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

26th October 2016

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

1. Welcome, Introductions

GE welcomed everybody to the thirteenth 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 Phil Jagger Northern Powergrid who was attending on behalf of RB.

JD attended the meeting via conference telephone.

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_13_1_Agenda_P28 WG_Meeting 13_26.10.16_v0.1]
[Document reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1]
[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 second draft of P28 Issue 2 particularly normal operating conditions and fault level conditions, 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 DC on slide 5 in the presentation.

[Document Reference: P28 WG_Paper_13_2_Meeting Minutes and Actions_08 09 16_Draft v1 Issued]
[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1]

ACTION 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)

GE presented an update on the actions from the last meeting.
[Document Reference: P28 WG_Paper_13_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 12.7 FG discussed National Grid has internal guidance on minimum fault level which may be relevant to P28.

ACTION 13.2: Review PD IEC TR 60725: 2012 to clarify whether reference impedances can be used in P28 Issue 2 (FG/GE)
(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)

Action 12.12 AH confirmed an ICP would be required to comply with P28.

Action 12.13 AH noted that ER P24 and P25 reflect that the earth fault loop impedance of 0.35 ohms for PME supplies is a typical value not a maximum.

Action 12.16 the reference is Paper 13_18 (not 13_8) which will be corrected on issue of the minutes

ACTION 13.3: Update Action List no. 12.16 - completed with Paper 13-18 (GE)

Action 12.18 FG stated remanent flux is between 0.3 – 0.5 for transformers.

Action 12.19 GE could not identify any reference in P28 which stipulated which percentile should be used. FG noted PD IEC/TR 61000-3-7 2008 references the 95th percentile for P_{st}. It was agreed to use the 95th percentile.

Action 12.20 GE agreed to focus on working with the sub-WG Chairs to finalise their outputs in order to progress the second draft.

Action 11.16 this action is still in progress but MH suggested the IPSA inrush curve may be too simple/general. FG added the paper may be suitable for an instant assessment but it was not a substitute for a detailed assessment.

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 stated the Phase 3 Revision submission of the 2nd draft was now delayed up to six weeks. GE will continue to work with the sub-WGs to close out any outstanding aspects.

[Document Reference: Slide 9 in Presentation_P28 WG_Meeting 13_26.10.16_v1]

It was agreed the project plan will be reviewed and updated accordingly.

ACTION 13.4: Add 15.12.16 and 26.01.17 meetings to the project plan and delete 05.01.17 meeting (GE)

6. Reports from sub-WGs

6.1 Flicker Assessment & Limits sub-WG

Stage 1 Assessment Process

[Document Reference: P28 WG_Paper_13_11_SPEN Comments_Stage 1]
[Document Reference: P28 WG_Paper_13_12_Stage 1 Process]

GE summarised Paper 12-12 which captures Simon Scarbro's (SSc) comments. SSc concerns referred to multiple items at an installation at the same location – in such circumstances the 3/2 ratio may not be valid and therefore suggested using a P_{st} level of less than 1, otherwise the compatibility levels are likely to be exceeded. However the WG agreed to keep P_{st}=1.

P28 should use the Standards Committee for guidance when using the BS EN 61000-3-3 and BS EN 61000-3-11 approach to eliminate potential abuse by manufacturers. P28 needs to be clear where there is one product with different installations, the systems should be considered 'working together' as a whole system. For example micro inverters and heat pumps (AH).

Following discussion it was agreed Stage 1 assessments should be applied for discrete items and Stage 2 for multiple items working together to perform a function/system. GE concluded the WG had made considerable progress in this area and thanked SSc for his input.

ACTION 13.5: On behalf of the team thank Simon Scarbro for his support given to P28 WG (AH)

KL presented Paper 13-11 with comments on the proposed Stage 1 Assessment Process flow diagram. AH disagreed that Zref = Ztest because Zref refers to specific impedance single phase 0.47 ohms which most networks will comply with, rather than 0.35 ohms. AH said if the system is equal to or less than Zref then connect, otherwise the DNO should take appropriate action to remedy it. It was agreed some extra commentary was required concerning requirements for supplies > 100 A, where specific data is required.

