Minutes of the Inaugural Meeting of the ER P24 Task Group

23rd June 2015

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

1. Welcome, Introductions

RP welcomed everybody to the inaugural meeting of the ER P24 Task Group to review the case and proposed scope of review of ENA Engineering Recommendation P24 in the UK.

Attendance, apologies and absences were noted (see Appendix A for Attendance List).

Round the table introductions were made. DH explained that Network Rail wish P24 to be an all-encompassing document to capture how feasibility studies should be carried out for proposed traction supply connections.

2. Address by the Chair (Designate)

In his role as Chair (Designate) RP gave an overview of the meeting Agenda including the background to the establishment of the Task Group (TG), the purpose of the TG, its obligations and the purpose of the inaugural meeting.

ENA Engineering Recommendation P24 AC Traction Supplies to British Rail (P24) was last published in 1984. Traction technology has moved on considerably and electrification plans of major rail lines are proposed. The Distribution Code Review Panel (DCRP) has requested a revision of P24.

The purpose of the TG is to define the issues with P24 and the topics requiring updating. RP stressed the need for the TG to work together and collaborate during the revision work.

The purpose of the inaugural meeting, being the formal constitution of the TG, to agree the scope and Terms of Reference (ToR) and to agree the project plan for progression of P24 were stated.

3. Formal Constitution of the Working Group

3.1 Overview

DS explained that P24 was an Annex 1 DCODE engineering document and as such Standard Procedure 1 within the DCODE Constitution and Rules is applicable to any work on the document. As the secretariat to the DCRP, DS has presented a paper to the DCRP for the proposed revision of P24. This paper was accepted and the revision work should be undertaken by a Task Group, made up of representatives from key stake holders. DS also explained that a Chair is required for the Task Group and asked for nominations from ENA Member Companies. JP, GBa and GBr expressed interest in becoming Chair. It was agreed that RP would continue as Chair (Designate).

DS also asked the TG to consider whether P24 should be retained as an Annex 1 document or become an Appendix 2 DCODE document. The TG should consider the fact that P24 is primarily a bi-lateral document between Network Rail and DNOs/TSOs.

ACTION 1: Attendees to seek approval from their organisation for Chair nomination.

ACTION 2: TG to consider if P24 is to remain an Annex 1 DCODE document or become an Appendix 2 DCODE document.

3.2 Membership

RP provided an overview of current membership of the TG and corresponding members (document reference: P24 TG_Proposed_Membership_14.05.15). Gavin Baxter informed the TG that he will replace Mick Walbank as the Northern Powergrid representative.

ACTION 3: RP to update membership details of P24 TG.

3.2 Secretariat

The facilitation and secretariat support for the TG is provided by the ENA and their nominated representatives, namely:

- David Spillett (ENA Representative and Project Leader)
- Richard Parke (Facilitator and Chair (Designate) of the TG)

There were no objections to these appointments by the TG.

4. Proposed Scope of ER P28 Review

RP summarised the recommendations of the Threepwood Consulting (TCL) Initial Review Report (document reference: Threepwood Report_ENA_ENA089_ER_P24_v1.0_Issued) The report highlights a number of significant considerations for the revision.

- 30 years of technology change to traction drives
- 275/400 kV not covered in detail in P24
- Inclusion of national and international Standards
- Developments in phase balancing (FACTS)
- Capability of latest modelling and simulation software

RP and GJE clarified with the TG the intent of P24: good practice on technical requirements for the interface between Network Rail and the network operator.

RP asked the TG for an open discussion on the document and proposed a 'walk through' the contents to stimulate debate and highlight important considerations for the revision.

A summary of the discussion is detailed below:

4.1 General

SS and JP raised the question of overlap between ENA TS 41-15 Part 9, *Standard Circuit Diagrams for Equipment in 132 kV Substations* and P24. DH agreed that protection and earthing considerations are important and possibly the biggest issues. DH also pointed out that the schemes in P24 are out of date and European Standards for protection of traction supplies have moved to a functional standard. The TG agreed that principles/philosophy for protection should be covered in P24 and should not be prescriptive. It is agreed that ENA TS 41-15 Part 9 should become a functional specification with no repetition to P24.

