EREC G5 Stage 2 Sub-group

Meeting No. 2

To be held at William Gilbert Meeting Room, REEC Building, Sir William Siemens House, Princess Road, Manchester, M20 2UR

On Thursday 14th July 2016 10:00-15:00

Meeting Notes

Attendee	Affiliation	Initials	Role
Frank Griffiths	ABB	FG	Member
Andrew Oliver	TNEI	AO	Member
Simon Scarbro	WPD	SPS	Chair
Ahmed Shafiu	Siemens	AS	Secretary

Item	Topic & Note	Action
2.	Agree Notes of Previous Meeting Agreed.	
3.	Review Terms of Reference (ToR) (carried over from Mtg 1) Reviewed.	
4.	Modelled 11kV Impedance Versus Frequency Curves (see Mtg 1 Notes: 6.1) AO presented harmonic impedance scans for fifteen 11kV nodes in the Milton Keynes area based on detailed network modelling. The busbars are split across three BSP groups. A mixture of busbars was chosen: • At the 11kV side of a 33/11kV transformer • Mid way along an 11kV feeder • At the end of an 11kV feeder. The networks AO used modelled 132/33kV, 33/11kV, 11/LV transformers, 33kV and 11kV circuits and loads connected at LV with some limited loads modelled at 11kV also. The networks AO used were adapted from ones developed for a different project which isn't looking at harmonics so some caution is required. It was agreed that these impedance scans sat under the maximum impedance curve defined by the k values in EREC G5/4-1. It was observed that the scans showed no resonance up to h=8, unlike the measured data presented in ETR 112 that formed the basis of the k values in Table 8 of EREC G5/4-1. It was unclear why this was; SPS wondered whether it could be to do with parallel R-X rather than series R-X modelling. AO noted the omission of generation. Loading may affect damping and the model had a single loading level that was present in the adapted model. There were also no capacitor banks in the network. SPS had previously provided models that	

	had been developed for modelling rural, urban and mixed 11kV bar load so that could be looked at. AO agreed to look at this a little further. FG queried whether this might allow k=1 for h≤8 but AS and SPS cautioned against this given the measured data. SPS said that the group could, in the absence of certainty, recommend keeping the existing k-values and suggest further modelling/measurement work could be used to refine this in the future. SPS to try and obtain report underpinning ETR112: 5. ECRC Report M1681: 'Some Measurements of the Supply Impedance at Primary Substations over the Range 79-975 Hz.'	AO SPS
5.	Typical Current Emission Profiles by Equipment Types (see Mtg 1 Notes: 6.6) FG presented information that showed the current emission profiles for 6-pulse and Active Front End equipment. The 6-pulse values are higher than used in ACE 73. FG explained how these were used to calculate maximum kVA values for a 100kVA fault level based. Other types of equipment were discussed including heating applications, DC welders, UPS, 12-pulse devices, & 18-pulse devices. FG stated that 18 pulse devices are no longer in use. It was felt that these would be dealt with under Step 3 below (item 6).	
5.1	Voltage Source versus Current Source (carried over from Mtg 1) FG has previously highlighted how current source modelling can be inaccurate where the equipment is really a voltage source. If assumptions about source impedance and background voltage distortion are satisfied this can allow a simpler current source assessment. Voltage source representation can allow more accurate modelling and can be justified in some cases.	
6.	Alternative Approach – Predicting Voltage Distortion (see Mtg 1 Notes: 4) FG presented the suggested process for assessment. This was reviewed by the WG and various refinements made. The result was a Stage 2 process with 4 approaches to assessment involving increasing complexity: • Step 1: Assume 75% PL to derive kVA values that can be connected based on 60MVA Fault Level that can be scaled for actual fault level. • Step 2: Use actual background level to derive kVA values that can be connected based on 60MVA Fault Level that can be scaled for actual fault level. • Step 3: Use actual background level, emission profile and maximum impedance based on actual fault level approach (existing advanced Stage 2 approach) to predict compliance with PL. • Step 4: Use actual background level, maximum impedance approach based on actual fault level and Thevenin model to predict compliance with PL.	

	If connection still not possible then go to Stage 3. FG to revise draft flow chart and start drafting associated text and examples. SPS to try and provide reasoning behind division the maximum kVA by 6.	FG SPS
7.	Review/Revise Specification for Stage 2 (see Mtg 1 Notes: draft spec.)	
8.	Develop Draft Flow Chart See item 6.	
9.	Outline Stage 2 text/sections/tables to populate	
10.	Allocate Stage 2 text tasks SPS to produce outline headings.	SPS
11.	AOB The use of working power versus maximum power was discussed. Differing views were aired. SPS suggested a percentage of time approach may give some flexibility. Scan_Doc0049 on the issue of resonant plant was discussed. AS agreed to look further at this.	AS
12.	Future meetings • Dates To be agreed. • Agenda items To be agreed by email.	
13.	Close	

Draft Spec for Stage 2 Update (SPS version 1)

Serial	Item	Comment
1	Alignment with Stage 1 approach.	Agreed.
2	Include a 'Compliant with Resonant plant requirement?'	To be reviewed.
3	Aggregation as per general text. NB This will affect Table 10 & 12 values.	Linear aggregation to be used for derivation of kVA values (Step 1 & Step 2)
4	Extension to 100th harmonic.	All have some concern over this.
5	No allocation (except as inferred in the two tables, equivalent to Stage 1 tables 13 and 14).	To review basis of denominator of 6 used in ACE 73 to derive maximum kVA values.
6	Ignore transfer from upstream.	Agreed.
7	No alignment with Stage 2 of IEC TR 61000-3-6.	See serial 3 of Possible Review/requirements.
8	Improve clarity over scaling of values in Tables 10 & 12.	Agreed.
9	Update harmonic emission profiles used to derive Table 10. NB This will affect values in Table 10.	Agreed.
10	Change typical fault level to be more typical (e.g. 60MVA for 11kV). Dependant on approach used for item 8 this	Agreed for maximum kVA values (Step 1 & Step 2)

	would also feed into Table 12 values.	
11	Bring table 11 values into line with updated planning limits.	Not required.
12	G5/5 draft 6 brings all 33kV connections into stage 2, we should provide a view to the main group on whether including 33kV connections in stage 2 is appropriate. SPS post-meeting note: I have asked Forooz whether 33kV connections should go to Stage 3.	Assume Stage 2 does not apply to 33kV.

Minimum Requirements

Serial	Item	Comment
1	Update for voltage sources.	Agreed for Step 4.
2	Review Maximum Impedance Zh Envelope.	Agreed.
3	Consider including $S_i/S_c \leq 0.2\%$ simplified assessment.	FG to consider in developing flow chart.
4	Provide method of inferring HV levels from measurement at LV.	Agreed.
5	Revise assessment to predict voltage distortion on basis of fault level and % PL	Agreed.
6	Consider Stage 2 plus (simplified Stage 3) where the actual Z versus frequency driving point impedance is used rather than Maximum Impedance Envelope	Keep in Stage 3.
7	Consider if PWHD clause for many marginal current exceedences $23 \leq h \leq 50$ of table 12 is worthwhile or if the connection in that case should just proceed to the voltage calculation.	Not required.

Possible Review/Requirements