

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

12th January 2016

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

1. Welcome, Introductions

GE welcomed everybody to the seventh 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_7_1_Agenda_P28 WG_Meeting 7_120116_v1]
[Document Reference: Presentation_P28 WG_Meeting 7_12.01.16_v1.1]

In addition to the standard agenda items the purpose of the meeting was threefold:

- Review Terms of Reference in light of Network Operators comments (section 4)
- Review amendments to Phase 2 Review Report (section 5)
- Review sub-WG progress (section 6)

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 following amendments:

[Document Reference: P28 WG_Paper_7_2_ P28 Meeting Minutes and Actions_041115_v0.1 Draft]

ACTION 7.1: Amend the meeting no.6 draft minutes (GE):

- **Page 3 PTh comment – reference fault level (FG)**
- **Page 6 penultimate bullet point change to “confirmed voltages were measured over one cycle but refreshed at half cycle in accordance with BS EN 61000-4-30” (FG)**

GE confirmed membership for Step Voltage Change and Measurements & Specific Applications sub-WGs had been successfully resolved, where membership of SM and PTw are in line with the draft minutes.

ACTION 7.2: Subject to the agreed amendments publish the approved minutes from P28 meeting no.6 04.11.15 on the DCode website. Note: amend title to Approved (GE)

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

[Document Reference: P28 Meeting Minutes and Actions_041115_v0.1_Draft_Update]

GE noted the actions highlighted in green had been completed and those in amber required further discussion before marking them as complete as listed below:

| Action | Who | Description | Outcome |
|--|-----|---|---|
| 6.1 | KL | <p>Send GE revised wording for Action 5.4a draft P28 Minutes & Actions 03.09.15 section 8.1.3 Electric Vehicles</p> <p>KL presented Paper 7.7 Interpretation of conditional and unconditional connections in IEC 61000-3-3 and IEC 61000-3-11</p> <p>P28 WG agreed with KL interpretation</p> | <ul style="list-style-type: none"> • Equipment having an input current equal to or less than 16A per phase, which is tested and complies with the limits in IEC 61000-3-11 can connect via the unconditional route if it meets the technical requirements of IEC 61000-3-3 (AH) • Stage 1 can be an unconditional connection only if network source impedance is below the reference test impedance • Should Stage 1 be amended to conform to a simplified product standard? <ul style="list-style-type: none"> ○ Some thought Stage 1 should be quick with no assessment required (KL/FG) whereas it was suggested P28 currently reflects a simplified approach (AH) ○ G5 approach is a simple pass or fail (FG) ○ Reference quoted from IEC 61000-3-7 not requiring a Stage 1 Assessment from Network Operators but a simple evaluation only (FG) ○ Justification is required to make a change (GE) <p>Agreed action complete</p> |
| ACTION 7.3: WG members to advise justifications why existing Stage 1 Assessment is not acceptable (All) | | | |
| 6.3 | GE | Review outstanding actions from previous meetings | Completed in meeting |
| 6.4 | GE | Ask David Spillett ENA Engineering Policy & Standards Manager to confirm the official version control required for P28 | Confirmed as P28 Issue 2 (not P28/2) See Paper 7.13 Agreed action complete |
| 6.5 | All | Make amendments 6.5 a-q to Phase 2 Review Report for ER P28 and circulate to WG for final approval | Agreed action complete except: <ul style="list-style-type: none"> • 6.5d (DC) Closed in meeting – see Action 7.4 • 6.5o (PTh) • 6.5q (GE) |
| ACTION 7.4: Circulate the latest draft of IEC 61000-3-11 (DC) | | | |
| 6.7 | All | Consider different P_{st} levels for different loads and what rules/situations would be covered in the Stage 2 Assessment Methodology | JD presented Paper 7.12 in Section 7 Review Papers and Proposals from WG of the minutes Agreed action complete |

| | | | |
|---|-----|---|--|
| 6.10 | DV | Document challenges of proposed approach to allocation of rights | <ul style="list-style-type: none"> No decision made by WG - refer to Flicker Assessment & Limits sub-WG Allocation of headroom is technically correct (RB) Need documented justification for change (GE) Current system may not be fair and does not align with IEC approach (FG) For now sub-WGs to proceed on basis that P28 Issue 2 is for connection of new customer loads only (All) <p>Agreed action complete - superseded by Action 7.17 (DV/GE)</p> |
| 6.11 | All | Review Paper 6-11 on and feedback comments to GE (Harmonic Allocation Proposal) | JD presented Paper 7.12 in Section 7 Review Papers and Proposals from WG of the minutes Agreed action complete |
| 6.12 | GE | Find out the high level cost of Stage 3 Assessment | Outstanding |
| 5.8 | GE | Ask ENA what the formal mechanism is for obtaining access to data that has been gathered | Outstanding |
| 4.12 | DC | Ask Eurelectric PQ WG about their knowledge of how other countries allocate rights | Outstanding |
| 4.14 | GE | 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 | Outstanding |
| 2.22 | JH | Prepare a paper of published literature research on modern lighting and flicker | Agreed action closed No longer relevant to revision and has been overtaken by subsequent discussion in the group (see Actions 7.5 & 7.6) |
| 2.23 | RB | Email the paper on flicker and modern lighting written by professor from Finland to GE Update: RB has emailed twice with no response | Close action 2.23 as no response received <ul style="list-style-type: none"> There is a paper by Frank Deter (written some time ago) which concluded that change from incandescent bulb to modern lighting technology does not have any effect on flicker perception (DC) DV to ask his flicker specialist colleague about the status of the Flickermeter and whether modern lighting has an impact (DV) |
| ACTION 7.5: Circulate Flicker and New Lamps paper by Frank Deter, Miele (DC) | | | |

ACTION 7.6: Ask flicker specialist colleague about the status of Flickermeter and whether modern lighting has an impact (DV)

PTw believed ER P2 Security of Supply is relevant although the current P28 Issue 1 does not reference it. It was noted ER P2 is under revision (JD/PTw). GE has already been tasked with writing to P2 Chair Steve Cox requesting view on whether it can be referenced in P28 (Action 6.5q).

