

TO: NERC Board of Trustees (BOT)



FROM: T.J. Galloway, NATF President and CEO

SUBJECT: NATF Periodic Update to the NERC BOT – August 2014

Attachments: 1. Summary of NATF / NERC Coordination Topics
2. NATF near term focus and activities
3. 345 kV Breaker Status Details (dated July 7, 2014)

The North American Transmission Forum (NATF) mission is to promote excellence in the reliable operation of the electric transmission system, with the vision to see reliability continuously improve. As such, the NATF shares many common objectives with NERC. To advance these common objectives, and avoid redundant or conflicting efforts, we have undertaken periodic (roughly quarterly) strategic coordination meetings between the senior leadership of both organizations. The last such meeting was completed June 13, 2014. A summary of the coordination topics and NATF status/actions are presented as attachment 1.

In addition to specific points of coordination, the NATF has a number of activities underway that benefit reliability, security, and resiliency that are likely of interest to the NERC BOT. These activities and initiatives are detailed in attachment 2.

Lastly, NERC had requested support and coordination with the NATF and other organizations following issuance of the October 2013 Advisory (Hitachi HVB 345 kV breakers). Per that request, the NATF has coordinated with our members and other organizations to promote awareness of the issue and to provide detailed status of the subject breakers. This effort was extremely successful, resulting in identification of **over 97%** of the subject breakers. Detailed results are contained under attachment 3.

cc:

NERC: G. Cauley, NERC President and CEO; M. Moon, Senior Director
NATF: R. Carter, K. Berent, C. Sills, Letter Log

Attachment 1 - Summary NATF / NERC Strategic Coordination Topics

Topic	NATF Status / Details
345 kV Breaker Alert and follow up activities	Coordination with NATF members and various other groups to promote awareness of NERC 345 kV breaker Advisory and related industry status. See details under attachment 3.
Protection System Misoperations	<ul style="list-style-type: none"> • NATF has a longstanding system protection practices group. • A 2013 NATF initiative was created specifically to help reduce misoperations by performing detailed analysis of data from a member subset. • Principle causes identified matched those of the MisOp task force. Namely: <ol style="list-style-type: none"> 1. Relay setting errors 2. Communication channel problems 3. Relay failures • Several contributors were identified to these causes including: <ul style="list-style-type: none"> ○ Application and setting of Directional Comparison Blocking Schemes ○ Failure rates of electro-mechanical relays ○ Complexity, knowledge/skills gaps regarding micro-processor settings ○ Impedance modeling, quality checks and lack of relay setting templates • NATF has created and is reinforcing a “superior practices” documents for relay setting and testing. Separate practice documents covering other misoperation aspects are being developed. A comprehensive NATF workshop focused on the above topics is planned for completion by 1Q15.
Critical Infrastructure Protection (CIP)	<ul style="list-style-type: none"> • Longstanding, active, and well-attended security practices group. • In October 2013 we added physical security work group. • Cyber/Physical are both standard parts of our peer review scope. • Project team efforts produced a comprehensive CIPV5 implementation guide. • Active member coordination is ongoing for CIP-014 implementation. • Significant increases planned regarding NATF security related assistance visits
Reliability Assurance Initiative (RAI)	<ul style="list-style-type: none"> • Risk/Controls has been a topic of heavy focus for about last two years. • Risk/Controls were added as a standard peer review element in 2013. • R/C focus has evolved to a broader focus of Governance, Risk, and Controls. • NATF evaluating “endorsing” certain aspects of members GRC programs.
Modeling	<ul style="list-style-type: none"> • Two NATF Modeling practices were shared with NERC (January 2014) to preclude the need for NERC/Technical Committees to generate similar documents. These documents are: <ul style="list-style-type: none"> ○ Generator specifications for planning, Ops, and real-time ○ Power flow modeling reference document
Geomagnetic Disturbance (GMD)	<ul style="list-style-type: none"> • NATF administered detailed member surveys to better gauge member understanding of GMD and actions towards mitigation. Generic results were shared with NERC GMDTF to help hone focus. • Conducted two GMD workshops (October 2013 and February 2014). • Ongoing, periodic coordination with the GMDTF to preclude duplication.
Facilities Rating Alert follow-up activities	<ul style="list-style-type: none"> • Working on superior practices for ongoing ROW maintenance.