GE asked how the connectee assesses impedance. The consensus was by measurement using a loop impedance device or generically for PME supplies, where the maximum value of earth fault impedance is typically 0.35 ohms. AH said the WG should not confuse earth fault impedance with phase-neutral loop impedance.

In summary, three approaches to determining LV supply impedance will be measurement, generic data, e.g. PME supply and specific impedance data provided by the network operator.

ACTION 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)

Stage 2 Assessment Process

The LTDS states the maximum fault level – is the WG agreed this is the fault level to be used? P28 should not be too prescriptive but should consider what information is required for different types of customer - DNO, National Grid or a developer. Who should pay for the assessment?

MH stated that design approval is required and made clear even when DNO designed assurance is required and the customer goes to an ICP, it is the customer who is responsible for it.
GE concluded P28 should not provide a prescriptive process but should give information requirements/responsibilities for Stage 1 and Stage 2, leaving the process to DNOs. Further discussion is needed about the information exchange and it was agreed to remove the LTDS from the flowchart.

ACTION 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)

Stage 3 Assessment Process

[Document Reference: Paper 3-19 P28 WG_Paper_13_19_Draft process Stage 3]

DV reviewed the flow diagram and proposed there is no link between Stages 1 and 2 with Stage 3. Stage 3 is triggered only when:

- There is a possibility that, based on the operator's existing knowledge of the network and existing connections, additional flicker of 0.5 Pst would cause the breach of planning levels. In this case the applicant seeking the connection should be advised as early as possible that Stage 3 assessment will be applied, rather than Stage 2 assessment
- When all of the following conditions exist:
    - the Stage 2 assessment has failed
    - the applicant requesting the connection has exhausted all available and reasonable technical options to reduce the flicker emissions
    - the future distorting connections are unlikely or would require network reinforcement

FG asked how this approach ties up with PD IEC/TR 61000-3-7. GE stated it is not really about allocation but the aim is to prevent bad practice.

In principle the WG agreed that DNOs will highlight problems with flicker – if the network operator is aware a connection is up to Pst = 0.5 in Stage 2 and connecting could cause a problem, it will push it into a Stage 3 Assessment. Considerations to include:

- Is Stage 3 Assessment more onerous than a Stage 2 Assessment?
- Where do the roles lie?
- What is the charging mechanism?
- Where the Stage 3 connection is not permitted, it is for the customer to determine mitigation. The customer needs to demonstrate "*optioneering*". It was agreed that it is important to avoid discretion for customers but where discretion is applied, justification must be provided (MH/DV)
- Suitable text covering mitigation required followed by starting the process again (AH) Mitigation should be paid for by the connectee (AH/DV)
- FG stated for Harmonics, it is the connectee who pays for mitigation. It should be the same for flicker as they are the polluters (FG)

6.2 Voltage Step Change sub-WG

No update has been received (GE).

6.3 Rapid Voltage Change sub-WG

FG reviewed the revised proposal on limits for RVC.

[Document Reference: P28 WG_Paper_13_16_RVC Limits-3-0]
[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1 slide 15]
Table 1 has been updated to just three categories - frequent events, infrequent events and very infrequent events. Figure 1 shows 6% voltage dip between flicker and RVC characteristics for category 1 - anything within the envelope is treated as flicker (else RVC), whether repetitive or not although GE suggested the text in Note 1 should be reviewed.

The 100 ms time is derived from previous RVC discussions. The first 100 ms found not to cause a problem. KL suggested the ITIC curve be superimposed on Table 1. The ITIC curve refers to LV based on rectangular voltage change and therefore can be applied to all limits in Table 1 (KL). The P28 Figure 4 with Pst = 0.5 may have to change as a result of Figure 1 being accepted (DV/SM).

AH asked whether it allows for fast transients. FG explained it is necessary to exclude switching transients by defining:

- RMS over one cycle and
- RVC conditions

The sub-WG is close to a definition of Steady State Voltage. The reference voltage is RMS voltage within 1s window as per 61000-3-3 and 61000-3-7. In trying to define the end of an RVC event, it is not necessary to meet an onerous steady state voltage limit. In order not to contradict flicker there are two options:

- Apply IEC standard
- Take some real measurements at 1s time window at LV, HV and EHV
    - Must distinguish between an event and what is normal system voltage fluctuation - concerns over practicalities, flicker problems and obtaining real measurements

ACTION 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)

MH suggested it would be useful to circulate the Lightsource presentation by Jose Ribecca.

