

December 31, 2013

Mr. Michael Moon
Senior Director, NERC

Attachments: 1. NATF Initial Update on HVB 345 kV Breakers, dated December 31, 2013

References: 1. NERC Letter, dated August 27, 2013 – “345 kV HVB Breaker Advisory”

Dear Mr. Moon,

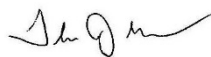
In response to your referenced letter, the North American Transmission Forum (NATF) has interacted with our members to promote further awareness of the subject advisory and to help characterize member actions taken and current field conditions.

To date, NATF members have accounted for approximately 80% of the relevant HVB breakers (791 of the nominally 1,000 breakers). We will continue interactions with NAGF, Trades, and other organizations to promote a comprehensive status as you requested by August 2014.

Our attached initial update report details NATF breaker performance history, member past and current actions to address related maintenance advisories, and some considerations for future actions to minimize reliability risks.

We appreciate the collaborative approach used by NERC with respect to this issue. We look forward to further dialogue on how to evolve future similar interactions to advance our mutual reliability objectives.

Sincerely,



T.J. Galloway
President and CEO, NATF

cc: G. Cauley, M. Rossi (NERC)
S. Ivey, S. Moore, S. Hathaway, R. Carter, K. Berent (NATF)
J. Anderson (Chair, MRC), A. Shriver (NAGF), P. Metro (NRECA)

NATF January 2014 Update - Hitachi 345kV HPI Circuit Breakers

Introduction

In August 2013 NERC issued a Level 1 Alert (Advisory) on Hitachi HVB (hereafter HVB) 345kV HPI single-break SF6 breakers, centering on a 2010 manufacturer maintenance advisory about loose hardware with the potential for breaker (nozzle) failures. Concurrent with issuing their August 2013 Alert (Advisory), NERC contacted the North American Transmission Forum (NATF), North American Generator Forum (NAGF), and certain Trade organizations to promote awareness and request assistance in evaluating and addressing reliability risks associated with this topic. Specifically, NERC requested those groups interact with respective members to ensure awareness of the issues described by the advisories and provide aggregated information back to NERC to help characterize actions taken and the current field conditions.

Shortly after NERC's request, NATF staff formed a team of relevant member subject matter experts (SMEs) and commenced periodic, formal interactions to share detailed information including breaker operating history, completed inspections and maintenance, lessons learned, and future plans. NATF's team took a comprehensive approach, reviewing member operational experiences with the subject breakers from multiple perspectives, starting from initial breaker in-service in 1988.

The NATF team quickly leveraged strong relationships from past and continuing efforts by and between individual members, groups of members, and the vendor (HVB) to gain a representative picture of historical breaker performance, actions related to the advisory, and appropriate future steps.

Background

HVB began selling the single-break HPI model SF6 345kV class breakers to customers around 1988. In the subsequent 25 years, HVB issued five (5) separate HVB advisories related to this type of 345kV breaker. The NATF advisory team focused on the three most relevant HVB advisories based on member applicability and prospective reliability impact.

2003 / Missing Loctite. The first relevant HVB advisory involved a limited number of pre-insertion resistors with set screws that were missing the required Loctite (prevents loosening of bolt). Affected customers were notified and HVB has since worked with these members to correct the issue.

2004 / Hardware Dimensions. The second HVB advisory involved a batch of contact/nozzle retaining ring hardware with incorrect dimensions (e.g., bolt length and/or washer diameter differed from specifications). Affected customers were notified and HVB has since worked with them to correct the issues. The condition originated when HVB shifted sourcing of some of its parts to suppliers whose dimensional tolerances were less stringent than original suppliers.