ACTION 4: JP/SS to review scoping paper for proposed re-write of ENA TS 41-15 Part 9.

GBr raised the question of providing Network Rail with a connection at 25 kV. With regards to DNO licence conditions, it is expected that all customers are treated fairly which infers a point of connection (POC) for Network Rail of 132 kV. In addition to this point, DNOs are nervous about having equipment on the network which is 'special', they are not familiar with and how other customers (windfarms) may perceive the fair treatment to Network Rail. DH in reply to these points stated that Network Rail wish connection to be provided at 25 kV and a 40 year precedent had been set for which there is good reason. There are issues with bringing 132 kV connection inside the Network Rail boundary and the Railways Act provides rules for operations and restrictions on Network Rail property. DH also explained that Network Rail would certainly not adopt a 'fit and forget' approach to new/special technology. In general the TG agreed that there are good reasons to continue provision of 25 kV connection to Network Rail but the discussion should be brought to the ENFG.

ACTION 5: ENA (DS) to raise question to ENFG regarding connection provision to a normal customer versus non-standard voltage connection to Network Rail. The question needs to consider view points from OFGEM and the Office of Rail Regulation (ORR).

ACTION 6: GBr to discuss 25 kV Network Rail connection provision within organisation and report back to the TG.

4.2 Railway Systems (Clause 2)

DH and BGo explained that traction supplies via a 400/275 kV autotransformer (AT) connection have been developed from first principles and in general are based on Euronorms. This type of connection is not covered in P24. Clause 2.1 should be re-written take account of AT connections and update descriptions of feeding arrangements. It is proposed that Clause 2 is split into the two type of connection considered.

a) Classic 132 kV connections
b) 400/275 kV AT connections

Clauses 2.1.1 – 2.1.3 are largely still applicable.
In Clause 2.2, booster transformers are no longer applicable.
Clause 2.3 will require amending to take account of the latest traction technology e.g regenerative braking. It is proposed to retain historic background on technology where appropriate.
The TG agreed to consider non-standard connections such as DC traction supplies. DH explained that harmonics are more applicable to DC traction supplies than AC traction supplies.

ACTION 7: DH to initiate redrafting of Clause 2.

4.3 Types of Supply Point (Clause 3)

As discussed above, Clause 3 will require updating with the latest guidance on 275/400 kV AT connections.
GBr pointed out that the arrangements depicted in Figures 4a)-e) should be reviewed for compliance with ESQCR. In particular, the requirement for a 25 kV CB when the 25 kV switchgear is remote to the transformer connection. The length of the 25 kV feed from the transformer to the switchgear can vary from a 'stones throw' up to 8 km.
JP pointed out that owner/responsibility for the equipment should be clear in the guidance and diagrams.
DH agreed that the guidance in Clauses 3.1 and 3.2 for 'classic' connections should be updated.
Clause 3.2.1 for 25 kV switchgear was discussed in detail. The main points raised here were:

a) Network Rail do not install 25 kV GIS switchgear
b) 36 kV rated switchgear is not sufficient. 66 kV switchgear is over specified
c) Network Rail must comply with specific switchgear standards i.e. BS EN 50152
d) ENA switchgear standards do not cover specific switchgear for traction supplies
e) How will switchgear be assessed as compliant by ENA?

Other discussions on equipment specification concluded that there are numerous Standards known to Network Rail which should be referenced in P24. Many of these Standards will be new to DNOs and TSOs. Network Rail must all comply with TSI for interoperability for railway applications.

Voltage control needs to be addressed in P24 as OLTCs are required for connections to maintain voltage levels within BS EN 50388.

With regards Clause 3.2.3 (Interlocking), SS raised a question about nomenclature. Network Rail have a Standard for nomenclature but DNOs do not have common Standard. This should be recognised during the revision.

Clause 3.2.5 (Supply Booster Transformer) should be rationalised as booster transformers are no longer widely used.

