

SAFETY ALERT



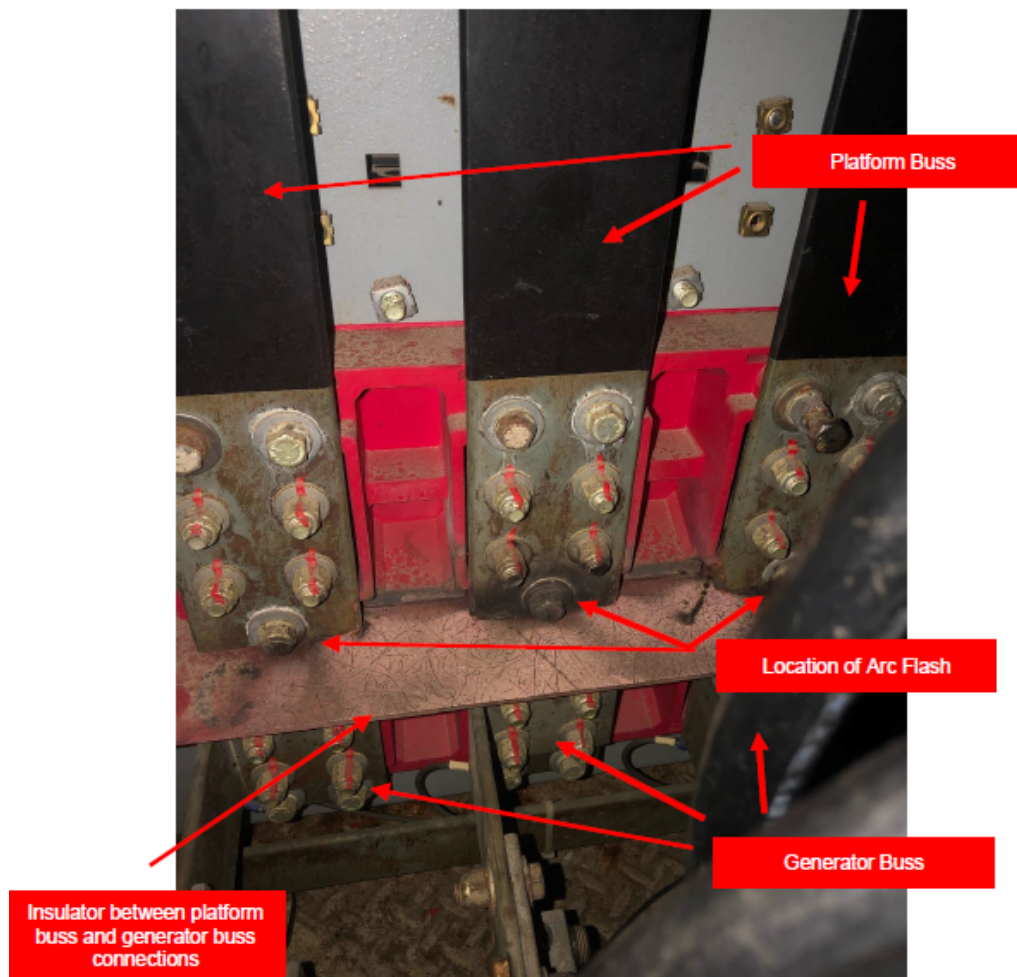
Safety Alert No. 436

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Arc Flash Injury During Generator Hookup



In Dec. 2021, an operator was using the natural gas-powered generator for main power and a rental generator for backup power, as the regular diesel backup generator was down for repairs. Once repairs to the diesel backup generator were completed, plans were made to disconnect from the rental generator and connect to the diesel backup generator. The Person in Charge (PIC) and electrician walked down the job, verified the breaker's proper open position, and conducted Lock-Out/Tag-Out (LO/TO) on the rental

generator. The PIC and electrician verified that the engine control switch on the diesel backup was in the proper position and verified the diesel backup breaker was also in the proper open position. The electrician checked all sides and contact surfaces on the bus to verify voltage to ensure that the job was safe to commence.

The electrician disconnected the rental generator cables and installed the first cable of the diesel backup generator. He then connected the next cable of the diesel backup to the bus. When the cable touched the attachment lug, an arc flash event occurred, which caused the main natural gas generator to shut down. Arc flash is a phenomenon where a flashover of electric current leaves its intended path and travels through the air from one conductor to another or to ground. As a result of the arc flash, the electrician received a second-degree burn to his arm. The job was stopped, and the electrician received treatment for his injury.

The investigation of the incident revealed that:

- The electrician completed a Job Safety Analysis (JSA) for Daily Electrical Repairs but did not detail the work steps and hazards associated with disconnecting and reconnecting generator leads to a live bus.
- The potential hazard of an arc flash was not addressed; therefore, proper Personal Protective Equipment (PPE) to protect personnel from arc flash was not donned.
- The electrical cabinets where the cables connect did not have any markings to indicate an arc flash possibility.
- The LO/TO documents failed to indicate specific equipment that was being locked out.

The breaker for the diesel generator was a central safety element. This breaker is essential to allowing work to happen on a live bus. A third party analyzed the breaker as part of the investigation and their initial finding showed the following:

- Main trip unit failed primary injection test
- Damaged arc chutes
- High resistance in current path
- Damaged wiring
- Loose and missing hardware
- Breaker had a crack in pole base that could allow voltage to leak to ground.

The breaker could not be isolated as the primary cause of the arc flash event, but it was a contributing cause to this incident.

Therefore, BSEE recommends that operators and contractors consider the following:

- Conducting proper JSA review and hazard assessment prior to commencing jobs that involve voltages greater than 50V. An independent hazard review with engineering should be considered for electrical work that is conducted infrequently.
- Including arc flash as a safety topic and encouraging personnel participation by asking questions linked to identifying these hazards.

- Conducting an arc flash assessment at least annually to ensure that proper hazards are understood by all personnel that may work on or near an arc flash hazard. The arc flash assessment should review hazard potential, signage, and PPE requirements. The assessment should also trigger specific steps to include in all supporting documents including LO/TO and JSA.
- Reviewing [OSHA CFR 29 §1910.269 App E - Protection From Flames and Electric Arcs](#), and NFPA 70E – Standard for Electrical Safety in the Workplace, and making appropriate adjustments.
- Reviewing and verifying qualifications of all personnel working on equipment with exposed voltage to ensure competency in arc flash prevention and protection.
- Reviewing all breakers' age and condition, especially before work that involves disconnecting and reconnecting leads of higher voltage equipment. The breakers are often run-to-failure elements, but the failure has dire consequences.

A **Safety Alert** is a tool used by BSEE to inform the offshore oil and gas industry of the circumstances surrounding a potential safety issue. It also contains recommendations that could assist avoiding potential incidents on the Outer Continental Shelf.

Category: Arc Flash