

Minutes of the 2nd Meeting of the ER P24 Task Group

23rd September 2015

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

1. Welcome, Introductions

RP welcomed everybody to the second meeting of the ER P24 Task Group.

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

Round table introductions were completed for the benefit of first time attendees.

2. Address by Chair (Designate)

In his role as Chair (Designate), RP gave an overview of the meeting Agenda. It was agreed that the overall purpose of the meeting was to consider the technical details of P24 revision.

3. Appointment of Chair and Deputy

The Task Group were asked for their support by RP in agreeing the appointment of a Chair and Deputy. The following appointments were agreed.

Chair – Gavin Baxter

Deputy – Dave Hewings

4. Review and agree Terms of Reference (ToR)

4.1 Overview

RP presented the latest draft of the ToR (*P24 TG_ToR_v0.3_Issued*) to the Task Group. No further comments to the latest draft.

4.1 DCODE document

As part of the ToR, the Task Group are required to consider the validity of P24 remaining a DCODE qualifying document. The Task Group were all agreed that P24 should continue as the governing document for connection of traction of supplies with powers under the DCODE to ensure its implementation. Important voltage balance considerations are critical to the UK networks as currently referenced in the DCODE.

Network Rail have experienced numerous requests from Independent Connection Providers (ICPs) in the past offering to provide new 25 kV connections. In most cases these ICPs are unaware of P24 which re-iterates the need to have a governing document implemented by the DCODE.

It was agreed that the group would review a response to the DCRP clarifying the status of P24 as a DCODE document.

ACTION 1: RP to prepare a short brief explaining P24 validity as a DCODE document. The brief will include reference to the DCRP Constitution and Rules.

5. Review actions from previous meeting

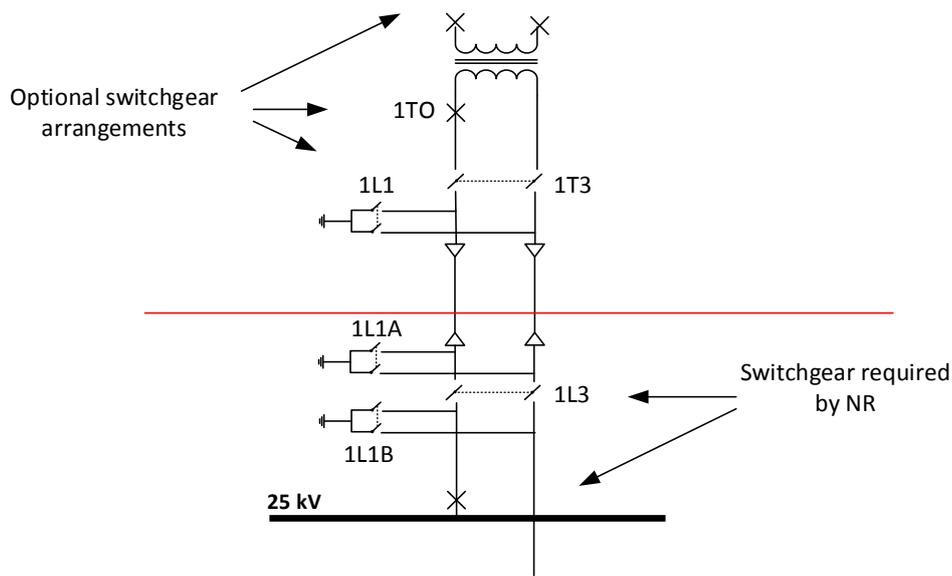
The Task Group reviewed the Actions from the previous meeting (*P24 TG Meeting 23 06 15 Minutes and Actions_v0.2_Issued*). All actions were agreed as complete with the exception of Item 17 which will be continued in further review of the protection principles in P24.

6. Review latest draft of P24

RP presented the latest working draft of P24 (*ENA_EREC_P24_Working Draft_22.09.15*) and the Task Group engaged in the following discussions.

6.1 Metering CB location

A basic diagram of a typical 25 kV connection was presented to the Task Group. GBr commented that ESQCR and EAWR regulations must be satisfied. PJ commented that duplication of equipment should be avoided. DH commented that Network Rail have a minimum requirement to have a circuit-breaker and disconnector at the traction compound. It was agreed that beyond the minimum requirements for Network Rail, the Network Operator requirements will depend on the design of the connection. A typical connection diagram should be shown in P24 indicating the equipment which is optional. An example is shown below.



