



Davis Besse EDG Failure Field Flash Selector Switch May 2021

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U.S. Nuclear Regulatory Commission
2022

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Event Summary

- May 27, 2021 - Fast-Start Surveillance Test – EDG 1
 - Test Performed with Field Flash Selector Switch (FFSS) in the 400 RPM (Emergency Start) Position
 - Diesel Started and Reached 900 RPM
 - EDG Failed to Reach Rated Voltage and Frequency
 - Investigation Found Generator Field Had Not Flashed
 - Licensee Chose to Stop Test and Shutdown EDG



Event Summary

- May 27, 2021 - Fast-Start Surveillance Test – EDG 1
 - During EDG Shutdown, Field Flashed After Licensee Placed the FFSS in 800 RPM (Idle Start) Position.
 - Licensee Continued With EDG Shutdown
 - In-situ Testing Found FFSS Emergency Start Contacts Failed 2 / 5 Times
 - Licensee Replaced FFSS
 - EDG Retested and Declared Operable May 28, 2021



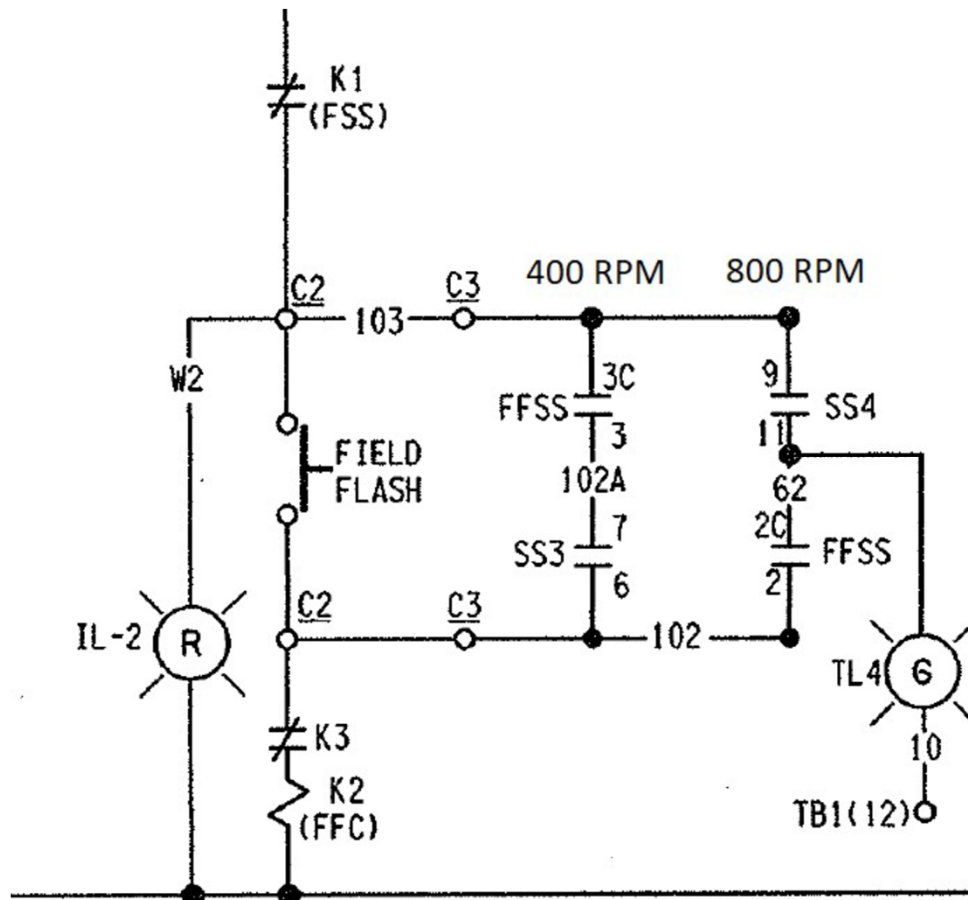
EDG Field Flash Selector Switch

- GE SBM Control and Transfer Switch
- Panel Mounted
- Rotary Cam Operated Switch