4. Terms of Reference (ToR)

[Document Reference: P28 WG_Paper_7_3_ER P28 WG_ToR_v2.2_Issued]

Having previously agreed the ToR, the RVC sub-WG tabled the following questions/clarifications to the main P28 WG, summarised below (GE):

- Is ER P28 a planning connection document that only applies to new connections (Network Users)
 - Majority view of RVC Sub-WG is Yes (proceeding on basis it is customer facing)
 - ToR does not preclude National Grid adopting recommendations for own network
 - Would it be better if P28 did not apply to DNOs?
 - Should compatibility levels be included (especially at LV)?

- As such it does not impose any requirement on the network owners and operators
 - Not regarding compliance with planning limits
 - Other requirements to facilitate assessment and connection may apply

- It is the responsibility of the network operator/owner to ensure that the connectees comply with the requirements
 - Belief is onus is on the connectee to demonstrate compliance
 - DNO may check certain studies/assessments at design stage
 - DNO may monitor compliance routinely or following voltage complaint
 - DNO may provide advice in case of non-compliance

- If the above context prevails, then what would be the GB standard or proposed method that network owners and operators should follow for flicker and RVC?
 - Is there a requirement for Network Operators to follow a standard?
 - Would requirements applying to DNOs be best captured as a separate aspect of P28 for example in an appendix, in a new ENA Engineering Document or in the DCODE?

- The other approach is that the requirement in P28 is equally applicable to network owners and operators as well as users. This approach has been in use by all GB transmission system operators and owners, which not only applies to the requirement in ER P28 document but all the Grid Code
 - What are the risks/impacts to applying P28 to DNOs? (What are exemptions?)
 - What do individual DNOs do at present regarding own design? (WG to formally ascertain)
 - Issues with voluntary adoption by DNOs

Following a round the table discussion there was broad agreement to the following proposal:

- Proceed on the basis P28 Issue 2 applies to customer connections only at this stage
- Consultation with TSOs and DNOs about the risks and impacts on adoption of P28 for planning their own networks – identify where P28 should not be applied and in what circumstances
- Agreement would be sought whether requirements/limits for voltage fluctuation should apply to TSOs and DNOs and where these should be captured - as an Appendix in P28 Issue 2 or in the DCode/GCode
- Formally approach GCRP and DCRP for their response and direction

ACTION 7.7: Circulate comments received on ToR v2.2 Issued (GE)

ACTION 7.8: Write to GCRP & DCRP identifying the issues raised in the applicability of P28 to Network Operators along with WG proposals (GE)

The sub-WG ToR have been issued to the sub-WG Chairs for comment. These are very similar in purpose and objectives in terms of management and reporting (GE).

The following amendment to section 6 Communication and Meetings had been received from RB which the P28 WG approved in the meeting:

- The work of the sub-WG shall remain confidential within members of the main WG (including corresponding members). Permission will be sought from the Chair of the main WG to send out any communications to external third parties. When required, chair of the Sub-WG can communicate any member of the main WG (including corresponding member) for their technical advice and support

There were no further comments, objections or clarifications sought by the P28 WG.

ACTION 7.9: Amend section 6 Communications & Meetings of sub-WG ToR and issue in line with amendment received from RB (GE)

GE noted there were two membership changes in the sub-WGs:

- Flicker Assessment & Limits
 - Mark Thomas had resigned from the P28 WG due to support from his employer Tata Steel being withdrawn. GE to write to Tata Steel asking whether Keith Joughin will continue as a corresponding member
- RVC
 - Mark Horrocks had resigned from Lightsource. The company does not wish to nominate a replacement. It is hoped that his new employer will support MH as a sitting member

The P28 WG expressed its preference in finding a replacement sitting member from another large disturbing load connectee. Suggestions included Celsa Steel UK, British Oxygen, Saint Gobain PAM and Major Users Energy Council.

GE to contact Solar Trade Association out of professional courtesy asking if they would like to nominate a replacement representative.

ACTION 7.10: Write to the Solar Trade Association, Celsa Steel UK, British Oxygen, Saint-Gobain PAM, Major Energy Users Council regarding P28 membership opportunities (GE)

5. Review Amendments to Phase 2 Review Report for ER P28 – Recommendations for Revision

GE presented the latest draft Phase 2 Review Report for ER P28 – Recommendations for Revision

[Document Reference:
P28 WG_Paper_7_4_P28 WG_ENA_EREC_P28_Ph2_Report_v2_Final_Tracked_Issued]

The report had been issued for final comment showing those amendments as agreed in the previous meeting. For ease these amendments were shown as tracked changes.