ACTION 2: RP to prepare typical connection diagrams showing the optional equipment for consideration by a Network Operator.

6.2 Connection arrangement on HV/EHV network

Currently, P24 presents some typical examples of the connection arrangements (Figure 3 a-d). It was agreed by the Task Group that these diagrams should be simplified and only the relevant arrangements shown for information. The examples showing re-configurable overhead jumpers are not relevant and should be removed.

ACTION 3: RP to simplify the diagrams in P24 Figure 3 and remove those which are not relevant i.e. re-configurable overhead connections.

6.3 Protection philosophy for P24

PJ and SS presented a proposed protection philosophy which defined zones and the type of protection which should be employed. FG asked: why should protection be defined? FG suggested that protection design will always be optimised for the connection arrangement and the principles in G59 are typical of the guidance required. DH commented that Network Rail protection follows the principles in BS EN 50633 but for the 25 kV connection with the Network Operator this is dependent on the requirements of the individual company.

It was agreed that P24 should provide some guidance on protection and include an indicative example to the reader. The protection philosophy within P24 should meet the following objectives.

1. Protection principles at the boundary between Network Rail and the Network Operator must be agreed between both parties.
2. High level indicative protection requirements should be specified for the Network Operator owned equipment.
3. High level protection principles followed by Network Rail should be provided.
4. Commentary on typical faults (see P24 Issue 1 Clause 12.2) should be included as this provides useful information to the protection designer who may not be necessarily aware of the nature of traction supply connections.

ACTION 4: RP to discuss the update of the protection principles with SS and PJ.

6.4 Connection arrangements

The Task Group had a progressive discussion around the different connection arrangements which Network Rail use:

- a) Classic 25 kV transformer connection used on many 132 kV connections.
- b) Auto-transformer connection used on many 275/400 kV connections
- c) The Scott transformer connection which is still a developing technology. National Grid have appointed two engineers to assess the use of Scott transformers. There is still work to do and the absence of an earthed neutral on Scott transformers is a significant issue.
- d) The converter (power electronics) connection which is still developing technology. DH commented that Network Rail have a lot of development work in this area and foresee the converter option as 'up and coming'.

BGr commented that WPD would be nervous about including connection arrangements in P24 which are based on developing technologies.

The Task Group consensus was that established connection arrangements can be included in P24 as normative guidance. Developing technologies may be included in P24 but should be predominately for information. DH commented that it is a good opportunity to include developing technologies in P24 and over the next 5 years much knowledge and experience will be gained which would lend to a future revision of P24.

The Network Operators would prefer not to own equipment which is developing technology and for this to be managed by Network Rail. The general consensus of the Task Group is that P24 could employ a connection boundary which is dependent on the technology used:

- i. 25 kV connection boundary used for established arrangements i.e. classic and auto-transformer.
- ii. EHV connection boundary for developing technologies.

ACTION 5: Task Group to decide how developing technologies (Scott transformer and converters) are included in P24.

6.5 Earthing

RP explained that the ENA Earthing Co-ordination Group will study earthing issues for P24. A lot of background work was completed during the last revision of ENA ER G12, most of which is relevant for P24.

Network Rail have the ability to model earthing currents and an earthing study is completed for the each connection. The Task Group agreed that P24 should provide clear guidance for the completion of an earthing study.

6.6 Regenerative braking

There was some discussion regarding regenerative braking and whether it should be classified as embedded generation. BS EN 50388 has relevance for regenerative braking.

DH commented that over the next 5 years there will be a new rail industry charging methodology for train power consumption. In basic terms, the train operators would have a supply contract with Network Rail and consumption data will be collated.

ACTION 6: Regenerative braking to be included in P24 as a separate clause and guidance provided on implications for metering, protection and earthing.

6.7 Disturbance limits

National Grid have revised the NPS limit to a unified limit of 1.5 % across the UK. This is confirmed for England and Wales but discussions with Scotland are ongoing.

The most onerous NPS limit in P24 is for 132 kV connection and it is derived from ETR 116. Within ETR 116, the NPS limit of 2 % is set for a 1-minute period to align with machine protection. National Grid believe the 1-minute average limit is too harsh and suggest the limit is based on the average peak value over a 10-minute interval. The 10-minute average is explained in the National Grid report (report to be shared with Task Group).

FG has suggested that the 132 kV NPS limits are amended after consultation with the ENA Power Quality Group.

ACTION 7: RP to ask ENA Power Quality Group for guidance in relation to the NPS limits at 132 kV.