Attachment 2 - Other NATF Focus and Activities

NATF / EPRI Collaborations

- Resiliency: Organizing a comprehensive, “all hazards” approach.
 - Severe Weather
 - Physical Security,
 - GMD Workshop(s),
 - EMP Workshop,
 - Resiliency Capstone (Oct 2014)
- Equipment Performance and Maintenance
 - Shared insights on failure rates, causes, and corrective actions
- Strategy Sessions: Grid Operations and Planning Synergies

NATF / INPO Collaborations

- Shared Operating Experience / LOOP Reductions (IER 13-53)
- Nuclear plant switchyard self-assessment tools
- Emergency power runtime / fuel supply replenishment

Other / General

- Systematic Interaction with Members / ERO on Reliability Assurance Initiative (RAI)
 - Sharing of Key Principles and Lessons Learned
 - Strong Risk / Controls focus in Peer Reviews
 - Preparing Members for risk-focused audits
 - Interacting with ERO Staff (workshops, etc.)
- NATF 2014 Peer Review Program Fully Integrates:
 - Risk Assessment and Internal Controls
 - Human Performance Error Reduction
 - Operating Experience Exchange
 - Physical Security
- Other Recently Completed / Near Term Activities
 - Compliance Practices Workshop (focus on Risk / Controls)
 - Human Performance Symposium
 - System Operations – EMS focus
- Implementation of a comprehensive peer challenge board concept for member events

NATF Report Attachment 3, 345 kV Breaker Status



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July 7, 2014

Mr. Michael Moon
Senior Director, NERC

Attachments: 1. NATF July 2014 Update on HVB 345 kV Breakers, dated July 7, 2014

References: 1. NATF Letter, dated December 31, 2013 – Initial Update 345 kV Breakers
2. NERC Letter, dated August 27, 2013 – “345 kV HVB Breaker Advisory”

Dear Mr. Moon,

In response to NERC’s request for cooperation, the NATF is providing the 2nd of two HVB 345kV breaker updates in advance of NERC’s August 2014 BOT meeting. In addition to NATF data, this report incorporates available breaker information from the North American Generator Forum (NAGF), American Public Power Association (APPA), and the National Rural Electric Cooperative Association (NRECA) on behalf of their respective members. The report and associated development activities has served to promote heightened industry awareness of the subject advisory and an accurate and comprehensive characterization of current field conditions.

To date, the NATF in conjunction with the above mentioned organizations, has accounted for over **97%** of the relevant HVB breakers (972 of the nominally 1,000 breakers).

Our attached report details entities’ breaker performance history, past and current actions to address related manufacturer maintenance advisories, and some considerations for future actions to minimize reliability risks.

We appreciate the collaborative approach 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,

A handwritten signature in black ink, appearing to read "T.J. Galloway".

T.J. Galloway
President and CEO, NATF

cc: G. Cauley (NERC), P. Metro (NRECA), A. Mosher (APPA), and A. Shriver (NAGF)
NATF: R. Carter, K. Berent, C. Sills

NATF Report Attachment 3, 345 kV Breaker Status



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NATF July 2014 Update on Hitachi 345kV HPI Circuit Breakers

Introduction

In August 2013 NERC issued a Level 1 Alert (Advisory) on Hitachi's 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.

The NATF submitted the first of two requested updates to NERC on December 31st, 2013 and included 345kV breaker information from not only NATF members but also from the NAGF members. Beginning in February 2014, the NATF began working closely with the APPA and the NRECA to obtain operational experiences from their members and have included that information in this report.

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.

NATF Report Attachment 3, 345 kV Breaker Status



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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 exposing it to risks associated with external/outside elements and potential human error).

Summary

NATF has worked with its members in an expeditious manner since October 2013 to obtain information on their operating experiences with the breaker. We also began collaborating and working closely with the NAGF in November 2013 and with the APPA and NRECA organizations in February 2014. The NAGF, APPA, and NRECA members polled are in some cases also NATF members. Consequently, the NATF has carefully coordinated with these organizations to ensure the information obtained is not duplicative between any two organizations.

For NERC's convenience, and for the purpose of including NATF, NAGF, APPA, and NRECA information in a single update for the upcoming August 2014 NERC Board meeting, information received from these organizations to date are being provided in this document.

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.