Three sets of responses have been subsequently received from Western Power Distribution, RES Group and Northern Powergrid.

[Document References:
P28 WG_Paper_7_14_ENA_EREC_P28_Ph2_Report_v2_Final_Tracked_Issued WPD inserts 08_01_2016_GJE

P28 WG_Paper_7_15_Paper_7_4_P28 WG_ENA_EREC_P28_Ph2_Report_v2_Final_Tracked_Issued JPD20160106_GJE

[Document Reference: P28 WG_Paper_7_16_ENA_EREC_P28_Ph2_Report_v2_Final_Tracked_Issued amc_GJE]

ACTION 7.11: Circulate the comments received on the Phase 2 Review Report v2 from WPD, RES Group and NPG (GE)

A summary of the salient points is captured below:

| By | Comment | Outcome |
|-----------|---|---|
| WPD (SSc) | <ul style="list-style-type: none"> Degree to which scope applies to Network Operators Should IEC TR 61000-3-14 be included as a reference? Add formulae for existing welders from ACE reports and for new types of welder (AC/DC welders) Should compatibility levels be defined by Network Operator? Is 3% still relevant as a general limit with other limits being for special circumstances? Relevant measurements may not be available for assessing new connections | <ul style="list-style-type: none"> See section 4 ToR – to be advised Agreed (note it is technical report not a standard). Agreed To be considered (clarification needed whether compatibility levels should be defined <i>for</i> or <i>by</i> Network Operator) (GE) The aim is to define & apply limits with 3% used as a default (care should be taken with the wording) Agreed |
| RES (JD) | <ul style="list-style-type: none"> Should voltage fluctuation requirements of Eurocodes (e.g. RfG and DCC) be considered explicitly? (as well developed drafts available) Do we need more justification that there is no problem with current Stage 2 assessment methodology and limits? | <ul style="list-style-type: none"> Review the latest Eurocode drafts for RfG & DCC and assess impact on P28 Evidence based justification is required to show there is not a problem with current Stage 2 assessment and limits. Maintain the status quo but document potential problems with the increasing no. of generator connections (JD). No problems means no evidence – P_{st} value = 0.5 with 8 customers but depending on the |

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| | | <p>technology there may need to be an adjustment i.e. different alpha values (DV). The opposite is true for some wind turbines - the more you have the smoother the performance with respect to flicker (PTh)</p> |
| NPG (RB/AC) | <ul style="list-style-type: none"> Degree to which scope applies to Network Operators Multiple Installations – is this multiple equipment at multiple locations? Should SQSS define fault conditions for Transmission and ER P2 for Distribution Should limits apply to protection operation for Generation? Any change to Allocation of Rights will have commercial, technical and regulatory implications for Network Operators. WG to look at these impacts? Why are connection of EVs treated differently to PV/Wind in Section 8.1.3 of Report? | <ul style="list-style-type: none"> See section 4 ToR – to be advised GE to clarify the definition of multiple installations. Must have effect at point of common coupling (JD) Yes There are to be no exceptions. Page 10 2nd paragraph text is sufficient (FG) Agreed - part of justification for change must include commercial & regulatory implications for <i>all</i> stakeholders (All) The Low Carbon Technology Group (LCT) has proposed EV connection arrangement is different to other types (heat pumps etc). LCT has contacted PQ&EMC for validation. P28 WG should keep abreast of EV developments (AH). In the absence of product standards for EVs, P28 should provide guidance on assessment (fixed installations) assuming compliance with IEC 61000-3-11 (GE). It would be very difficult to assess mobile chargers (for example those on board a vehicle). Potential danger of treating EVs as unconditional connections (KL). Agreed to treat EVs separately and to liaise with LCT Group (GE) |

ACTION 7.12: Consider whether compatibility levels should be defined *by or for* Networks Operators (GE)

ACTION 7.13: Review the latest Eurocode drafts for RfG & DCC and assess the impact on P28 (GE)

ACTION 7.14: Obtain wind turbine flicker data from contact at West Coast Energy (PTh)

ACTION 7.15: Consider different technologies and how to treat them in the Phase 2 report (e.g. equipment with different alpha values) (GE/DV)

ACTION 7.16: Clarify what is meant by multiple installations (GE)

ACTION 7.17: Document impact of making changes to the Allocation of Rights including the technical, commercial and regulatory impact (GE/DV)

ACTION 7.18: Obtain the latest developments on connections by EV manufacturers (PTh)

ACTION 7.19: Liaise with Low Carbon Technology WG on EV developments (GE)

ACTION 7.20: Accept existing changes to draft P28 report v2. Issue final draft v3 with tracked changes incorporating the latest comments received (see actions 7.12 – 7.19) for final comment, ahead of GCRP & DCRP approval (GE)

ACTION 7.21: Review and comment on amendments only shown as track changes in final draft Phase 2 Review Report for ER P28 v3, within two weeks of report being issued *Note: it was agreed no comments received will be taken as approved (All)*

6. Reports from sub-WGs

6.1 Rapid Voltage Change sub-WG

FG presented a summary of progress to date:

[Document Reference: slides 23 to 25 in Presentation_P28 WG_Meeting 7_12.01.16_v1.1]