Clause 3.2.6 (AC auxiliary supplies) should be reviewed against Network Rail's reliability requirements given that the LV distribution network is not always the most reliable.

ACTION 8: GBr to review P24 Figures 4 a)-e) for compliance with ESQCR.

ACTION 9: DH to initiate redrafting of Clause 3.

4.4 Load Estimating (Clause 4)

Network Rail are developing a 30 year projection for traction in the UK and a 10 year statement. They are capable of predicting loads to within 5 seconds on a route basis. The Network Rail system study tool is very powerful and capable of providing a lot of data including NPS, fault levels and return currents. The clause will require a thorough revision and the main requirement will be to capture what information and how much detail is required by the network operators.

A discussion around transformer and cable ratings raised the importance of equipment to have sufficient continuous rating. The 'Scott' transformer is a common special specification used at 132 kV.

ACTION 10: DH to initiate redrafting of Clause 4.

4.5 Standards of Security (Clause 5)

Minimal changes are expected to Clause 5 of P24.

4.6 Nature of Traction Current (Clause 6)

DH provided an overview of the developments in traction technology over the last 30 years. The early tap-change locos had step characteristics and were later replaced by thyristor rectifier bridges which used phase angle control and emitted a lot harmonics. The latest traction drives use inverter technology with high frequency bipolar transistors. These electronics produce very 'clean' sinusoids with only harmonics in the very high frequency range. Hence, harmonics are no longer an issue with modern AC traction drives and although Network Rail can carry out harmonic penetration analysis, this exercise is not applicable.

The TG agreed that Clause 6 should be rationalised and new guidance included for modern traction drives. It is agreed that Appendix B is no longer applicable as the HARP program is redundant and the Network Rail software tool can provide load flows using equivalent models for each connection point.

ACTION 11: DH to initiate redrafting of Clause 6.

4.7 Disturbance limits (Clause 7)

The TG reviewed the Table in the addendum and Table 2. BGo commented that the GCODE is subject to a change on the NPS limit. In addition, the NPS limits quoted by National Grid are on the primary side of a connection and not the secondary as identified in P24. These points should be considered during the revision of Clause 7.

ACTION 12: BGo to provide update on the changes to NPS limits in the GCODE.

4.8 System Disturbance Estimation (Clause 8)

Clause 8 was briefly discussed. In general, the study conditions for disturbance estimation should take account of modern arrangements. As before, harmonics are not an issue. All the figures associated with Clause 8 should be revised.

ACTION 13: DH to initiate redrafting of Clause 8.

4.9 Reduction of Disturbances (Clause 9)

It was suggested by DH that this clause can be slimmed down as harmonics are no longer a major issue. The topic of phase balancing is still very important and the practice of 'swinging' phases is not employed in practice.

The network operators commented that the minimum cost connection (2-phase) should be provided by default and 3-phase connections would have to be justified.

ACTION 14: DH to initiate redrafting of Clause 9.

4.10 Equipment (Clause 10)

The TG discussed the specification requirements for the various equipment.

- Transformers should be compliant with ENA TS 35 series where appropriate, however the specialist nature of application would mean that the transformer specification is unlikely to be covered in Standards in detail. Continuous ratings are most important and the requirements for tap-changers is also very important.
- Cables should be correctly rated (not 33 kV). Bonding is a particularly important issue as it is critical for earthing arrangements.
- Overhead lines are generally of trident design.
- Switchgear should be complaint with relevant Standards (BS EN).

ACTION 15: DH to initiate redrafting of Clause 10.

4.11 Earthing (Clause 11)

DH explained that BS EN 50122 requires a fixed limit of 645 V for 200 ms on Network Rail (this is the touch potential limit). This has implications for fault conditions, in particular for hot sites (400 kV). A major re-write of Clause 11 is required. Earthing assessments should be part of a feasibility study for connections. Lack of consideration of earthing issues has led to the abandonment of connections at a late stage in certain circumstances.

ACTION 16: DH to initiate redrafting of Clause 11.

4.12 Protection

The TG suggested that protection principles in ER G59 should be adopted in P24. This should be considered during the revision of TS 41-15 Part 9.

