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

15th December 2016

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

1. Welcome, Introductions

GE welcomed everybody to the fourteenth 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 Richard Newman UK Power Networks who was attending on behalf of SM.

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_14_1_Agenda_P28 WG_Meeting 14_15.12.16_v0.1]
[Document reference: Presentation_P28 WG_Meeting 14_15.12.16_v0.1]
[Document reference: COMPETITION ACT COMPLIANCE.docx]

In addition to the standard agenda items the primary purpose of the meeting was to review the outstanding technical issues necessary to complete the second draft of P28 Issue 2.

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.

[Document Reference: P28 WG_Meeting Minutes and Actions_26.10.16_Draft v1]

ACTION 14.1: Publish the approved P28 minutes meeting no. 13 dated 26.10.16 on the DCode website (GE)

GE presented an update on the actions from the last meeting.
[Document Reference: P28 WG_Paper_14_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 13.2: AH believed that assessment using a maximum phase-neutral loop impedance of 0.35 Ω for LV single-phase supplies was adequate. There was discussion on what equivalent impedance value should be used for three-phase supplies? An impedance value of 0.19 Ω for LV three-phase supplies (as PD IEC TR 60725) should be considered generally except where supplies are fed from a small rated power pole mounted transformer and/or small cross-section service cable.

Action 13.8: FG confirmed that NG had power quality voltage measurements for 132 kV, 275 kV and 400 kV substations, if required. These generally show r.m.s. voltage (1 second average updated every ½ cycle) stays with 0.2% change - can be noisier at 132 kV. KL agreed to provide voltage measurement data for LV networks.

ACTION 14.2: Provide r.m.s. voltage measurement data for LV networks to see whether 0.2% or 0.5% limit change is acceptable (KL)

Action 13.11: There was discussion whether any changes in P28 Issue 2, would be retrospective. The P28 WG agreed the requirements apply to assessment of new connections and changes to existing connections. This needs to be made clear in the Foreword or Introduction in P28 Issue 2.

ACTION 14.2a: Review Paper_14_5 concerning Normal Operating Conditions with specific reference to meeting security of supply requirements (JD)

4. Review Outstanding Technical Issues

The WG reviewed the issues/responses in Paper_14_4. A summary of discussions and agreements are documented below.

[Document Reference: P28 WG_Paper_14_4_List of Outstanding Tech Issues_v2]

RVC Sub-WG

RVC 1: Agreed maximum steady state step voltage change limit of 3% (based on nominal voltage U_n). Agreed different voltage shapes (other than step voltage) could be higher, if of sufficiently low occurrence, but the equivalent step voltage change (after application of shape factors) should not exceed 3%.

RVC 2: Agreed maximum step voltage change of 6% for no more than 100 ms is acceptable. The equivalent of a 6% voltage change is permitted once every 9 minutes according to the Pst = 1 flicker severity curve. This is consistent with a 3% step voltage change once every 10 minutes for Pst = 0.5.

RVC 3: Agreed to remove 3% general limit regardless of shape (see response to RVC 2). 3% limit now equivalent to 3% step voltage change.

RVC 4: Agreed the duration of an RVC event shouldn't be time bounded - RVC events end when steady state voltage conditions are reached. Need to make clear that RVC is a single event and not a series of repetitive voltage fluctuations, i.e. flicker.

RVC 5: Agreed that the value of I_b could be used in place of I_k'', if not available, as this would give a worse result for flicker severity/RVC magnitude. Also agreed the sub-transient reactance should be used for RVC.

RVC 6: Agreed just using the peak value r.m.s. magnetising inrush current was not correct - too pessimistic. Simple evaluations are no substitute for complete electro-magnetic transient studies. Agreed some basic principles/guidelines from the Bathurst paper and the Turner paper could be cited in P28 Issue 2.

[Document Reference: P28 WG_Paper_13_13_CIRED2009_0988_Paper Transformer inrush Graeme Bathurst]
[Document Reference: P28 WG_Paper_14_10_Transformer Paper]

RVC 7: Discussion around the basis of 50% remnant flux for RVC assessment. Actual remnant flux should be used, where available. If not a sensitivity study should be carried out if close to RVC limits.