- The sub-workgroup has met twice 10th December 2015 and 6th January 2016
- The following points had been discussed:
 - The nature of P28 document as a standard, does it apply to network users only or to network owners/operators as well? This question has been put on hold until clarification from P28 WG and/or ENA is received. Meanwhile, the work will progress on the basis that the document is a “customer facing” standard
 - Definition of RVC
 - Accepting the document produced by WPD (SSc) as a framework to arrive at sets of limits for each category (see Paper 3.14)
 - The depth and duration of RVC for each category
 - The frequency of occurrence for each category
 - Check similarity between Fig 4 in P28 with Fig A.1 of IEC 61000-3-7
 - Defining the reference voltage for determining the depth of RVC, this has been agreed to be the pre-event voltage and not the nominal voltage
 - Defining the shape and duration of compliant region

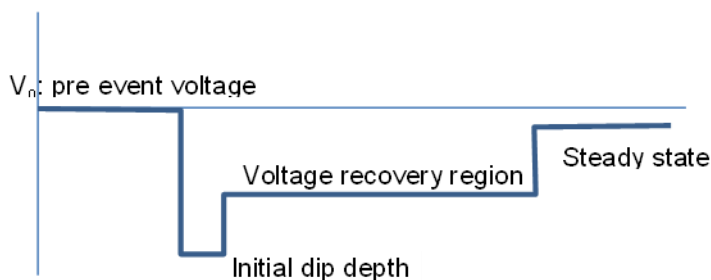


Diagram 1 *Important agreement reached on shape of RVC*

- Work in progress:
 - Limits for dip depth
 - The voltage recovery duration
 - The frequency of occurrence

Although the categories had been defined there has been no progress on the definition of categories 2 and 3:

- Category 1 will be in line with Figure 4 in P28 Issue 1
- Category 2 Current proposal 10% dip recovering in 100ms then 6% voltage recovery lasting 2s recovering to 3% steady state
- Category 3 10% dip not discussed yet

This area of work covers rise (swell) as well as dip although agreeing on the dip element of RVC could take considerably longer. A long discussion is envisaged on occurrences so comments would be welcomed from the P28 WG to assist with progress (FG) (see Section 10 AOB Action 7.31)

6.2 Step Voltage Change sub-WG

RB presented a summary of progress to date:

[Document Reference: slide 26 in Presentation_P28 WG_Meeting 7_12.01.16_v1.1]:

- Members are Roshan Bhattarai (NPg), Joe Duddy (RES Group) and Steve Mould (UKPN)
- The first conference call meeting was held on 8th January 2016 to agree sub-WG responsibilities. In doing so clarification was sought from the main P28 WG:
 - The purpose of this sub-WG is to revise and propose limits for steady state voltage change due to different activities within the electricity network
 - It was not clear whether Step Voltage Change (SVC) due to transformer/cable energisation falls under this sub-WG or RVC sub-WG
 - Scope will include the review of existing step change provisions of P28 and to propose something new to the main WG
 - Timeline for deliverables to main WG
- The next planned meeting is 6th February to discuss progress for presentation at the next P28 WG meeting on 3rd March

It was agreed there is an overlap with the RVC sub-WG. Looking at the diagram in section 6.1 the SQSS (Security and Quality of Supply Standard) states SVC occurs after 5 seconds resulting in a transient gap of 2 seconds. Between these is the SVC which has not finished yet (JD).

FG agreed to check the definition of voltage in a steady state condition in IEC standard 61000-4-30 (*note: it was thought to be 0.5% voltage change within 1 second (FG)*).

ACTION 7.22: Circulate IEC standard containing the definition of voltage in a steady state condition (FG)

An important consideration is whether to use a definition based on *voltage level* or *time*.

ACTION 7.23: Define steady state characteristics for step voltage change for P28 WG to review (RB)

What about multiple events in terms of limits? A single voltage change is a single event which may affect flicker (JD). FG referenced a Norwegian paper "RVC – Definition and Minimum Requirements" about power quality measurements. It concluded a clear definition was needed for any voltage disturbance to achieve reliable measurements. RVC should not be treated the same as flicker.

[Document ref: P28 WG_Paper_7_10_Norway paper 1-RVC Definition and min req]

It was agreed there was no need to change our approach based on the standards IEC 61000-3-3 and IEC 61000-3-7, accepting RVC and flicker are not the same. The flicker curves and IEC standards can be used to determine the frequency of occurrence in the knowledge the visual impact would not be the same (DV/FG).

6.3 Measurements & Specific Applications sub-WG

PTh requested data be made available by the members to assist with the progress of this sub-WG. The P28 WG was reminded of the need to present data in a meaningful way and should contain a representative sample of urban, rural, industrial, commercial and residential sites ranging from transmission down to LV.

The members agreed to share data captured below:

- KL to provide flicker data from 24 sites covering Merseyside and North Wales giving values of P_{st} and P_{lt} from 16 x 33kV busbars plus 8 x 11kV busbars, which include general background levels. These will be to 95% probability values
- PTw has data to share (no details specified)
- FG to provide flicker values for 132kV, 275kV & 400kV - grouped by geographical area if possible – up to 100 sites

Other members would check data availability and agreed to circulate it in due course. Given the possible size of such files it was agreed to share the sub-WG Dropbox folder link in order to collate data efficiently.

ACTION 7.24: Send P28 WG the Dropbox link for collecting data to assist the Measurements & Specific Applications sub-WG (GE)

ACTION 7.25: Circulate data referenced in the meeting to assist the Measurements & Specific Applications sub-WG (KL/PTw/FG)

6.4 Flicker Assessment & Limits sub-WG

In the meeting JD and AE both volunteered to join this sub-WG replacing Mark Thomas who had resigned.