ACTION 13.9: Circulate Lightsource presentation P28 Modelling & Simulations meeting no. 4 June 2015 (GE)

<u>Considerations for segregating flicker and RVC - 30ms</u>

[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1 slide 12]

A discussion followed about the limitation of the initial voltage dip/swell to 6%:

- Between 0-30ms there is no limit, > 30ms implies a 3% limit
- 6% limit allows addition of correcting factors - Figure 4 stays as it is (DV)
- Current P28 Issue 1 - 30ms refers to motors with no mention of transformers (MH)
- 30 ms gives clean post event data (FG)

- Starting at 0ms, with RMS 1 cycle rolling at 0.5 cycle, in 30 ms will a cap of 6% cause a problem for a motor start (ie voltage dip)? No firm conclusion was drawn
- The 30 ms limit could be related to visual impact (AH)
- The introduction of a 6% limit is justified because they are repetitive events (GE)
- 0-100 ms is acceptable because they are repetitive starting events in Figure 1(GE)
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- Amend repetitive event with “event more frequently than category 2 event” (AH)
- Agreed measurement is at point of common coupling
- Amend Category 1 to frequent events
- Need to confirm RMS Voltage:
    - Retain 3% limit in Figure 4 in P28 and add wording around Figure 1 (DV)
    - Figure 4 assesses flicker Pst = 0.5 capped at 3%
    - For less frequent events say 1 in every 10 minutes, allow for a deviation of 0.2% voltage change if less than 100 ms duration. It must comply with flicker(AH)

ACTION 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)**

ACTION 13.11: **Review whether 3% limit in Figure 4 should be increased to accommodate RVC Figure 1 and advise GE (All)**

System Impedance

This area needs reviewing (GE):

- System impedance is at the point of connection and sub transient impedance of machines (FG)
- Use the same terminology and values as IEC 60909, should be the same as G74 (AH)

ACTION 13.12: Review basis of system impedance for RVC (FG)

GE will forward FGs response to TNEI comments on RVC Limits
[Document Reference: P28 WG_Paper_13_18 Response to TNEI comment on RVC Limits]

ACTION 13.13: Send Paper 13-18 to TNEI showing FG response to their comments on proposed RVC limits (GE)

6.4 Measurements & Specific Applications sub-WG

GE presented the feedback from PTh from groups of transformer energisations:
[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1 slide 17]

- All less than 10% voltage dip when energising a complete string of 6 turbine transformers (33kV/690V 2.8 MVA)
- Most transformer energisation were well below 10% voltage dip
- Testing soft start of whole site 65 MW whilst disconnected from grid with 2 x 1.5 MW gen sets and load bank – results?

KL and PJ had nothing else to add.

6.5 Drafting sub-WG

GE presented a summary of progress made by the Drafting sub-WG

[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1 slide 18]

- Progress continues to be made and GE will work closely with each sub-WG to close out outstanding issues in preparation for 2nd draft (action 12.20)
- Technical aspects
    - Updated 'Measurements' section
    - Work on Normal Operating Conditions
    - Work on fault level info requirements
    - Revise Stage 1 Assessment Process
    - Stage 3 Assessment – Multiple Connection Application

GE stated P28 will cross reference IEC Standards wherever possible and will remove data relating to impedance and flicker.

