

DISCUSSION MEETING

Study Committee A3

Transmission and Distribution Equipment

Date 02.09.2022

SUMMARY

Chairman:	Nenad Uzelac (US)
Secretary:	Frank Richter (DE)
Special Reporters:	<u>Rene Smeets (NL)</u>, Nicola Gariboldi (CH), Tadao Minagawa (JP), Wayne Pepper (AU), Erik Sperling (CH)
Interactivity manger:	Martin Kriegel (CH)

1. INTRODUCTION

The 2022 group discussion meeting of Study Committee A3 was held on 02nd of September 2022 in room Bordeaux at the Palais des Congrès, Paris, France in a morning and afternoon session.

The Discussion Group Meeting was chaired by the Study Committee Chairman, Nenad Uzelac (US), with Rene Smeets (NL), Nicola Gariboldi (CH), Tadao Minagawa (JP), Wayne Pepper (AU), Erik Sperling (CH) as Special Reporters and Frank Richter (DE) as SC A3 Secretary. Martin Kriegel (CH) act as the interactivity manager. Rene Smeets who coordinated the work led the team of special reporters.

As already described in the Special Report, the papers received for the 3 preferential subjects were categorized into four groups with 20 questions in total. The discussion was also clustered into these groups, which were named as follows:

1. Miscellaneous T&D equipment and systems (16 papers) moderated by Tadao Minagawa and Wayne Pepper
2. SF6 alternatives (18 papers) moderated by Rene Smeets
3. Asset management, monitoring and diagnostics (9 papers) moderated by Nicola Gariboldi
4. Instrument transformers and digitalization (9 papers) moderated by Eric Sperling

The advantage of dividing into topics instead of ordering them into Preferential Subjects is that the experts can be addressed better and more specifically due to the large variety of the scope handled in SCA3. This resulted in a very good average participation rate.

2. RUNNING OF THE MEETING

The chair welcomed the participants. He gave a brief overview about Study Committee A3 and the ongoing work. After the introduction of the Chair a SparkUp poll was done to get more interactivity with the audience. SparkUp was always used after the breaks and in between to ask polls and discuss questions transferred by the auditorium.

The special reporters explain the procedure of the group discussion. Each topic is presented by an introductory lecture. Hereby, invited experts presented topic 2 and 4:

Topic 2 by Nina Stoa-Aanensen and

Topic 4 by Paolo Mazza.

The beginning was made by the Next Generation Network talk. Abigail Zafris gave an excellent contribution about “Monitor Data Management for Asset Failure Prevention”.

TOPIC 1: MISCELLANEOUS T&D EQUIPMENT AND SYSTEMS

Tadao Minagawa/ Wayne Pepper

16 reports were categorized into this topic and six questions were raised in the special report.

Generator circuit breaker (GCB) was dealt with in two reports and two prepared contributions about delayed current zero in the doubly-fed induction generator were presented. The convenor of WG A3.46 put words about present situation of the study on the issue as a spontaneous contribution. Two reports describe HVDC switchgear and relevant technical challenges in relation to standardization, and they were discussed by five prepared contributions. To the question in association with three reports on “metal vapor deposition in vacuum interrupter”, “controlled switching with high-resolution/high-bandwidth measurement” and “high-temperature superconducting fault current limiter”, improvements of technologies for new generations of T&D equipment were discussed by four prepared contributions.

The experiences related to “Safety with use of digitalization”, which was described in three reports, were introduced by two prepared contributions. A question about “Overstress”, Commissioning” and “Service life” in terms of equipment management was asked in the special report, and experiences on the issue were introduced by four prepared contributions. Two reports describe technical challenges for data management in monitoring, and the considerations on monitoring and diagnosis of disconnector associated to a pollution severity were presented in a prepared contribution.

TOPIC 2: SF6 ALTERNATIVES

Rene Smeets

Eighteen (18) reviewed reports were falling in this topic. In the GDM, seven questions from the Special Report were discussed by 20 prepared contributors from six countries. Prior to this, an overview on the urgency and the actual status of the technology in this topic was given by Nina Stoa-Aanensen from Norway, being a key member from WG A3.41 on current interruption in SF6-free switchgear.