It was agreed to transfer the task Flicker Headroom Allocation Method from the RVC sub-WG to here with FG offering to assist as and when necessary.

It was agreed there was a good mix of users and DNOs in the sub-WG.

ACTION 7.26: Update sub-WG membership list and transfer Flicker Headroom Allocation method to Flicker Assessment & Limits sub-WG (GE)

7. Review Papers and Proposals from WG

JD presented his comments on the P_{st} levels for different loads and the Harmonic Allocation paper written by SSC

[Document references:

P28 WG_Paper_7_12_Comments on Mtg No.6 Minutes Actions_J.Duddy

P28 WG_Paper_6_11_Harmonic Allocation Proposal Rev 1 SSc]

Stage 2 Assessment

With reference to action 6.7 “Consider different P_{st} levels for different loads and what rules/situations would be covered in the Stage 2 Assessment Methodology”, it could be specified that, where it was known that more than 8 devices of a common type were intended to be connected to a particular circuit, then the $P_{st} \leq 0.5$ criteria used in Stage 2 Assessment might have to be reduced (or it may be necessary to use a Stage 3 Assessment, although this was not a preferred option) (JD).

Stage 3 Assessment

| JD Comments on Paper 6.11 | Outcome |
|---|---|
| <p>Regarding the section “Demand Customers”, the proposal to allocate harmonic emission rights based on pro rata agreed supply capacity vs firm capacity may be fair but may also be inefficient. Is it likely that every customer will use all of their rights? No, this is highly unlikely. Therefore there will be unused emissions rights of some customers which are effectively sterilised, thus compelling other customers (who would exceed their own emission rights) to invest in mitigation when it may be unnecessary to do so (sufficient unused emissions rights of others exist). How much would such fairness cost?</p> <p>A similar argument of economic inefficiency could be made for the section about Generation Customers</p> <p>Is there any evidence that the first come first served system is</p> <ul style="list-style-type: none"> • Disadvantaging significant numbers of customers / generators? • More or less costly than an allocation of emissions rights method? <p>The proposed method treats generators and demand customers equally. However the addition of generation to a network will increase the short circuit level (significantly in the case of some generation technologies) and thus reduce the harmonic voltage emissions of others. This effect is neglected in the proposed methodology</p> | <p>More clarity is required on Allocation of Rights</p> <p>How many of Stage 3 Assessment were carried out last year?</p> <p>If found to be a significant number, the Stage 3 Assessment should be reviewed (GE)</p> <p>FG pointed out there had been 2 cases since 2006 at transmission level. Not a problem historically but could be with increasing flicker producing loads in operation and further changes likely to the future network, it is important to future proof P28 (FG)</p> <p>Evidence based methodology needed to justify the change - it was necessary to gather data to support increasing flicker values (JD)</p> <p>Any change must be practical and make implementation possible. It would be useful to look at studies where different allocation methodologies have been used. It was important to consider how applicants approached their studies – gather the evidence (JD)</p> <p>New windfarm generators are generating less flicker (PTh)</p> <p>Fault levels are reducing however there is a greater variation in the fault levels (JD)</p> <p>It was important to look at different connections not just fault level considerations (RB)</p> <p>Yes but improving technology should enable fault levels to reduce further. There must be fair access to networks for all. How does the DCRP treat this (DV)?</p> |

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| Similar arguments could be developed for and against a methodology for allocating flicker emissions rights | |
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In summary, it was agreed to document the proposed case and impacts for changing the current allocation of rights with a clear justification for making such a change. It is important to include the technical, commercial and regulatory *impact* of making any change (see Section 5 Review Amendments to Phase 2 Review Report Action 7.17)

The case for change to be put forward to the DCRP was on a question of fairness. However whilst the first come first served approach maybe not be considered fair, it may well be economically efficient.

ACTION 7.27: Write to the Network Operators requesting data on the no. of Stage 3 Assessments carried out in the last 3 years and the levels of flicker before and after connection (GE)

ACTION 7.28: Obtain information on the different allocation methodologies that other countries use and forward to DV/GE (All)

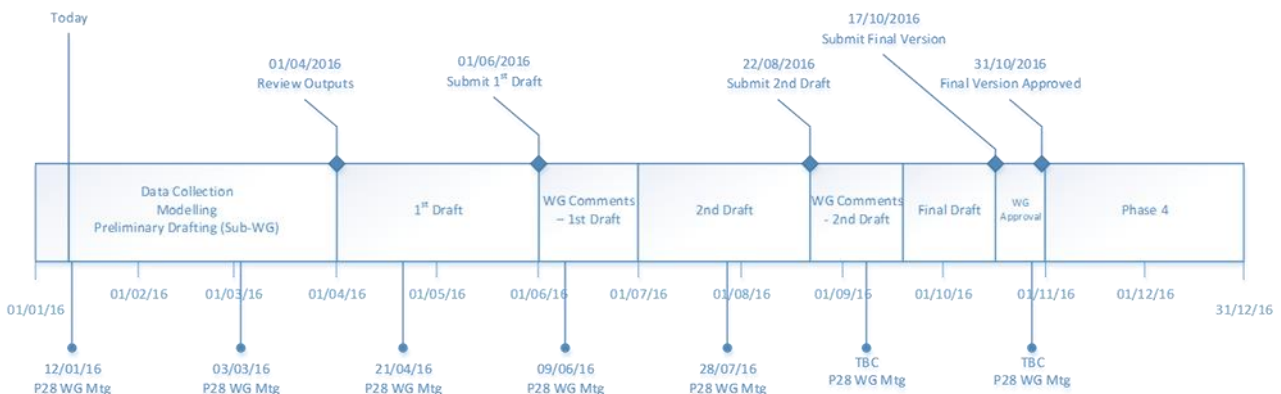
PTh discussed the problem of defining and measuring flicker and harmonics when not in generating conditions.