Voltage Fluctuations

GE asked if voltage disturbances should be related to lighting only and if so a justification is needed:

- Do voltage disturbances (flicker) have a detrimental effect on equipment?
    - RVC has an effect on equipment
    - Traditional flicker is visual perception only
    - There are medical implications (MH)
    - Visual impact of flicker light with a 3% limit would have minimal effect on equipment (AH)
    - Should allow a judgement on time of use in Stage 3 – for example PV is an area only used in daylight hours, garage welders may be used in the evening (AH)
    - P28 is a planning document with an application section. There is an ongoing connection contract *"if you change the operating cycle, which impacts flicker assessment, you need to …"* type guidance. P28 could become a power quality standard in the future
    - GE highlighted the need to separate flicker Stage 3 from RVC and general step change
    - It would be useful to compare the information DNOs provide and what P28 states should be provided (JD)

ACTION 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)

ACTION 13.15: Compare what information DNOs currently provide compared to what P28 Issue 1 states should be provided (JD)

Provision of Fault Level Information for P28 Studies

At the last P28 meeting the P28 WG agreed an Action 12.4 for each DNO to advise their current process for providing fault level data to applicants and the type of fault level data provided. The objective being to see whether a standardised approach and guidance for carrying out P28 studies can be agreed.

[Document Reference: P28 WG_Paper_13_4_Network Operator FL Data]
[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1 slide 23-27]

The current P28 Issue 1 requires:

- A system impedance value to be chosen that gives a realistic maximum value of flicker severity, which may occur at the time when lighting is in widespread use over the useful lifetime of the disturbing load.
- Future system changes to be taken into account, which suggests some consideration of future fault levels.
- Advocates the use of system impedances relating to spring and autumn evenings for flicker

The general findings are:

- Network Operator 'Connections' webpages provide little information
- DNO Connection Methodology and Charging Statement documents do not mention the requirements in detail
- ENA Distributed Generation Connection Guide mentions flicker considerations but does not provide specific guidance

UKPN provides the customer with max/min system impedance at the point of connection. UKPN updates its plans in the LTDS which is published every 5 years or so. Customers assess connections themselves. Slide 24 of the presentation shows UKPN network parameters (excludes generation sites) (SM).

SPEN although it does not have a published process, KL was able to explain what happens in practice splitting it between ≥ 11kV and at LV (see slide 25 of the presentation). At LV simple modelling is used to provide fault level information by scaling the transformer sizes to give a rating (KL).

SSEN has a defined process which is split between LV, 6.6/11kV and 33kV and above connections (see slide 26 of the presentation). It uses modelling software to calculate the fault level at the POC/PCC (AE)

In summary there is some commonality between the DNOs:

- Common
    - can/do provide specific fault level info at POC / PCC at 11 kV and above when requested
    - UKPN/SPEN assume credible outage scenario (usually GT outage) – SSEN?
    - UKPN/SPEN do not take into account generation from generation site
    - All do not provide seasonal data
- LV
    - SPEN and SSEN designers carry out simple WinDebut model themselves and check compliance
    - Lack of transparency for LV?

The intention is to see whether it's possible to have a standardised approach across all DNOs but it is not clear whether:

- The compliance report should be Network Operator or customer responsibility?
- What information would Network Operators provide for modelling RVC – 10ms peak fault level?
- What would be a standardised approach?

Risk it is important to look at how the risk profile changes at different voltage levels. The responsibility needs to be better defined – for example at LV connections the DNO accepts responsibility but for anything higher than this refer the customer to P28 system impedance (PCC or POC) to carry out an assessment for the DNO to review (GE).

7. Review Papers and Proposals from WG

Fault level considerations for normal/abnormal operation

At the last P28 meeting the P28 WG agreed an Action 12.6 to define the elements of Normal Operating Condition for each voltage level and summarise in a table for the WG to consider (GE). This is because P28 is currently open to misinterpretation for normal operating conditions.

[Document Reference: P28 WG_Paper_13_6_Normal Operating Conditions]
[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1 slide 28]

The recommendations are:

- Consideration of whether to disregard system outages should no longer be based on the simplistic premise that major maintenance is carried out in summer months when the use of lighting is at a minimum
- Local conditions and impacts will need to be considered (including generation contribution)
- Assessment of flicker emissions should be based on the worst normal operating condition identified from credible scenarios that results in the maximum system impedance (generally outage of Grid Transformer)
- A definition of "Normal Operating Conditions" should be included in ER P28 Issue 2 based on Clause 3.18 of BS EN 61000-3-7 (move away from seasonal basis)

