briefly showed the results of historical flicker data provided by National Grid. This did not show any particular correlation or trend. The P28 WG asked whether the measurements had been taken at the same time of year for the same site. GE believed not and this may account for some significant differences.

The P28 WG discussed the limitation of not having good historical flicker data on which to make decisions. GE agreed to raise this with ENA and the PQ&EMC group to see whether any historical data can be obtained from a previous study of harmonics.

Responses Papers 11-11 & 11-12

[Document Reference: P28 WG_Paper_11_11_P28_historicalFlicker_pres 2]
[Document Reference: P28 WG_Paper_11_12_P28 review group flicker at sites with site names 28.07.2016]

MK presented a summary of historical background measurements recorded at 19 sites across SPEN (95th percentile values measured over one week). The earliest measurements dated from the year 2000 and the latest measurements in 2016. These included measurements at 11 kV, 33 kV and 132 kV locations. Measurements both pre and post connection of distributed generation were provided. In conclusion, this did not show any particular upward trend in background flicker at HV. Indeed, background flicker had reduced at some sites. Although not presented, KL highlighted there may some correlation at LV but that this is still low and what should be expected.

NOTE: As data presented was not taken in the same time period, care is required with interpretation of trends.

Flicker Pst levels measured throughout the distribution system for 125 sites across England, Scotland and Wales over 16 years showed average flicker levels to be generally low (Pst < 0.4). For known disturbing loads this can be higher (Pst > 1).

Results for a typical solar farm connected at 11 kV were presented, where the 95th percentile of Pst = 0.2. KL showed a video of an ammeter displaying changes in the current output of a solar farm during changes in cloud cover. This showed significant variations but all were ramp type changes as opposed to step changes. No significant issues with Pst had been found.

Responses Papers 11-13 & 11-14

[Document Reference: P28 WG_Paper_11_13_CREST WPD Project Sync Final Report 23 May 2016]

[Document Reference: P28 WG_Paper_11_14_T1 Impact of cloud cover on PV results 1-0]

GE presented a summary of findings from Paper_11-13 and Paper 11-14. The findings are captured in Slides 31 and 32 of the meeting presentation [Document reference: Slide 31-32 of Presentation_P28 WG_Meeting 11_28.07.16_v1.2]. In summary, the study found no major power quality issues with connection of PV although it highlights an increase in short term variations.

Responses Papers 11-21

[Document Reference: P28 WG_Paper_11_21_Scenarios for Flicker Allocation Under Stage 3]

As there was insufficient time to review Paper_11_21 in detail, GE requested the P28 WG review the paper outside the meeting and feedback any comments individually.

Considerations highlighted were as follows:

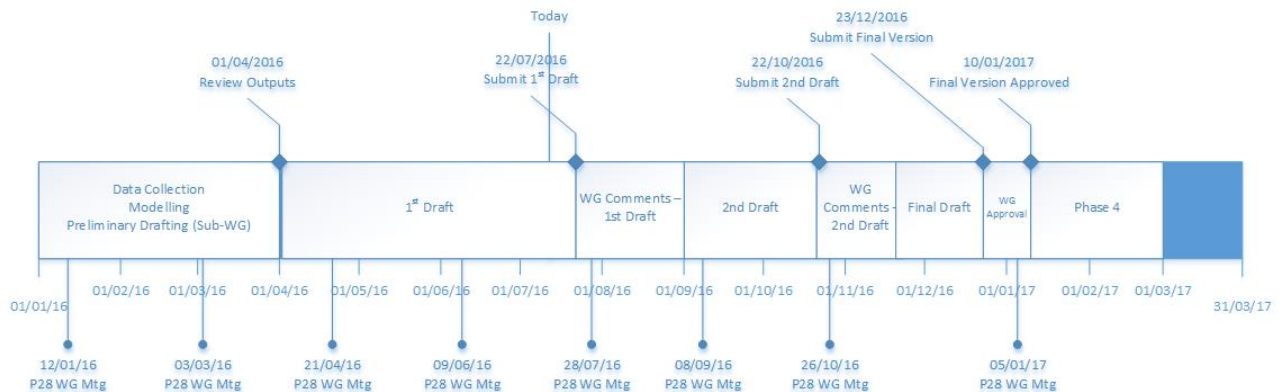
- Are the scenarios presented credible?
- Are there any additional scenarios for Stage 3 assessments?
- Is there justification for a hybrid approach?
- Given the low number of Stage 3 assessments is an allocation method justified at all and would this be best covered by a paragraph in P28 Issue 2 to highlight a process for concurrent connection applications for disturbing load?