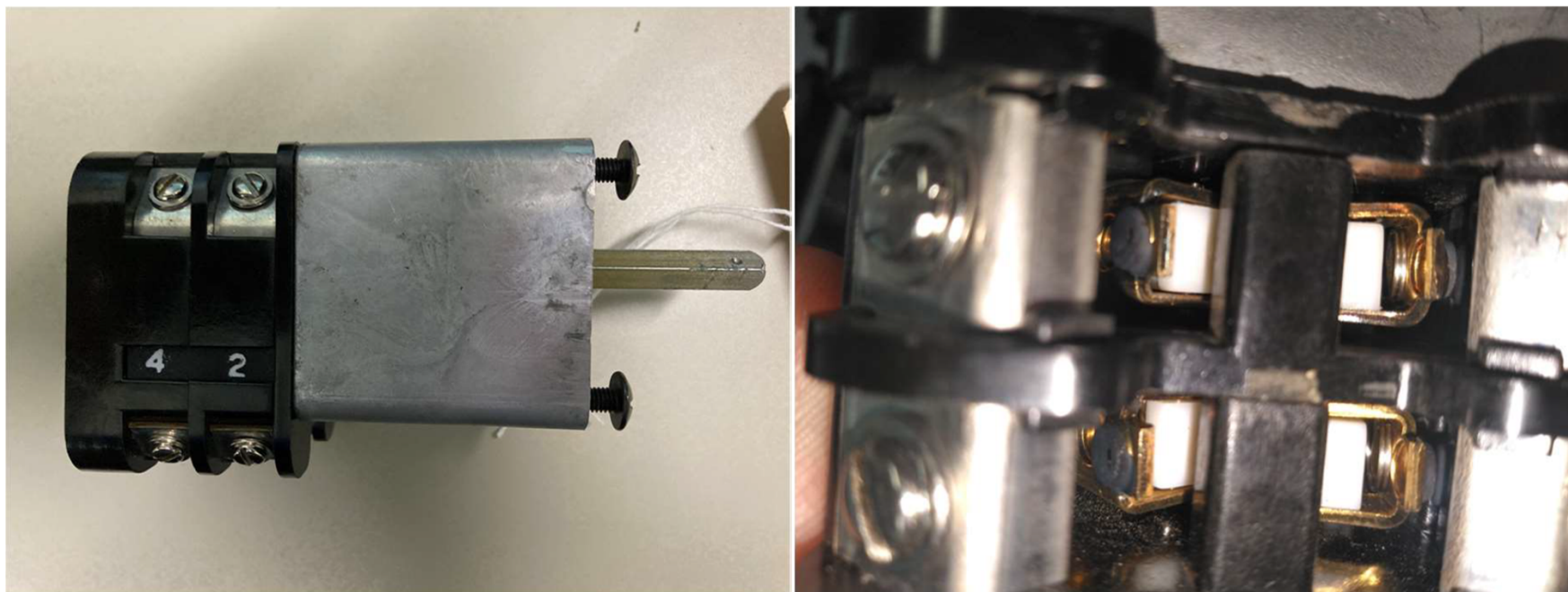
EDG Field Flash Selector Switch

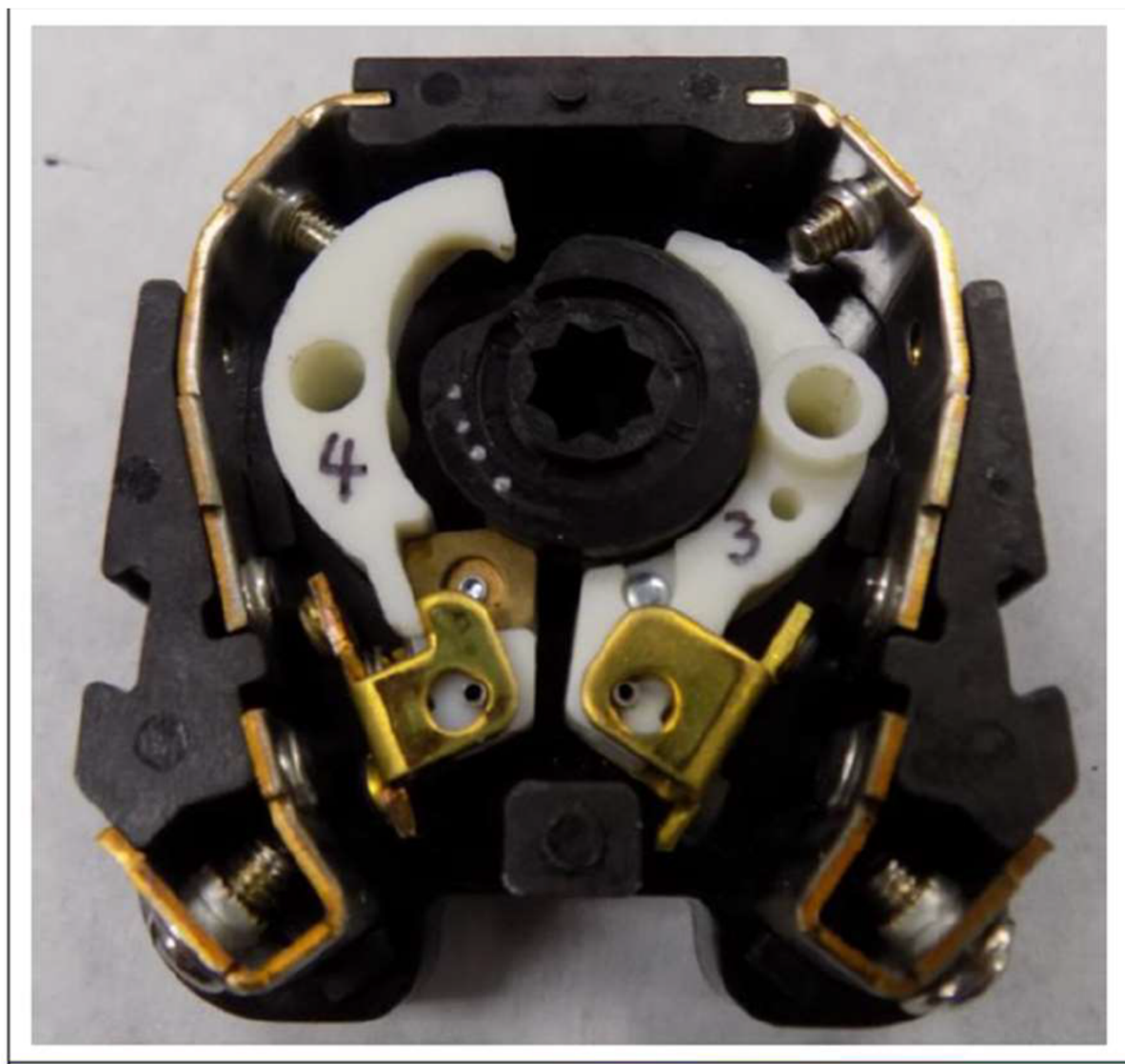


EDG Field Flash Circuit



EDG Field Flash Selector Switch







Licensee's Preliminary Investigation

- Contacts Failed From Fouling on the Contacts
- GE Type SBM Vendor Instructions:
 - At regular intervals, the switch contacts should be inspected for wear and burning
 - If contacts are coated with sulphide, they should be cleaned
- Licensee CR: “No PM is currently performed on the switch, leading to fouling that is present on the contacts. Part of the resolution will be to create a PM to clean the contacts on these switches.”



Independent Failure Analysis

- Multiple Vendors
- Intrusive and Non-intrusive Inspection
- Contact Resistance Checks
- Functional Testing
- Failure Modes Analysis

Photo 20 – Stationary Contact 3



Photo 21 – Stationary Contact 3C



Photo 11 – Stationary Contact 2



Photo 12 – Stationary Contact 2C



Photo 22 – Moving Contact 3

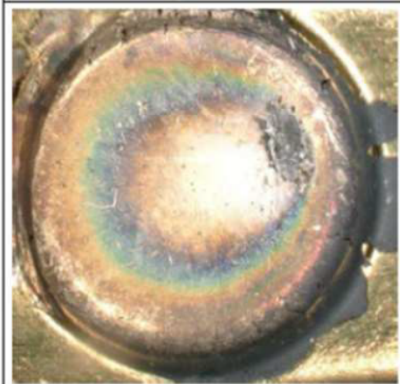


Photo 23 – Moving Contact 3C



Photo 13 – Moving Contact 2



Photo 14 – Moving Contact 2C





Post-Failure Custody / Quarantine

- May 27, 2021 - Failure / Troubleshooting
- June 3, 2021 – Contacts Photographed
- September 9, 2021 - Switch Prepared For Shipment For Inspection / Testing