ACTION 7.29: Measurement & Specific Applications sub-WG to consider problem with defining flicker & harmonics when not in generating conditions (PTh)

8. Project Plan

[Document reference: P28 WG_Paper_7_6_ENA_ERECP28_Ph3_Project Plan_v0.1]

GE presented the updated Phase 3 Revision Project Plan with no objections raised by the P28 WG accepting it may ambitious and subject to change should any technical issues not be resolved in a timely manner.



- The deadline for the data collection, modelling and preliminary drafting of the sub-WG outputs is 1st April 2016
- The final version of the Phase 3 Revision document should be approved by P28 WG 31st October 2016
- The final Phase 4 Acceptance & Adoption is due to commence thereafter

9. General Management/Administration

Arrangements for general management and administration had not changed since the previous meeting. The secure access area on the ENA website is operational. GE had issued the link and login details.

9.1 On-line Repository Requirements

- Public access
 - Hosted by ENA on the DCRP website
 - Administered on behalf of the WG by the ENA Secretariat
 - Access to all approved outputs from WG (see <http://www.dcode.org.uk/areas-of-work/>)
- Working Group secure access
 - Hosted by ENA on their website
 - Click on ER P28 Working Group
 - Enter Username and Password supplied
 - If there are any problems accessing files let GE know

GE confirmed the ENA Secretariat had uploaded all WG papers to the new P28 area on the ENA website.

Due to time constraints the following two sections 9.2 and 9.3 were omitted from the meeting as nothing had changed since the last meeting.

9.2 Consultation Process

The following governance processes that need to be complied with are summarised below.

- Current References
 - DCRP Constitution and Rules - Standard Procedure 1
 - Electricity Networks and Futures Group (ENFG) Document Review/Approval Process (v3 Revision November 2013)
- Proposed Processes
 - Interfaces with Working Group now incorporated into revised ENFG Document Review/Approval Process
 - No initial public consultation proposed for development of ER P28 revision
 - Regulatory authorities, trade associations and IET will be given early opportunity to comment of draft P28 revision
 - Working Group will draft consultation paper for agreement by the GCRP and DCRP
 - Public consultation will only take place following acceptance of the modifications by the ENFG and joint agreement by the GCRP and DCRP

9.3 Support Requirements

The following support requirements are being provided:

- Provided by ENA Secretariat
 - Organisation and facilitation of WG meetings
 - Preparation of meeting agendas
 - Taking and distributing meeting minutes/actions
 - Preparation of briefing papers and documents
 - Preparation and distribution of WG reports and documentation
 - Collation of incoming data and responses

- Provided by Working Group Members
 - Preparation of papers
 - Response to papers
 - Specialist technical support
 - Incoming/field data

There were no other support requirements identified.

10. **AOB**

10.1 **Title & Scope of P28**

The current reference and title is:

“Engineering Recommendation P28 Issue 1 1989 Planning Limits for Voltage Fluctuations Caused by Industrial, Commercial and Domestic Equipment in the United Kingdom”

The proposed reference and title is:

“Engineering Recommendation P28 Issue 2 2016 Limits for Voltage Fluctuations Caused by Equipment Connected to Electricity Transmission Systems and Distribution Networks in the United Kingdom”

No agreement was reached and requires further consideration during drafting (GE)

10.2 **RVC and Frequency of Occurrence**

The DCode uses a frequency of once per year whereas the tables in IEC 61000-3-7 are very different ramping up to 24 times per day. FG also referenced the Norwegian Paper 7.10 “RVC – Definition and Minimum Requirements” which also considers the number of occurrences.

What is the science behind these figures?

ACTION 7.30: Give feedback on appropriate no. of occurrences considered for RVC (All)

11. **Date and Venue for Future Meetings**

The following dates have been proposed for future meetings:

- 3rd March 2016
- 21st April 2016
- 9th June 2016
- 28th July 2016
- September 2016 tba
- October 2016 tba

ACTION 7.31: Advise P28 meeting dates for September and October 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.7