RVC 8: Agreed to keep Addendum 1 in P28 Issue 1 as there is no evidence to dispute these values.

RVC 9: Agreed 30 ms cut-off was no longer relevant as the revised P28 Issue 2 provides an envelope that maximum r.m.s. voltage must stay within. Need to stress this is r.m.s. voltage and not fast transients.

Flicker Sub-WG

Flicker 1: Agreed ENA ER P16 is still valid - as amended in P28 Issue 2.

Flicker 2: Agreed equipment that fails Stage 1 assessment can still proceed to Stage 2 assessment but is unlikely to pass. Agreed to add suitable wording in P28 Issue 2.

Flicker 3: Agreed the assumptions concerning high pressure discharge lighting not being a problem are still valid.

Flicker 4: Agreed any assumptions when carrying out flicker simulation need to be investigated in more detail.

ACTION 14.3: Investigate what assumptions, if any, need to be stated when carrying out flicker simulation in software (GE)

Flicker 5: Although memory time technique is not mentioned in PD IEC/TR 61000-3-7 there is no evidence it is no longer valid.

ACTION 14.4: Consult with DV whether memory time technique is still valid (GE/DV)

Flicker 6: Agreed to review 95th percentile values in BS EN 50160. There is a risk with deviating from absolute limits currently in P28 Issue 1.

Flicker 7: Agreed not to carry out background measurements in a known weak network. System/Network Operator already has a requirement to track of high background levels.

Flicker 8: Generally agreed shape factors in IEC documents should be used. More work is required to compare with the methodology in Figure 4 and Figure 5 of P28 Issue 1.

ACTION 14.5: Compare flicker severity results for ramp voltage changes assessed using Fig. 4 and Fig.5 in P28 Issue 1 with those in Annex E of PD IEC/TR 61000-3-7 (GE/DV)

ACTION 14.6: Check copyright status of reproducing figures from IEC Standards in P28 Issue 2 (GE)

Flicker 9: See response to Flicker 8.

Flicker 10: Agreed not to reference DD IEC TS 61000-3-5 in P28 Issue 2.

Measurement Sub-WG

Meas 1: Agreed that only known or foreseeable network alterations need to be considered as opposed to the lifetime of the disturbing load.

Meas 2: Agreed to reference relevant aspects of the following Papers in P28 Issue 2. Also agreed the previous Paper on magnetising inrush current from Pauwels would be useful.

[Document Reference: P28 WG_Paper_13_13_CIRED2009_0988_Paper Transformer inrush Graeme Bathurst]
[Document Reference: P28 WG_Paper_14_10_Transformer Paper]

Meas 3: Discussed the use of the 50 Hz r.m.s. component for assessing rapid voltage change. Need to highlight that actual measurements may differ significantly from calculated/simulated results. Discussed example from FG concerning dominance of 50 Hz r.m.s. component on voltage dip.

[Document reference: Presentation_P28 WG_Meeting 14_15.12.16_v0.1 - slide 12]

Meas 4: Agreed no requirement to reference BS EN 60868 as BS EN 61000-4-15 is a later publication.

5. Terms of Reference (ToR)

[Document Reference: ER P28 WG_ToR_v2.2_Issued]