Licensee Post-Failure Analysis Conclusions

- Switch Failure Was Not Contact Fouling From Lack of PM
- Found Nickel Contamination on Contact
- Postulated FME From Upper Terminal Screw Location
- PM Performance Deficiency Did Not Cause May 27th Event



Apparent PD / Violation

- The Team concluded that the failure to develop a preventive maintenance schedule for the inspection of the FFSS, was contrary to Technical Specification 5.4.1 and Section 9.b of Regulatory Guide (RG) 1.33, Revision 2, February 1978, and constituted a performance deficiency.
- Davis-Besse TS 5.4.1(a) requires the licensee to establish, implement, and maintain applicable written procedures for the safety-related systems and activities recommended in RG 1.33, Revision 2, Appendix A, February 1978.
- Section 9.b of RG 1.33, states, in part that preventive maintenance schedules should be developed to specify lubrication schedules, **inspections of equipment**, replacement of such items as filters and strainers, and inspection or replacement of parts that have a specific lifetime such as wear rings.



Preliminary GTG Finding December 16, 2021

- **FFSS Fast Start Contacts**
 - 184-Day TS Test Frequency
 - Previously Tested November 12, 2020
- **Preliminary PRA Evaluations Produced Greater-Than-Green Results**



Regulatory Conference

- Licensee Discussed Conservatism in the PRA Model
- Key Areas Evaluated:
 - Exposure Time
 - Operator Recovery
 - Model Conservatism
- Licensee Significance Estimate
 - White



Regulatory Conference

- Licensee reiterated that they changed their perspective from the initial investigation:
 - Determined that a PM to inspect the FFSS contacts FFSS would likely have not prevented the May 27th event
 - Significance of the performance deficiency associated with the FFSS should not be based on the May 27th event



Regulatory Conference

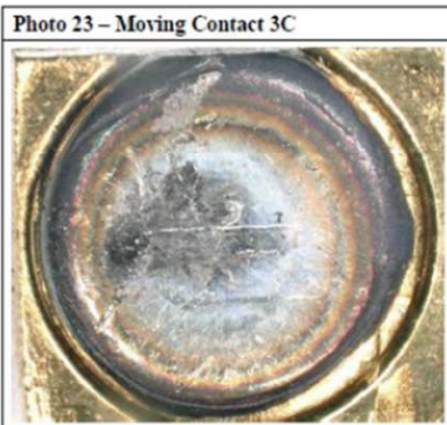
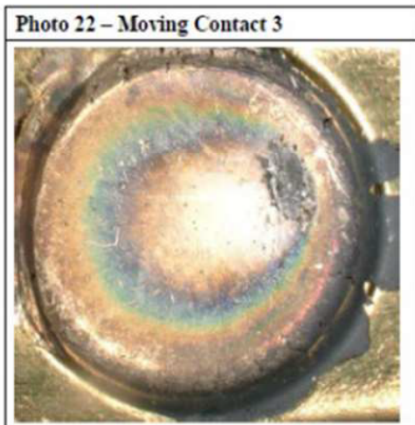
- Licensee Actions Taken:
 - Replaced FFSS on both EDGs
 - Test Procedure Enhancements – Continuity Checks Following Switch Manipulation
 - Procedure Enhancement – Field Flash Pushbutton use added to Emergency Use section of Operating Procedure
 - Initiated Enhancement PMs to Inspect / Replace FFSS
 - EDG Reliability Assessment