Summary of Actions from Current Meeting

| Item | Action | Who | Due by |
|------|---|-------|--------|
| 7.1 | Amend the meeting no.6 draft minutes: <ul style="list-style-type: none"> • Page 3 PTh comment - reference fault level (FG) • Page 6 penultimate bullet point change to “confirmed voltages were measured over one cycle refreshed at half cycle in accordance with BS EN 61000-4-30” (FG) | GE | |
| 7.2 | Subject to the agreed amendments publish the approved minutes P28 meeting no.6 04.11.15 on the DCode website Note: amend title from Draft to Approved | GE | |
| 7.3 | WG members to advise justifications why existing Stage 1 Assessment is not acceptable | All | |
| 7.4 | Circulate the latest draft of 61000-3-11 | DC | |
| 7.5 | Circulate Flicker and New Lamps paper by Frank Deter, Miele | DC | |
| 7.6 | Ask flicker specialist colleague about the status of Flickermeter and whether modern lighting has an impact | DV | |
| 7.7 | Circulate comments received on ToR v2.2 Issued | GE | |
| 7.8 | Write to GCRP & DCRP identifying the issues raised in the revision of P28 along with WG proposals | GE | |
| 7.9 | Amend section 6 Communications & Meetings of sub-WG ToR and issue in line with amendment received from RB | GE | |
| 7.10 | Write to the Solar Trade Association, Celsa Steel UK, British Oxygen, Saint-Gobain PAM, Major Energy Users Council regarding P28 membership opportunities | GE | |
| 7.11 | Circulate the comments received on the Phase 2 Review Report v2 from WPD, RES Group and NPG | GE | |
| 7.12 | Consider whether compatibility levels should be defined <u>by</u> or <u>for</u> Networks Operators | GE | |
| 7.13 | Review the latest Eurocode drafts for RfG & DCC and assess the impact on P28 | GE | |
| 7.14 | Obtain wind turbine flicker data from contact at West Coast Energy | PTh | |
| 7.15 | Consider different technologies and how to treat them in the Phase 2 Report (e.g. equipment with different alpha values) | GE/DV | |
| 7.16 | Clarify what is meant by multiple installations | GE | |
| 7.17 | Document impact of making changes to the Allocation of Rights including the technical, commercial and regulatory impact | GE/DV | |
| 7.18 | Obtain the latest developments on connections by EV manufacturers | PTh | |
| 7.19 | Liaise with Low Carbon Technology WG on EV developments | GE | |
| 7.20 | Accept existing changes to draft P28 report v2. Issue final draft v3 with tracked changes incorporating the latest comments received (see actions 7.12 – 7.19) for final comment, ahead of GCRP & DCRP approval | GE | |
| 7.21 | Review and comment on amendments only shown as track changes in final draft Phase 2 Review Report for ER P28 v3, within two weeks of report being issued Note: it was agreed no comments received will be taken as approved | All | |

| Item | Action | Who | Due by |
|------|---|----------------|--------|
| 7.22 | Circulate IEC standard containing the definition of voltage in a steady state condition | FG | |
| 7.23 | Define steady state characteristics for step voltage change for P28 WG to review | RB | |
| 7.24 | Send P28 WG the Dropbox link for collecting data to assist the Measurements & Specific Applications sub-WG | GE | |
| 7.25 | Circulate data referenced in the meeting to assist the Measurements & Specific Applications sub-WG | KL / FG PTw | |
| 7.26 | Update sub-WG membership list and transfer Flicker Headroom Allocation method to Flicker Assessment & Limits sub-WG | GE | |
| 7.27 | Write to the Network Operators requesting data on the no. of Stage 3 Assessments carried out in the last 3 years and the levels of flicker before and after | GE | |
| 7.28 | Obtain information on the different allocation methodologies that other countries use and forward to DV/GE | All | |
| 7.29 | Measurement & Specific Applications sub-WG to consider problem with defining flicker & harmonics when not in generating conditions | PTh | |
| 7.30 | Give feedback on appropriate no. of occurrences considered for RVC | All | |
| 7.31 | Advise P28 meeting dates for September and October 2016 | GE | |

Summary of Outstanding Actions from Previous Meetings

| Item | Action | Who | Due by |
|------|---|-------------------------|--------|
| 6.5 | Make amendments 6.5 a-q to Phase 2 Review Report for ER P28 and circulate to WG for final approval: <ul style="list-style-type: none"> 6.5o Section 8.1.5 ask Renewable UK if there are problems with small/medium scale synchronous generators and variable wind speeds - feed this information into the Measurements sub-WG 6.5q contact P2 confirming P28 revision will reference P2 | GE PTh GE | |
| 6.12 | Find out the high level cost of Stage 3 Assessment | GE | |
| 5.8 | Ask ENA what the formal mechanism is for obtaining access to data that has been gathered | GE | |
| 4.12 | Ask Eurelectric PQ WG about their knowledge of how other countries allocate rights | DC | |
| 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 | |

Summary of Completed Actions in Current Meeting

| Item | Action | Who | Due by |
|------|--|-----|----------|
| 6.1 | Send GE revised wording for Action 5.4a draft P28 Minutes & Actions 03.09.15 section 8.1.3 Electric Vehicles | KL | Complete |
| 6.2 | Subject to the agreed amendments publish the approved minutes from P28 meeting no. 5 03.09.15 on DCode website | GE | Complete |
| 6.3 | Review outstanding actions from previous meetings | GE | Complete |
| 6.4 | Ask David Spillett ENA Engineering Policy & Standards Manager to confirm the official version control for P28 | GE | Complete |