There followed a discussion with SM concerned there is a risk of over defining normal operating conditions. JD asked how P2 Security of Supply fits in with the recommendations with GE responding that it is outside of our remit. The justification for moving away from the current P28 is that we are talking about voltage fluctuation which is wider than flicker (GE)

Due to time constraints GE asked the WG to review Paper 13-6

ACTION 13.16: Review Paper 13-6 with a view to agreeing a definition of Normal Operating Conditions (All)

CIRED Paper 0988 - Simplified method for estimating voltage dips

GE presented Paper 13-13 which gives a simplified method for estimating voltage dips due to mag inrush written by Graeme Bathurst in 2009:

[Document Reference: P28 WG_Paper_13_13_CIRED2009_0988_Paper Transformer inrush Graeme Bathurst]
[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1 slide 29]

- It is a simplified method for estimating voltage dips for small transformers (typically 33 and 11 kV/LV) in absence of saturation characteristics
- Premise is that current at fundamental frequency contributes <50% of overall inrush current
- Rule of thumb for maximum transformer capacity that can be energised at a specified voltage dip

Transfer Coefficients from Measurements

[Document Reference: P28 WG_Paper_13_15_flicker-FG1]
[Document Reference: Presentation_P28 WG_Meeting 13_26.10.16_v1.1 slide 20-21]

ACTION 13.17: Comment on Paper P28 WG_Paper_13_15_flicker-FG1 (All)

Network Conditions and Voltage Step Change Limits

[Document Reference: P28 WG_Paper_13_9_RES Comments_Network Conditions & Voltage Step Change Limits]

ACTION 13.18: Comment on JDs questions (see Paper 13_9) (GE)

Impact of Flicker on Various Equipment

[Document Reference: P28 WG_Paper_13_17 Effect of Flicker on Various Equipment]

ACTION 13.19: Comment on the website links in P28 WG_Paper_13_17 Effect of Flicker on Various Equipment (from MH) (All)

8. Project Plan

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

LCNI Papers Referencing P28

The WG should be aware of all the projects and key learnings across the LCNI (Low Carbon Networks & Innovation) programme of work. There is concern decisions are made within the groups which could be in direct conflict with P28 (GE/AH).

ACTION 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)

Membership

[Document Reference: P28 WG_Paper_13_10_Membership_17.10.16_Issued]

The document captures changes in membership.

ACTION 13.21: Write to Nicola Waters concerning her commitment to attending meetings of the P28 WG (GE)

High Level Fault Reporting

It was agreed more information would be useful to add credence to the revision of P28.

ACTION 13.22: Provide high level fault level information & compliance report (AH/PJagger)

11. Date and Venue for Future Meetings

The following dates were agreed for future meetings:

- 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.13

Summary of Actions from 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	
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	
13.3	Update Action List no. 12.16 completed with Paper 13-18	GE	
13.4	Add 15.12.16 and 26.01.17 meetings to the project plan and delete 05.01.17 meeting	GE	
13.5	On behalf of the team thank Simon Scarbro for his support given to P28 WG	AH	
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	
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	
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	
13.9	Circulate Lightsource presentation P28 Modelling & Simulations meeting no. 4 June 2015	GE	
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	
13.11	Review whether 3% limit in Figure 4 should be increased to accommodate RVC Figure 1 and advise GE	All	
13.12	Review basis of system impedance for RVC	FG	
13.13	Send Paper 13-18 to TNEI showing FG response to their comments on proposed RVC limits	GE	
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	
13.15	Compare what information DNOs currently provide compared to what P28 Issue 1 states should be provided	JD	
13.16	Review Paper 13-6 with a view to agreeing a definition of Normal Operating Conditions	All	
13.17	Comment on Paper P28 WG_Paper_13_15_flicker-FG1	All	
13.18	Comment on JDs questions (see Paper 13_9)	GE	

Item	Action	Who	Due by
13.19	Comment on the website links in P28 WG_Paper_13_17 Effect of Flicker on Various Equipment (from MH)	All	
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	
13.21	Write to Nicola Waters concerning her commitment to attending meetings of the P28 WG	GE	
13.22	Provide high level fault level information & compliance report	AH/ PJagger	