The questions were on the following subjects:

1. The possible impact of increased filling pressure (four prepared contributions in the GDM)

2. Retro-fill issues and the role of sealings/gaskets (one contribution)
3. The impact of the “new gases” on temperature rise performance (three contributions)
4. Multi-break circuit breaker applications (two contributions)
5. Size, weight and footprint of HV SF6-free switchgear (three contributions)
6. Alternative gas management (two contributions)
7. Harmonisation of the variety of new mixtures into one-fits-all solution? (five contributions)

Two contributions were on MV switchgear, all others covered HV equipment, including LPIT. Seventeen (17) contributions were from manufacturers and were mainly oriented to remove possible concerns. One was from a TSO and two were on behalf of a national manufacturer’s organization.

Spontaneous contributions (around 15 short ones) was mainly directly from the audience, SparkUp was not used very much to transfer question to the contribution authors or the audthorium.

TOPIC 3: ASSET MANAGEMENT, MONITORING AND DIAGNOSTICS

Nicola Gariboldi

Nine (9) reports were grouped into this category from six countries. Three questions were proposed in the special report, two of which were discussed in six (6) contributions.

Controlled switching was quite a treated topic addressing different aspects like detailed quantitative evaluation of the Rate of Decrease of Dielectric Strength (RDDS), limitation of overvoltage at shunt reactor switching, capacitor bank insertion, limitation inrush currents while energizing power transformers.

The outlook seemed to be the integration into IEC 61850 as a configurable software module in a control and protection device.

Question 14 given in the special report about controlled switching technology and the possibility to be integrated in IEC 61850 digital substations were answered by three contributions from France, Sweden and Australia. The contribution can be summarized as follow.

Australia and New Zealand collected 25 years’ experience in different applications. Integration through IEC 61850 and the use of type POW relay for various CB brands was confirmed to be the outlook.

The increasing demand for this technology is due to the fact that it is becoming more and more trusted and has proven to be the most efficient solution for limiting overvoltage for various applications. Some concerns exist regarding commissioning and appropriate training.

Specifically on Asset management, monitoring and diagnostics five reports focused on different aspects like health indexing and reliability assessment methods for SF6 circuit breakers based on commonly available parameters, applications of Artificial Intelligence (AI), new wireless sensors, Internet of Things (IoT) and pattern recognition. For all the aim is to enhance the asset reliability by means of more the efficient use of resources and controlling the costs. There is also a proposal for the more traditional off-line test for high voltage circuit breakers. It is shown that, in contrast to current practice, the high voltage circuit breaker can remain grounded on both sides to improve the hazard and safety of the test personnel.

In response to question 16, which was specifically addressed to utilities, three contributions were presented to answer it: two from Japan and one from France.

Continuous monitoring with online access to data enables faster response and data transmission for post-processing and analysis. Wireless communication allows for easier installation, but requires special adaptation to ensure that all components in the substation are reached.

Regardless of the strategy or technology used, it was confirmed that improving maintenance efficiency and reducing costs were the driving motivations. One contribution was an increase of more than 70% in the labour efficiency of circuit breaker inspections. Another case study example showed that the inspection interval could be extended from 6 to 24 years.

TOPIC 4: Instrument transformers and digitalisation

Eric Sperling

Nine reports were summarized in the topic four. Six reports on conventional or low-power instrument transformers were transmitted. Three reports focus on monitoring aspects, machine learning and digital twins, as well as risk-based replacement of ITs.

Prior the discussion started, Paolo Mazza (Italy) introduced the topic with an impulse lecture and showed the challenges in the application and standardization of instrument transformers of different types.

In the Special Report four questions were formulated which were answered by seven contributions.

Finally, the chair closed the session, thanked all participants for the discussions and gave the hint to continue the discussions at the next two planned events in Birmingham (UK) and Cairns (AUS).

- 6. CONCLUSION

51 prepared contributions were shown. Several spontaneous contribution were given during the group discussion meeting. A discussion, which could be more livelier, followed most of the contributions. The Sparkup tool for interactive participation of the auditorium was an enrichment. Spontaneous contributions and suggestions provided many interesting ideas. The session was of interest to all participants from a technical viewpoint. The number of participants was over 130 (during the morning session), averaged more than 70.