ACTION 11.17: Review P28 WG_Paper_11_21_Scenarios for Flicker Allocation Under Stage 3 with particular regard to the two documented scenarios (All)

8. Project Plan

[Document Reference: Slide 20 in Presentation_P28 WG_Meeting 11_28.07.16_v1.2]

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.

GE stated a copy of the first draft P28 Issue 2 had been circulated with the papers for the meeting [Document Reference: P28 WG_Paper_11_22_ENA_EREC_P28_Issue 2_2016_Draft_v1_Working]

Also see **Action 11.6**.

10. AOB

No other business was raised by members of the WG.

11. Date and Venue for Future Meetings

The following dates have previously been agreed for future meetings:

- 8th September 2016
- 26th October 2016

GE stated there was a need for one or two additional meetings given the extended programme for the revision of P28 Issue 2 - one in December 2016 and/or one in January 2017.

ACTION 11.18: Set up a P28 WG meeting early December 2016 (GE)

The venue for P28 WG meetings in 2016 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.10

Summary of Actions from Current Meeting

Item	Action	Who	Due by
11.1	Publish the approved P28 minutes meeting no.10 09.06.16 on the DCode website	GE	
11.2	Ask SSc for details of which WPD site has power quality issues	JD	
11.3	Ask NW whether Primrose Solar did the flicker calculations or was it a third party consultant?	GE	
11.4	Measurements sub-WG to review P28 measurement aspects of P28 clarifying further work necessary	PTh	
11.5	Provide flicker data from a site with different measurement connections	KL	
11.6	Provide comments on 1 st draft of P28 report by 01.09.16 See P28 WG_Paper_11_22_ENA_EREC_P28_Issue 2_2016_Draft_v1_Working	All	
11.7	Consider how a disturbing installation is covered in the P28 flowchart see Paper 11_20B	AH	
11.8	Consider replacing 'LV Connection' with 'LV Equipment' in the P28 flowchart see Paper 11_20B	AH	
11.9	Assist Flicker sub-WG with reviewing LV installations in the P28 flowchart see Paper 11_20B	KL/AE/SM	
11.10	Explain the justification of using Category 1 events see Paper 11_18	FG/SSc	
11.11	Explain the justification of using Figure 4 for Category 2 events see Paper 11_18	FG/SSc	
11.12	Document risks/benefits of the current P28 Issue 1 flicker curve and the proposed IEC flicker curve see Paper 11_18	DV	
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	
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	GE	
11.15	Send PTh the word version of P28 report to comment on measurements aspects in section 7	GE	
11.16	Speak to Steve Hattersley, TNEI regarding IPSA simple inrush curve approach see Paper 11_7	PTh	
11.17	Review P28 WG_Paper_11_21_Scenarios for Flicker Allocation Under Stage 3 with particular regard to the two documented scenarios	All	
11.18	Set up a P28 WG meeting early December 2016	GE	

Summary of Outstanding Actions from Previous Meetings

Item	Action	Who	Due by
10.7	Advise update on changes to the revision to IEC 61400-21	FG	In progress - see email 12.07.16 and discussion on 20.07.16
10.9	Ask SSc about the Stage 2 non-compliant route options	AH	Awaiting response from AH
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	FG/AH	In progress - awaiting NG monitors
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
10.1	Publish the approved P28 minutes meeting no.9 21.04.16 on the DCode website	GE	Complete
10.2	Check whether NIE has historical background flicker data measurements to determine trends and draw conclusions Complete - no data available	PJ	Complete
10.3	Check whether ENW has historical data measurements for no. of complaints relating to flicker to determine trends and draw conclusions Complete - no data available	PTw	Complete
10.4	Check whether SPEN has historical background flicker data measurements to determine trends and draw conclusions Complete - KL to present data on 28.07.16. See Paper_11_11 & 11_12	KL	Complete
10.5	Ask FG if NG has historical background flicker data measurements to determine trends and draw conclusions Complete - data submitted for 132 kV, 275 kV and 400 kV sites. See Paper_11_10	GE	Complete
10.6	Amend Paper 9.8 to incorporate comments from JD	GE	Complete
10.7a	Update project plan timescale with 6-8 weeks delay	GE	Complete
10.8	Issue a proposal advocating apportionment method using a claim, argument and evidence approach for AE, KL and AH to assess (GE)	GE	Complete