2010 / Loose Hardware, New Torque Values. The third HVB advisory (addressed in NERC's 2013 Alert (Advisory) was issued in 2010 for loose hardware with the potential for breaker (nozzle) failure. HVB notified and continues to work with affected customers to address the issue. HVB had determined that design safety factors related to hardware torque and nozzle weight needed adjustment. As a result, HVB recommended that breakers made from 1988 to 2007 (with the exception of the 40kA model produced from 1988 to 1992¹) be replaced with a newly designed nozzle to reduce overall nozzle weight. HVB also recommended that all HPI single-break SF6 models have their hardware replaced (including replacement of stainless steel bolts with black iron to increase strength) to accommodate increased torque. HVB has been extremely responsive to the NATF team, answering multiple added detailed questions with respect to the breaker design, performance, and appropriate actions.

NATF members that experienced a breaker failure have since inspected and performed HVB-recommended maintenance on those breakers. Most have completed replacing the original nozzle with the newer design. A few members who own this breaker type have not experienced any failures or reliability issues. These members are assessing various approaches to optimize the balance between risks cited in the advisory with those related to breaker removal from service / performing field maintenance. Assessment considerations include specific breaker application and service conditions, optimal integration with maintenance schedules, and evaluation of alternative, non-intrusive means of breaker inspection (e.g., X-Ray technology rather than opening the breaker and exposing it to unnecessary risks associated with external/outside elements and potential human error).

Summary

NATF is working closely with both the NAGF and applicable Trades organizations to ensure we are fully addressing the relevant breaker population while not reporting duplicative information from utilities who are members of two or more organizations.

For NERC's convenience, and for the purpose of including both NATF and NAGF information in a single initial update, information received from NAGF members is provided on the last page of this document. The NAGF members polled are in some cases also NATF members. So, the NAGF figures augment those provided directly by NATF but with some potential duplication. Any such duplication will be reconciled prior to the August 2014 update.

NATF believes this matter has been well communicated. We anticipate providing an even more comprehensive and detailed report per NERC's request by August 2014.

¹ The HPI breakers rated at 40kA interrupting current manufactured from 1988 to 1992 have a different type nozzle and did not need to be replaced.

