Alternate Gases TF

October 10, 2016, Pittsburgh, Pennsylvania

3rd Task force meeting: IEEE PES Switchgear Committee Meeting **Chair**: Nenad Uzelac

Meeting Minutes

1. **Call to order and introduction:**

   In person meeting of IEEE Task Force on alternative gases started on October 10, 2016 at 10:17AM EDT.

2. **Attendance**

   Introductions were made. 16 members (out of 23) present with 36 guests in the first session. Refer to list of attendees in Annex.

3. **Previous Meeting Minutes**

   The minutes from 8/17/2016 were reviewed. A few comments were received and incorporated into Rev 2.

   No changes, additions, or objections.
   Minutes were approved. Motion to accept by George and seconded by Neil.

4. **Meeting Highlights**

   - Nenad provided a brief introduction on the purpose of the task force.
   - Nenad reviewed the list of members (23).
   - All information (presentations, contributions, etc) are on the Central Desktop (imeet).
     - Anyone who does not have access but would like to work on the task force, contact Nenad.
   - Each section of the report has a lead.
     - Literature (Neil McCord)
     - IEEE Switchgear (Carl Reigart)
     - IEEE Substation (George Becker)
     - Alternate Gases considerations - Technical (Daniel Schiffbauer)
     - IEC/CIGRE/T&D Europe (Jean-Marc Biasse)
   - Nenad reviewed the report outline.
     - Question: Did anyone contact the Transformer committee?
       - No, the scope for this project is just switchgear. Once report is written, ADSCOM and Substation can choose to approach other committees.
   - Nenad reviewed the meeting schedule.
     - JTCM has been confirmed (Thursday, January 12th, New Orleans.)
   - Contributions:
     - Literature review
       - Review of work performed by Current Zero Club. (Presented at CIGRE A3 – on August 22, 2016).

- Nenad will request permission to upload this presentation to central desktop.
- Conclusion of 1st section (SF_6): There is no known gas that combines all of the properties of SF_6.
- 2nd section (Toxicity):
    - Survey of all members and collection of publically available information.
    - Comment made on the toxicity of the by-products of some of the new gases.
    - Discussion on the considerations for filling, leak rates, toxicity, and etc.
    - Comment: Could we achieve the same benefit (decreasing impact of SF_6) by doing a SF_6 mixture?
        - SF_6/CO_2 mixtures have been studied. Results show that you have to maintain a relatively high percentage of SF_6 to maintain performance.
    - Comment: A new gas is a significant process and has technical challenges, should we just put the effort into correcting the issues in the field and reduce leaking moving forward?
    - Comment: It sounds like we need a sub-team for the report to focus on safety.
    - Comment: In Europe, there is a significant political pressure to move from SF_6, and many people have "jumped on the band wagon." It is probably going to happen here and we should guide it.
    - Conclusion:
        - In non-arced conditions, primarily non-toxic.
        - In arced conditions, not fully known.
- Switching section conclusion: There is a lack of information to make specific conclusions.
- Medium voltage conclusions:
    - MV operating temperature range will depend on application.
    - F-Ketones and F-Nitriles do not recombine after arcing.
    - No issues reported for internal arcing.

- Technical considerations overview:
    - Cost is not just the cost of gas, it is the cost increase in the product (to be compatible), cost increase of user equipment/procedures, and potentially cost to approach local PUC.
    - Concern about differences between manufacturers and there no longer being a common platform.

Conclusion of Session 1 (paused at 11:58 AM EDT.)
Session 2 called to order at 1:45 PM EDT

- Eldridge Byron explains the revision of IEEE PC37.20.9 D2A Draft Standard for Metal-Enclosed < 52 kV

- There is only “insulating” medium, not “interruption”, so some issues go away but some stay
- The standard formulates a number of provisions for case of an “other gas”
- As for temperature rise the new document will refer to “other gas” which for the moment is treated the same as air, for SF6 it refers to IEC 62271-1 2007 and it doesn’t take into account yet its evolution at current CDV stage
- Text in the standard will be: “Gasses other than SF6 shall be evaluated”
- Much refers to T&D Europe document
- The ballot pool is out and everybody is invited to join the ballot group, due somewhere in December.

- Eldridge also gives some feedback of the discussion on nameplates
  - Incorporate regulatory agencies like EPA, OEMs and other stakeholders
  - Prevalence of error
    - Total HV circuit breakers inspected: 221
    - HV CBs that had a nameplate (“density”) discrepancy greater than 1%: 184
    - HV CB with inaccurate nameplates greater than 1%: 31
    - Testing within 1% accuracy: 6

    That’s a startling number

- Koustubh Ashtekar presents “draft of the draft” Technical Considerations
  - This is about dielectric strength – not arc quenching features and provides and recommends test methods
  - It applies basic thermos dynamic identities
  - Testing and qualifying gas mixtures under uniform and not-uniform electrical field
  - On top of that BIL test
  - 3rd test is Partial Discharge
  - These three tests are used to find out dielectric strength, all based on ASTM standard
  - On top there is an instruction how to fill.
  - Dan Schiffbauer advises to take “brittleness” into consideration.