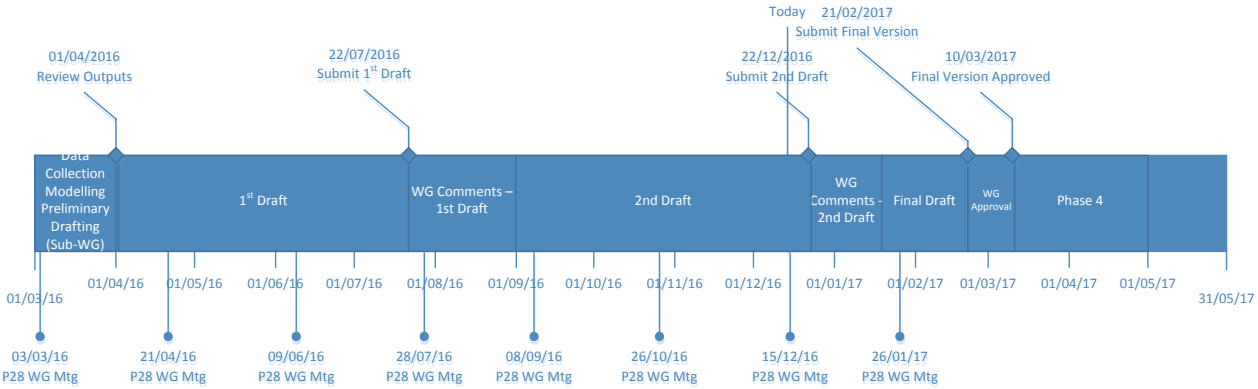
GE stated there had been no changes to the ToR. No comments were received from the WG.

6. Status of Phase 3 Revision

GE confirmed that completion of the 2nd draft had been delayed. This would be completed and sent for comment by Friday, 23rd December 2016.

7. Project Plan

The revised Project Plan was briefly discussed.



[Document reference: Presentation_P28 WG_Meeting 14_15.12.16_v0.1 - slide 12]

GE highlighted that comments on the 2nd draft of P28 Issue 2 were due by 19th January 2017. GE would then consolidate comments and responses to review at the next meeting of the P28 WG on the 26th January 2017.

8. General Management/Administration

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

9. AOB

Membership

GE stated that Mark Horrocks was now representing the P28 WG as an employee of McLellan and Partners Ltd

ACTION 14.7: Update P28 WG Membership for Mark Horrocks to reflect change in employment (GE)

10. Date and Venue for Future Meetings

The following dates were agreed for future meetings:

- 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.14

Summary of Actions from Current Meeting

Item	Action	Who	Due by
14.1	Publish the approved P28 minutes meeting no. 13 dated 26.10.16 on the DCode website	GE	
14.2	Provide r.m.s. voltage measurement data for LV networks to see whether 0.2% or 0.5% limit change is acceptable	KL	
14.2a	Review Paper_14_5 concerning Normal Operating Conditions with specific reference to meeting security of supply requirements	JD	
14.3	Investigate what assumptions, if any, need to be stated when carrying out flicker simulation in software	GE	
14.4	Consult with DV whether memory time technique is still valid	GE/DV	
14.5	Compare flicker severity results for ramp voltage changes assessed using Fig. 4 and Fig.5 in P28 Issue 1 with those in Annex E of PD IEC/TR 61000-3-7	GE/DV	
14.6	Check copyright status of reproducing figures from IEC Standards in P28 Issue 2	GE	
14.7	Update P28 WG Membership for Mark Horrocks to reflect change in employment	GE	