Summary of Outstanding Actions from Previous Meetings

Item	Action	Who	Due by
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	In Progress - PTh confirmed preparing Paper
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	GJE to follow up
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	In Progress - Email sent on 24/10/16
12.20	Work closely with each sub-WG to close out outstanding issues in preparation for 2nd draft	GE	In Progress - Email Chairs
11.3	Ask NW whether Primrose Solar did the flicker calculations or was it a third party consultant?	GE	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
12.1	Publish the approved P28 minutes meeting no. 11 28.07.16 on the DCode website	GE	Complete
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 No longer required - see revised RVC limits	GE	Closed
12.4	Each DNO to advise their current process for providing fault level data to applicants and the type of fault level data provided Email sent on 14/10/16. See Paper_13_4	All	Complete
12.5	Advise the ENA Engineering Report that addresses how DG should be considered for security of supply and fault level purposes EREP 130 governs how DG contribute to security of supply_See Paper_13_5	GE	Complete
12.6	Define the elements of Normal Operating Condition for each voltage level and summarise in a table for the WG to consider See Paper 13_6	GE	Complete
12.7	Liaise with the Chair of the G74 WG to determine whether it is possible to have deminimis fault levels No minimum or maximum fault levels. G74 is aimed at providing accurate and consistent method for fault level calculation possible. More for planning worst case fault level	GE	Complete
12.9	Send GE revised version of BS EN 61000-3-11 for review See Paper_13_7	DC	Complete
12.10	Ask Dave Overman of GTC for clarification whether IDNOs are bound to comply with requirements in P28 Issue 2 See Paper_13_8	GE	Complete
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	Complete
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	Complete
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 See Paper_13_ 16 RVC sub-WG Paper	RB	Complete
12.15	Reconsider whether it is appropriate to use pre-event voltage as opposed to nominal voltage for setting percentage RVC limits Nominal voltage	FG	Complete
12.16	Provide a formal response to the comments raised by TNEI regarding the proposed RVC limits See Paper_13_18. Requested further info from TNEI	FG	Complete
12.18	Reissue an email from MH to GE concerning remanence to the RVC and SVC sub-WGs Email sent on 19.10.16	GE	Complete
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 Other than reference to IEC 868 no percentile measurements mentioned	GE	Complete
11.7	Consider how a disturbing installation is covered in the P28 flowchart see Paper 11_20B	AH	Complete

Item	Action	Who	Due by
11.8	Consider replacing 'LV Connection' with 'LV Equipment' in the P28 flowchart see Paper 11_20B	AH	Complete
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	Complete

Appendix B

ER P28 Joint GCRP & DCRP Working Group Meeting No.13

Attendance List
26th October 2016 ENA Office, London

Attendees:

Name	Initials	Company
Matthew Ball	MB	Ofgem
Phil Jagger	PJa	Northern Powergrid
Adrian Ellis	AE	Scottish & Southern Electricity Networks
Forooz Ghassemi	FG	National Grid
Steve Mould	SM	UKPN
Andrew Hood	AH	WPD
Mark Horrocks	MH	HVMS
Peter Johnston	PJ	NIE Networks
Ken Lennon	KL	SP Energy Networks
Davor Vujatovic	DV	VandA Engineering Services
Joe Duddy	JD	RES Group
Gary Eastwood	GE	Threepwood Consulting Ltd
Michelle Chambers	MJC	Threepwood Consulting Ltd

Apologies:

David Crawley	DC	ENA
Roshan Bhattarai	RB	Northern Powergrid
Mark Kilcullen	MK	Department for Business, Energy and Industrial Strategy
Peter Thomas	PTh	Nordex
Peter Twomey	PTw	ENW
John Parsons	JP	BEAMA
Sridhar Sahukari	SS	Energy UK

Absences:

Nicola Waters	NW	Primrose Solar

NOTE: JD participated via telephone conference facility

Appendix C

ER P28 Joint GCRP & DCRP Working Group

Meeting No.13

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

on Wednesday, 26th October 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 • CIRED Paper 0988 - Simplified method for estimating voltage dips • Fault level considerations for normal/abnormal operation	**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