- George Becker Impacts on K0 Gas Insulated Substation Standards
  - 18 Working groups under K0
  - Number of impacts
  - In a number of standards there is already mentioning of mixed gasses (for low temperature)
  - Nenad suggests that we list aspects that we can’t judge yet

- Carl Reigart about switchgear – accumulated feedback from subcommittees
  - Nenad wonders what process to use to apply for all individual standards

- Jean-Marc Biasse gives overview of what’s happening in other parts of the world: IEC, Cigre and T&D Europe
  - Expectation of a Cigre document end of 2018 seems a little too optimistic
  - Assessment foreseen in July 2020 by the European Commission

- Next meeting:

  Webex Meeting – November 2016. Date to be announced. Watch for Doodle Poll.

  Nenad wants to start putting all contributions in a Word format in order to have a rough draft in December

5. **Meeting was adjourned at 3.25 PM EDT**

Submitted by:
Nenad Uzelac
IEEE Alternative Gases Task Force Chair

Annex A: Meeting Attendance October 10, 2016

X = present at meeting

	First Name:	Last name	Member	Company	1st Session	2nd Session
1	Arnaud	Ficheux	corresponding	GE	Absent	
2	Carl	Reigart	regular	Hubbell	X	
3	Dan	Hrncir	corresponding	Eaton	Absent	
4	Daniel	Schiffbauer	regular	Toshiba	X	
5	David	Rhein	regular	Hubbell	X	
6	Eldridge	Byron	regular	Schneider	X	
7	George	Becker	regular	Power Engineering	X	
8	James	Houston	regular	Southern Co	X	
9	Jean-Marc	Biasse	regular	Schneider	X	
10	Jerry	Wen	corresponding	BC Hydro	X	
11	John	Eastman	regular	Incon	X	
12	Karla	Trost	regular	G&W Electric	X	
13	Li	Yu	corresponding	Eaton	X	
14	Lukas	Graber	corresponding	Georgia Tech	Absent	
15	Neil	McCord	regular	Southern States	Absent	
16	Nenad	Uzelac	regular	G&W Electric	X	
17	Pat	DiLillo	regular	ConEd	X	
18	Paul	Leufkens	regular	Power Projects Leufkens	X	
19	Peter	Grossman	corresponding	Siemens	Absent	
20	Ted	Olsen	regular	Siemens	Absent	
21	Victor	Hermosillo	regular	Alstom	X	
22	Christian	Franck	corresponding	Swiss Institute of Technology	Absent	
23	Koustubh	Ashtekar	Regular	Eaton	X	

	First Name:	Last name	Member	Company	1st Session	2nd Session
	Joe	Kausek	Guest	First Energy	X	
	Michael	Whitney	Guest	S&C Electric	X	
	Rahul	Jain	Guest	S&C Electric	X	
	Chris	Ambrose	Guest	Federal Pacific	X	
	Chris	Lettow	Guest	S&C Electric	X	
	Stephen	Cary	Guest	GE	X	
	Matt	Williford	Guest	Schneider	X	
	Brad	Leccia	Guest	Eaton	X	
	Dave	Lemmerman	Guest	PECO	X	
	Dave	Nyberg	Guest	3M	X	
	Don	Martin	Guest	G&W Electric	X	
	Oscar	Montano	Guest		X	
	Paul	Found	Guest	BC Hydro	X	
	Dave	Feldman	Guest	HICO	X	
	Jinhu	Kim	Guest	Hyosung	X	
	Laura	Reid	Guest	Hubbell	X	
	Jacob	Blake	Guest	Hubbell	X	
	Brent	Richardson	Guest	Hubbell	X	
	Victor	Savulyak	Guest	DNV-GL	X	
	Bruce	Venne	Guest	Rockwell?	X	
	Tim	Royster	Guest	Dominion VA Power	X	
	Antone	Bonner	Guest	Eaton	X	
	Ron	Hartzel	Guest	Eaton	X	
	Zachary	Pintado	Guest	Entergy	X	
	Devki	Sharma	Guest		X	
	Paul	Barnhart	Guest		X	
	Helmut	Heiermeier	Guest	ABB	X	
	Nick	Vonfeldt	Guest	Ameren	X	
	Chris	Borck	Guest	Eaton	X	
	Dave	Gohil	Guest	AZZ	X	
	Vince	Chiodo	Guest	HICO	X	
	Neil	Hutchins	Guest	Southern Company	X	
	Francois	Soulard	Guest	Hydro Quebec	X	
	Ken	Edwards	Guest	BPA	X	
	Travis	Johnson	Guest	Xcel Energy	X	
	Carl	Schuetz	Guest	ATC	X	