Summary of Outstanding Actions from Previous Meetings

Item	Action	Who	Due by
13.15	Compare what information DNOs currently provide compared to what P28 Issue 1 states should be provided	JD	In Progress
13.17	Comment on Paper P28 WG_Paper_13_15_flicker-FG1	All	In Progress
13.19	Comment on the website links in P28 WG_Paper_13_17 Effect of Flicker on Various Equipment (from MH)	All	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
13.1	Publish the approved P28 minutes meeting no. 12 dated 08.09.16 on the DCode website – subject to DC amendment (slide 5 of presentation)	GE	Complete
13.2	Review PD IEC TR 60725: 2012 to clarify whether reference impedances can be used in P28 Issue 2 (Consideration of reference impedances and public supply network impedances for use in determining disturbance characteristics of electrical equipment having a rated current ≤ 75 A per phase)	FG/GE	Complete - see presentation slide
13.3	Update Action List no. 12.16 completed with Paper 13-18	GE	Complete
13.4	Add 15.12.16 and 26.01.17 meetings to the project plan and delete 05.01.17 meeting	GE	Complete
13.5	On behalf of the team thank Simon Scarbro for his support given to P28 WG	AH	Complete
13.6	Review wording in Papers 3-11/13-19 flow diagram for assessing system impedance splitting it to distinguish between <100A per phase (typically 0.35 ohms) and >100A (specific system impedance required)	AH/GE	Complete - see Paper_14_6
13.7	With regards to the LTDS consider what information is required to be exchanged for various types of connection, making clear the different role responsibilities in Papers 3-11/13-19	GE	Complete - see latest draft of P28
13.8	To define what is the end of an RVC event, obtain a set of measurements at 1 second cycle refreshed every 1/2 second cycle and report back	All	Complete - see Paper_14_7
13.9	Circulate Lightsource presentation P28 Modelling & Simulations meeting no. 4 June 2015	GE	Complete - see Paper_14_8
13.10	Review and amend Paper 13-16 RVC Limits-3-0 (change Figure 3 to 12% and change Category 1 to “Frequent Events”)	FG	Complete
13.11	Review whether 3% limit in Figure 4 should be increased to accommodate RVC Figure 1 and advise GE	All	Complete - see presentation slide
13.12	Review basis of system impedance for RVC	FG	Complete
13.13	Send Paper 13-18 to TNEI showing FG response to their comments on proposed RVC limits	GE	Complete
13.14	Consider whether voltage fluctuation limits should only apply to where disturbance can cause flicker or to other situations irrespective of lighting – should local factors be taken into account?	All	Complete
13.16	Review Paper 13-6 with a view to agreeing a definition of Normal Operating Conditions	All	Complete - see Paper_14_5
13.18	Comment on JDs questions (see Paper 13_9)	GE	Complete

Item	Action	Who	Due by
13.20	Search LCNI Smarter Networks portal to ensure P28 WG is aware of work being carried out, where recommendations for amendment of P28 is highlighted	GE	Complete
13.21	Write to Nicola Waters concerning her commitment to attending meetings of the P28 WG	GE	Complete
13.22	Provide high level fault level information & compliance report	AH/ PJagger	Complete

Appendix B

ER P28 Joint GCRP & DCRP Working Group Meeting No.14

Attendance List
15th December 2016 ENA Office, London

Attendees:

Name	Initials	Company
Adrian Ellis	AE	Scottish & Southern Electricity Networks
Mark Horrocks	MH	McLellan & Partners
Ken Lennon	KL	SP Energy Networks
Andrew Hood	AH	WPD
Roshan Bhattarai	RB	Northern Powergrid
Peter Johnston	PJ	NIE Networks
Peter Thomas	PTh	Nordex
Matthew Ball	MB	Ofgem
Mark Kilcullen	MK	Department for Business, Energy and Industrial Strategy
Forooz Ghassemi	FG	National Grid
Joe Duddy	JD	RES Group
Richard Newman	RN	UKPN
David Crawley	DC	ENA
Gary Eastwood	GE	Threepwood Consulting Ltd
Michelle Chambers	MJC	Threepwood Consulting Ltd

Apologies:

Davor Vujatovic	DV	VandA Engineering Services
Steve Mould	SM	UKPN
John Parsons	JP	BEAMA
Sridhar Sahukari	SS	Energy UK
Nicola Waters	NW	Primrose Solar

Absences:

Peter Twomey	PTw	ENW

AMENDMENT: Peter Twomey has subsequently confirmed that he sent his apologies, due to illness, to Gary Eastwood by voicemail on the 15th December 2016. Gary Eastwood had not received this message due to migration to new mobile phone and network provider. Apologies from Peter Twomey are subsequently accepted.

Appendix C

ER P28 Joint GCRP & DCRP Working Group

Meeting No.14

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

on Thursday, 15th December 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.	**Review Outstanding Technical Issues**	**GJE/ALL**	
5.	Terms of Reference (ToR)	**GJE/ALL**	
6.	Status of Phase 3 Revision	**GJE/ALL**	
7.	Project plan	**GJE**	
8.	General management/administration • On-line repository requirements • Consultation process • Support requirements	**GJE**	
9.	AOB	**ALL**	
10.	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