| Item | Action | Who | Due by |
|------|---|---|-----------------|
| 6.5 | <p>Make amendments 6.5 a-q to Phase 2 Review Report for ER P28 and circulate to WG for final approval:</p> <ul style="list-style-type: none"> 6.5a Reword section 4.2 and send to GE (SSc) 6.5b Reword section 4.4 to include why IEEE standards are considered as limited value in this revision (GE) 6.5c Reword section 4.5 - remove SSEG in 1st occurrence and change 2nd occurrence to “disturbing load” (GE) 6.5d Section 4.5 ask DC to distribute presentation from Maintenance Committee on multiple installations (GE) see Action 7.4 6.5e Section 5.1 advise GE of the definition of operating conditions in IEC (relates to comment on credible outage conditions) (DV) 6.5f Section 5.1 clarify alignment of definitions in P28 with IEC and add a footnote with IEC definition (GE) 6.5g Section 5.1 reference P2/6 (GE) 6.5h Section 5.2 amend wording to explain why a probabilistic approach is preferred where absolute limits are defined and why a probabilistic balance of risk is not unduly pessimistic (GE) 6.5i Section 5.2 remove “Distribution Code” from 4th paragraph (GE) 6.5j Section 5.2 change TNEI comments in 4th paragraph to “...laboratory tests, the impact on equipment immunity, protection settings and visual impact will need to be considered” (GE) 6.5k Section 5.2 send GE the Norwegian SINTEF paper on RVC (FG) 6.5l Section 7 add concern about IEC approach quoting proportional allocation of rights subject to having a documented justification (GE) 6.5m Section 8.1.2 add a general section for future connections which are dependently controlled. Remove specific reference to SSEG and heat pumps (GE) 6.5n Section 8.1.3 send GE a reworded section 8.1.3 Electric Vehicles (KL) 6.5p Section 9 add LV to the existing HV, MV and EHV systems listed in the last paragraph (GE) | <p>GE</p> <p>SSc GE</p> <p>GE</p> <p>GE</p> <p>DV</p> <p>GE</p> <p>GE</p> <p>GE</p> <p>GE</p> <p>GE</p> <p>GE</p> <p>GE</p> <p>FG</p> <p>GE</p> <p>GE</p> <p>KL</p> <p>GE</p> | <p>Complete</p> |
| 6.6 | Prepare and circulate the sub-WG ToR, timelines and finalise the memberships | GE | Complete |
| 6.7 | Consider different P _{st} levels for different loads and what rules/situations would be covered in the Stage 2 Assessment Methodology | All | Complete |
| 6.8 | Develop a detailed Phase 3 Revision Plan (including deadlines for sub-WGs) | GE | Complete |
| 6.9 | Upload current action list to top of ENA P28 website | MJC | Complete |
| 6.10 | Document challenges of proposed approach to allocation of rights Superseded by Action 7.17 | DV | Closed |
| 6.11 | Review Paper 6-11 and feedback comments to GE Update: comments received from JD | All | Complete |
| 5.3 | Produce a set of principles for proportional allocation of rights and circulate to P28 WG | FG | Complete |

| Item | Action | Who | Due by |
|------|--|-----|----------|
| 5.5 | Contact LCT Group to understand how it treats flicker (xref action 5.4a) See response from Jamie McWilliam | GE | Complete |
| 2.22 | Prepare a paper of published literature research on modern lighting and flicker Note: in light of JH resignation GE to pursue DC/DV to progress new actions see Actions 7.5 & 7.6 | JH | Closed |
| 2.23 | Email the paper on flicker and modern lighting written by professor from Finland to GE <i>Update: NFA - RB has emailed twice with no response</i> DC/DV to progress new actions see Actions 7.5 & 7.6 | RB | Closed |

Appendix B

ER P28 Joint GCRP & DCRP Working Group Meeting No.7

Attendance List

12th January 2016 ENA Office, London

Attendees:

| Name | Initials | Company |
|-------------------|----------|---------------------------------------|
| Peter Twomey | PTw | ENW |
| Peter Johnston | PJ | NIE |
| Ken Lennon | KL | SP Energy Networks |
| Adrian Ellis | AE | SSE |
| Steve Mould | SM | UKPN |
| Andrew Hood | AH | WPD |
| Roshan Bhattarai | RB | Northern Powergrid |
| Forooz Ghassemi | FG | National Grid |
| Matthew Ball | MB | OFGEM |
| Mark Kilcullen | MK | Department of Energy & Climate Change |
| Peter Thomas | PTh | Nordex |
| Joe Duddy | JD | RES Group |
| Davor Vujatovic | DV | VandA Engineering Services |
| David Crawley | DC | ENA |
| Gary Eastwood | GE | Threepwood Consulting Ltd |
| Michelle Chambers | MJC | Threepwood Consulting Ltd |

Apologies:

| | | |
|------------------|-----|-------------|
| Mark Horrocks | MH | Lightsource |
| Gareth Evans | GE | OFGEM |
| Tony Headley | THe | BEAMA |
| Sridhar Sahukari | SS | Energy UK |

Absences:

| | | |
|-------------|----|---|
| Mark Thomas | MT | TataSteel (Resigned) |
| James Hoare | JH | Renewable Energy Association (Resigned) |

Appendix C

ER P28 Joint GCRP & DCRP Working Group Meeting No.7 Tuesday 12th January 2016, 10:30 – 15:30

Agenda

| | | | |
|-----|---|---------|-------|
| 1. | Welcome, introductions | 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. | Review Amendments to Phase 2 Review Report for ER P28 - Recommendations for 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 | ALL | |
| 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 <ul style="list-style-type: none">• Title & Scope of P28• Attenuation of flicker from lower to higher voltage levels | ALL | |
| 11. | Future meetings <ul style="list-style-type: none">• Dates• Agenda items | | 15:30 |