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Operational Experience

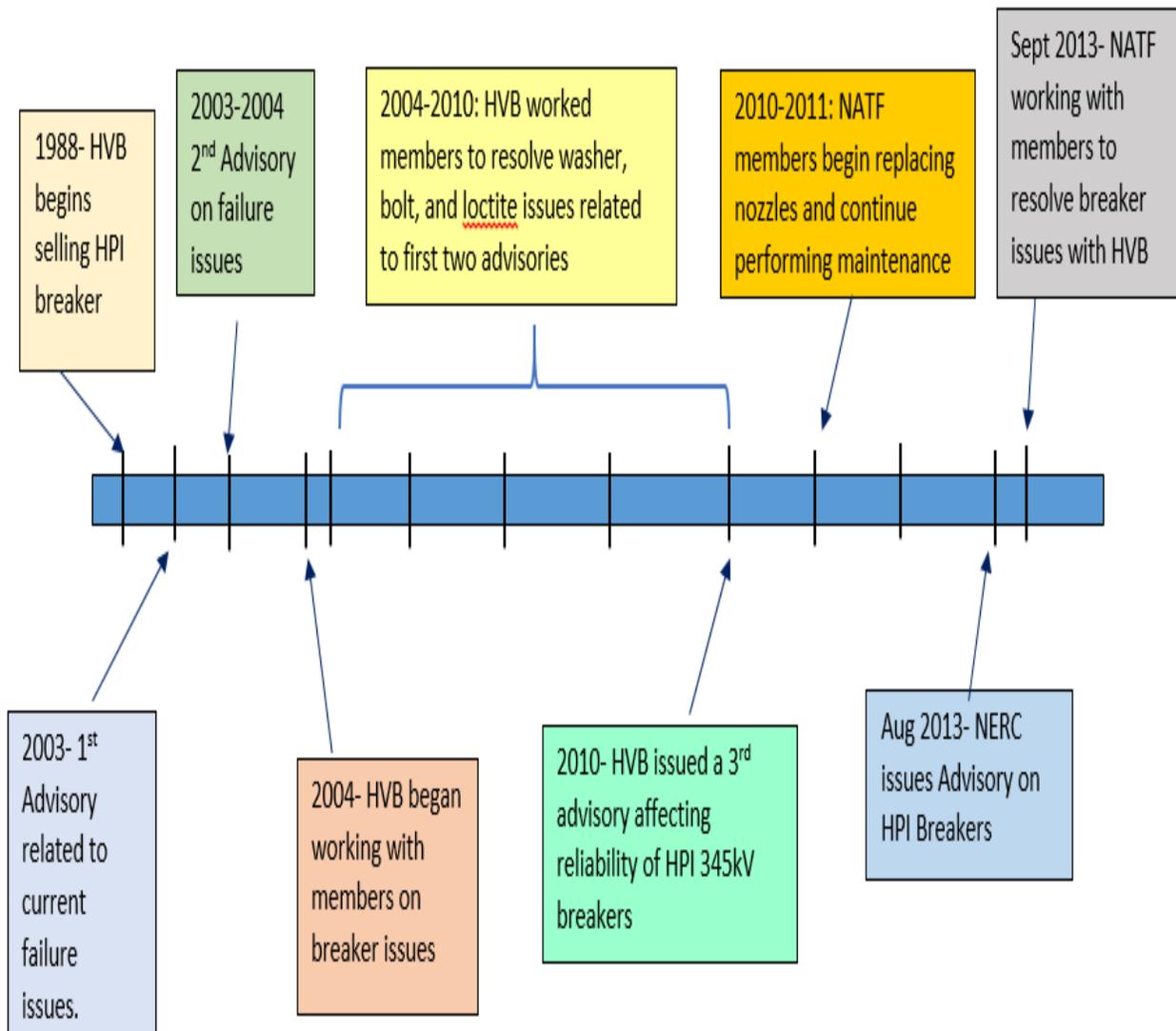
The following information are key highlights of the operational experiences and actions collected from NATF members as of June, 2014.

1. The NATF has accounted for 972 HPI SF6 breakers (includes NAGF, APPA, and NRECA member information) that are applicable to the three HVB maintenance advisories and the 2013 NERC Level 1 Alert (Advisory).
2. 725 of the 972 applicable breakers have been inspected and 490 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 433 of the breakers have had their nozzles replaced with the newer design.
4. Of the 972 breakers that are applicable to the three HVB advisories, 35 have failed. Of those, only 11 breakers actually failed due to the nozzle and torqueing issues addressed in the 2013 NERC alert advisory and the 2010 HVB maintenance advisory.
5. Entities have experienced and addressed reliability issues on more than 60 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 year the breakers were manufactured and the year they failed and have not determined any trending or found any particular year that stands out as a concern over another.
7. Some entities have already completed the HVB-recommended inspections, maintenance and nozzle replacement work. Others have indicated they will complete maintenance and replacement work by the end of 2014, while the remaining entities will optimally incorporate this work into their normal equipment maintenance schedule.
8. For those entities 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 it would cause certain failures to occur.
9. HVB believes inspections, maintenance and replacement of hardware and nozzles as prescribed in the manufacturer maintenance advisories are sufficient to preclude added failures associated with those advisories.