ACTION 8: FG to share the National Grid Power Quality Report with the Task Group.

6.8 Types of Supply Point

The Task Group agreed the following naming conventions for connection types:

1. Classic connection should be referred to as '1x25 kV' connection
2. Auto-transformer (AT) connection should be referred to as '2x25 kV' connection

The Task Group agreed that the Scott transformer is removed as a 'typical' connection arrangement. The Scott transformer will likely be described in a standalone informative clause or Annex.

The Task Group agreed to include overview diagrams and descriptions for the 1x25 kV and the 2x25 kV arrangements. The existing diagram in Figure 4 a) has an error. The diagram in Figure 4 b) is correct. It is intended to add new informative descriptions for 2x25 kV arrangements.

The use of Boosters with 1x25 KV connections is no longer relevant.

The majority of diagrams in Figure 3 will be removed. The guidance within Clause 5.2 will be simplified and should only emphasise the importance of phase pairings. The selection of phase pairings as described in Clause 5.3.1.1 is applicable to both 1x25 kV and 2x25 kV.

6.9 25 kV circuit-breaker

Reference to EAWR and ESQCR should be added to Clause 5.3.2 regarding circuit-breaker function. The reference to P18 as described in item b) is not required for P24 and should be replaced with a high-level statement.

6.10 Switchgear interlocking

The description of interlocking in Clause 5.3.4 should address the interface equipment. The Task Group agreed that the existing equipment nomenclature in P24 should be retained as it provides a sensible convention.

DH commented that Network Rail must adhere to IEC 61850. This must be addressed in the interlocking approach. Mechanical interlocking to be avoided. Electrical interlocking is acceptable. Software (IEC 61850) interlocking is preferable.

National Grid have an example of a document outlining the interface arrangements with Network Rail.

ACTION 9: RP to list equipment to be interlocked. PJ to provide a high-level approach to interlocking.

ACTION 10: National Grid to forward example interface document.

6.11 Equipment specification

The Task Group agreed that some guidance was required in P24 for equipment specification. The following discussion is relevant for P24 revision.

Transformer

MVA ratings should not be fixed. National Grid have provided a typical transformer specification. The critical values to be specified are: impedance, tapings, neutral capacity, winding bracings, short-circuit tests.

ACTION 11: RP to prepare transformer specification based on National Grid example

Cable

ACTION 12: RP to include typical examples of 25 kV and 66 kV cables. Cable specification should take account of switchgear design.

Overhead

Overhead line construction is relevant to 132 kV connections. The design should be based on existing ENA standards.

Network Rail design is based on N-1 scenario.

7. AOB

The date of the next meeting is 24/11/15.

Summary of Actions from Current Meeting

Item	Action	Responsibility	Due by
1	RP to prepare a short brief explaining P24 validity as a DCODE document. The brief will include reference to the DCRP Constitution and Rules.	RP	24/11/15
2	RP to prepare typical connection diagrams showing the optional equipment for consideration by a Network Operator.	RP	24/11/15
3	RP to simplify the diagrams in P24 Figure 3 and remove those which are not relevant i.e. re-configurable overhead connections.	RP	24/11/15
4	RP to discuss the update of the protection principles with SS and PJ.	RP,SS,PJ	24/11/15
5	Task Group to decide how developing technologies (Scott transformer and converters) are included in P24.	Task Group	Following next meeting
6	Regenerative braking to be included in P24 as a separate clause and guidance provided on implications for metering, protection and earthing.	Task Group	Ongoing
7	RP to ask ENA Power Quality Group for guidance in relation to the NPS limits at 132 kV.	RP	24/11/15
8	FG to share the National Grid Power Quality Report with the Task Group.	FG/BG	24/11/15
9	RP to list equipment to be interlocked. PJ to provide a high-level approach to interlocking.	RP	24/11/15
10	National Grid to forward example interface document.	BG/CM	24/11/15
11	RP to prepare transformer specification based on National Grid example.	RP	24/11/15
12	RP to include typical examples of 25 kV and 66 kV cables. Cable specification should take account of switchgear design.	RP	24/11/15

Ongoing Actions

Item	Action	Responsibility	Due by
	None		

Appendix A

ER P24 Task Group Inaugural Meeting

Attendance List

23rd September 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
Forooz Ghassemi	FG	National Grid
Richard Parke	RP	Threepwood Consulting Ltd

Apologies:

Callan Masters (CM)	National Grid
Ben Gomersall (BG)	National Grid