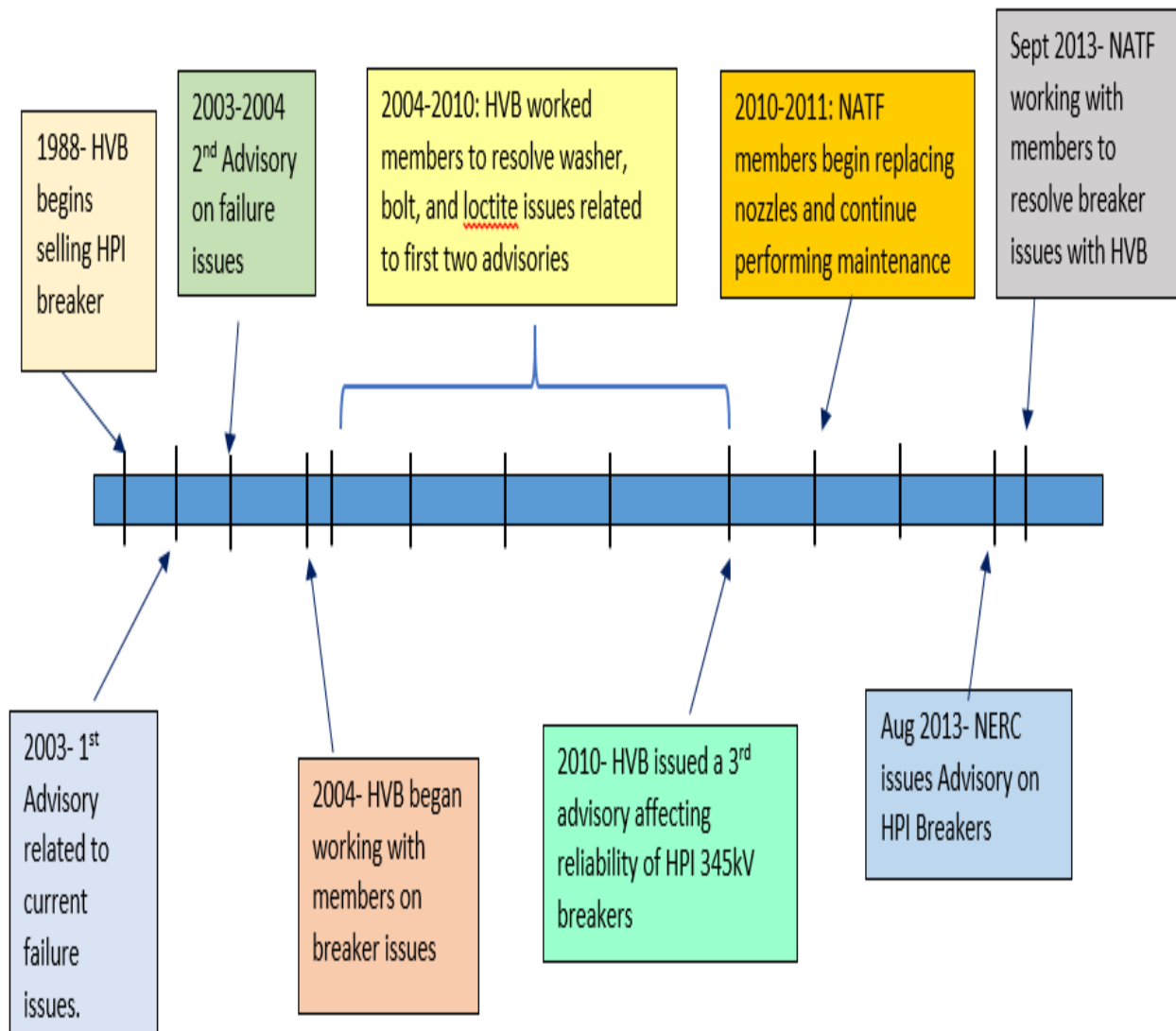
Operational Experience

The following information are key highlights of the operational experiences and actions collected from NATF members as of December 30th, 2013.

1. The NATF has accounted for 791 HPI SF6 breakers that are applicable to the three HVB maintenance advisories and the 2013 NERC Level 1 Alert (Advisory).
2. 531 of those 791 applicable breakers have been inspected, and 297 have had recommended maintenance procedures performed (e.g., increase torque on M8 socket head hardware from 8-10 ft. lbs. to 18 ft. lbs.).
3. Approximately 220 of the 791 breakers addressed in the NERC alert advisory and 2010 HVB advisory have had nozzles replaced with the newer design.
4. Of the 791 breakers owned by NATF members, 24 have incurred failures. Of those 24 failures, only 7 breakers actually failed due to the nozzle and torquing issues addressed in the 2013 NERC alert advisory and the 2010 HVB maintenance advisory.
5. NATF members have experienced and effectively addressed various reliability issues on more than 50 breakers unrelated to the 2010 HVB maintenance advisory. Those issues include: wrong hardware (e.g., bolts to be the wrong type or size), loose and smaller diameter washers, excessive lubrication in nozzle, inadequate Loctite (some breakers had none), operating pin preventing close, and oil low in dashpot.
6. NATF reviewed both the breaker manufacture dates and the failure data and have not, as yet, determined any relevant correlation.
7. Several NATF members have already completed the HVB-recommended inspections, maintenance and replacement work. Others have indicated they will complete maintenance and replacement work by the end of 2014, while a few remaining members should be completed within three years.
8. For those members who have experienced failures, the number of operations at the time of failure varied from as few as 14 operations to more than 1000, indicating there is no certain threshold whereby exceeding breaker operations it would cause failures to occur.
9. HVB believes inspections, maintenance and replacement of hardware and nozzles as prescribed in the three maintenance advisories are sufficient to preclude added failures.
10. NATF will continue work with members and HVB to accurately represent actual failure rates related to different causes and operating influences.

The timelines and charts below provide summary information collected from NATF members and HVB representatives:

Timeline of 345 kV Breaker Activities with Forum Members



Timeline of Forum Member Breaker Failures