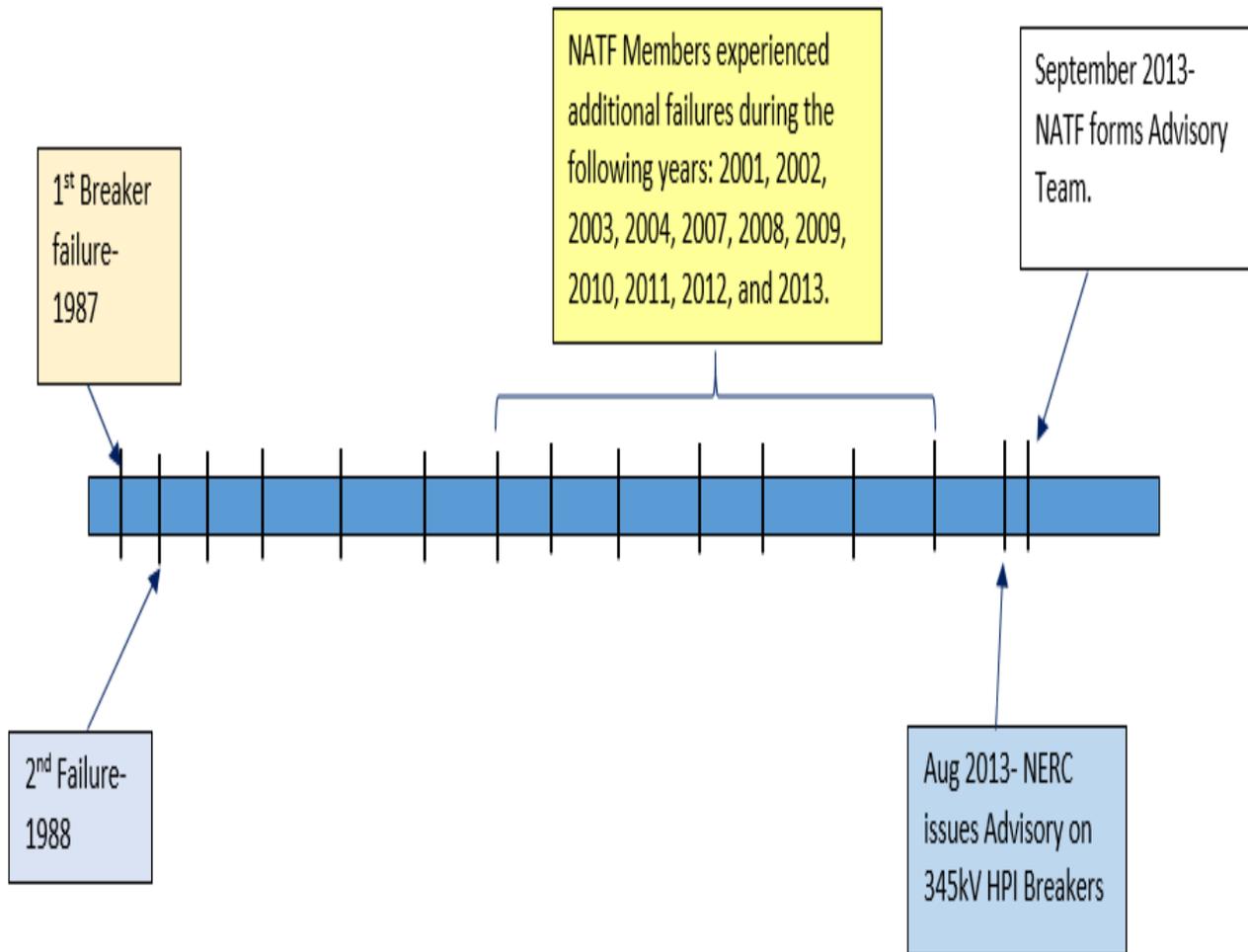
The timelines and charts below provide summary information collected from NATF members and HVB representatives:

Timeline of 345 kV Breaker Activities with Forum Members





Timeline of Forum Member Breaker Failures





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