Item	Action	Who	Due by
10.10	Review proposed flowchart in Paper 10_17 Flicker sub-WG_Presentation (slide 3) by 23.06.16 Response rec'd from SM and AH (Paper_11_4 & 11_5)	All	Complete
10.11	Propose the purpose, scope and objectives for the P28 accompanying Technical Report See Paper_11_16	GE	Complete
10.12	Update voltage swell causes (see slide 35 of ppt) with <ul style="list-style-type: none"> • battery storage including fast frequency response and • switching in of long length a.c. cables 	GE	Complete
10.13	Check definition of swell in BS EN 50160 Complete - see Paper_11_6	GE	Complete
10.14	Critically review & comment on FG report RVC Limits-1-1 by 30.06.16 GE to allocate a Paper no. for it Allocated Paper_10_19. See response in Paper_11_5	All	Complete
10.15	Send current working version of P28 report to DV	GE	Complete
10.16	Provide RES data from UK solar site that has a flicker meter No data available	JD	Complete
10.17	Ask Nicola Waters for data from solar sites showing changes in background flicker under cloud cover changes Email sent on 11/07/16. NW to provide data for 33 kV and 11 kV sites	GE	Complete
10.18	Ask SSc to obtain data on flicker measurements under cloud cover changes Complete - email sent 25.07.16 from SSc	AH	Complete
10.19	Provide comparisons for mag inrush for 3 different transformer types Complete - see Paper_11_8,9 & 10	PTh	Complete
10.20	Ask SSc for an interpretation of the graphs shown in Paper 10.12 Complete - email sent 25.07.16 from SSc	AH	Complete
10.21	Request a copy of specific documents referenced in P28 Issue 1 and DC/ENA will share them with the WG	DV	Closed
10.22	Add agenda item to next meeting to discuss how to assess single phase welders from a flicker perspective	GE	Complete
9.10	Review ETR 125 for nominal voltages / pre event values / sensitivity to change and IEC Standard 61000-2-8	SVC sub-WG	Complete
9.15	Contact transformer manufacturers to clarify how magnetic inrush is impacted by new transformer designs Complete - see response from BEAMA - email 05/06/16	GE	Complete
9.17	Contact Jim Cardwell Northern Powergrid for a copy of LCNI smart grid presentation	GE	Complete
9.19	Prepare paper to highlight the scenarios where an allocation approach could be considered for Stage 3 assessment at different voltage levels (GE)	GE	Complete

Appendix B

ER P28 Joint GCRP & DCRP Working Group Meeting No.11

Attendance List 28th July 2016 ENA Office, London

Attendees:

Name	Initials	Company
Joe Duddy	JD	RES Group
Adrian Ellis	AE	SSE
Mark Horrocks	MH	HVMS
Ken Lennon	KL	SP Energy Networks
Steve Mould	SM	UKPN
Davor Vujatovic	DV	VandA Engineering Services
Peter Thomas	PTh	Nordex
David Crawley	DC	ENA
Gary Eastwood	GE	Threepwood Consulting Ltd
Michelle Chambers	MJC	Threepwood Consulting Ltd

Guest Attendees:

Mourad Khaddoumi	MK	SP Energy Networks
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Apologies:

Matthew Ball	MB	Ofgem
Roshan Bhattarai	RB	Northern Powergrid
Forooz Ghassemi	FG	National Grid
Andrew Hood	AH	WPD
Peter Johnston	PJ	NIE
Mark Kilcullen	MK	Department of Energy & Climate Change
Peter Twomey	PTw	ENW
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.11

To be held at ENA, 6th Floor, Dean Bradley House, 52 Horseferry Road, London, SW1P 2AF
on Thursday, 28th July 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 <ul style="list-style-type: none">• Progress• Issues for discussion with Main WG	GJE/ALL	
7.	Review Papers and Proposals from WG <ul style="list-style-type: none">• Single-phase welders• P28 Issue 2 (1st Draft)• Historic flicker data (FG & KL)	ALL GJE FG/KL	
8.	Project plan	GJE	
9.	General management/administration <ul style="list-style-type: none">• On-line repository requirements• Consultation process• Support requirements	GJE	
10.	AOB	ALL	
11.	Future meetings <ul style="list-style-type: none">• 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