ACTION 17: SS/PJ to consider G59 principles when reviewing the TS 41-15 Part 9 rewrite.

4.13 System Monitoring (Clause 13)

The agreement of a sensible alarm and indications I/O schedule was discussed. The need to define the monitoring interface is important (mastering cabinets).

4.14 Terms of Reference (ToR)

RP reviewed the draft ToR with the TG. The following amendments to the ToR are required as agreed by the TG.

- Include a review of ETR 116
- Include a review of ER G38

The TG agreed that equipment specification is an important aspect, in particular for transformers. However, where the development of standalone documents for equipment specification is required, this should not be undertaken by the TG. The scope of P24 should remain as a reference source for the correct equipment standards/technical specification.

ACTION 18: RP to amend ToR

5. Revision Plan

RP presented a proposed revision plan for P24. The first draft of the revision will require a meeting between RP and DH to begin drafting work. The draft should be ready for review during the next meeting of the TG.

It was suggested that a schedule is prepared detailing a priority list of amendments and the information and actions required against each.

The date for the next meeting is to be confirmed. The timescale is the end of August 2015.

ACTION 19: RP and DH to arrange meeting and prepare first draft of P24 revision in time for next meeting.

ACTION 20: RP to prepare a priority schedule detailing required amendments to P24.

ACTION 21: RP to propose date for next meeting.

6. AOB

No other business tabled.

Summary of Actions from Current Meeting

Item	Action	Responsibility	Due by
1	Attendees to seek approval from their organisation for Chair nomination	JP, GBa, GBr	Next meeting
2	TG to consider if P24 is to remain an Annex 1 DCODE document or become an Appendix 2 DCODE document	All	End of Revision
3	RP to update membership details of P24 TG	RP	Next meeting
4	JP/SS to review scoping paper for proposed re-write of ENA TS 41-15 Part 9	SS, JP	Next meeting
5	ENA (DS) to raise question to ENFG regarding connection provision to a normal customer versus Network Rail. The question needs to consider view points from OFGEM and the Office of Rail Regulation (ORR)	DS	Next meeting
6	GBr to discuss 25 kV Network Rail connection provision within organisation.	GBr	Next meeting
7	DH to initiate redrafting of Clause 2	DH	Next meeting
8	GBr to review P24 Figures 4 a)-e) for compliance with ESQCR	GBr	Next meeting
9	DH to initiate redrafting of Clause 3	DH	Next meeting
10	DH to initiate redrafting of Clause 4	DH	Next meeting
11	DH to initiate redrafting of Clause 6	DH	Next meeting
12	BG to provide update on the changes to NPS limits in the GCODE	BG	Next meeting
13	DH to initiate redrafting of Clause 8	DH	Next meeting
14	DH to initiate redrafting of Clause 9	DH	Next meeting
15	DH to initiate redrafting of Clause 10	DH	Next meeting
16	DH to initiate redrafting of Clause 11	DH	Next meeting
17	SS/PJ to consider G59 principles when reviewing the TS 41-15 Part 9 rewrite	SS, PJ	
18	RP to amend ToR	RP	Next meeting
19	RP and DH to arrange meeting and prepare first draft of P24 revision in time for next meeting	RP, DH	Done, in progress
20	RP to prepare a priority schedule detailing required amendments to P24	RP	16/07/15
21	RP to propose date for next meeting	RP	16/07/15

Appendix A

ER P24 Task Group Inaugural Meeting

Attendance List
23rd June ENA Office, London

Attendees:

Name	Initials	Company
David Hewings	DH	Network Rail
Pavel Januska	PJ	SSE
Stuart Stone	SS	SSE
Gavin Baxter	GBa	Northern Powergrid
Graham Brewster	GBr	WPD
Ben Gomersall	BG	National Grid
David Spillett	DS	ENA
Gary Eastwood	GE	Threepwood Consulting Ltd
Richard Parke	RP	Threepwood Consulting Ltd

Apologies:

Mick Walbank	Northern Powergrid
Callan Masters	National Grid