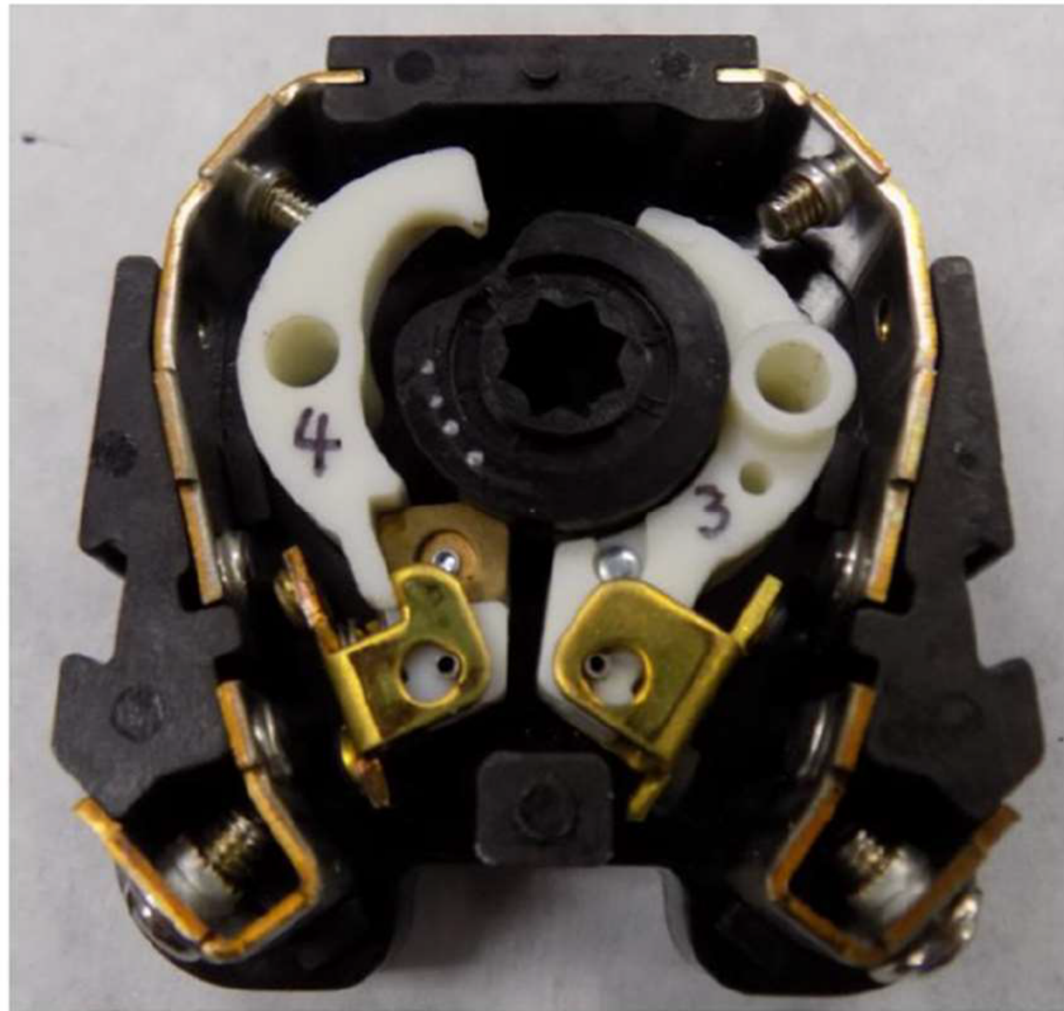
Regulatory Conference

- Licensee Modifications Being Considered:
 - Install an indicating light for the switch contacts when returned to the 400 RPM position to validate circuit integrity
 - Redesign field flash circuit to remove dependence on the 400 RPM contact

Regulatory Conference



Regulatory Conference





Final Closure Letter

- Agency concluded that the cause of the malfunction was not certain
- Licensee PM schedule decisions were reasonable at the time of the modification
- The switch failure was not reasonably within the licensee's ability to foresee



Final Closure Letter

- Under the ROP, equipment failures that are not caused by a performance deficiency are considered part of the baseline risk of the facility, in which equipment failures can occasionally occur.



SIT Unresolved Item FFSS

- 2006 Voltage Regulator / FFSS Modification
- TS Surveillance Testing Adequacy



Public ADAMS Documents

- Special Inspection Report **ML21321A365**
- Preliminary GTG Letter **ML21348A767**
- Reg Conference (NRC) **ML22028A397**
- Reg Conference (Licensee) **ML22028A392**
- Reg Conference Summary **ML22084A102**
- Closure Letter **ML22109A157**



Internal ADAMS Documents

- **First FFSS IFRB ML21298A241**
- **Second FFSS IFRB ML21309A119**
- **SERP ML22003A084**



Questions