EMT SMARTFILL / ADDING SF6 GAS TO ENERGIZED CIRCUIT BREAKERS

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Past Practice

- Pre 2000, SF6 gas added to circuit breakers using common gas regulator with filter.
  - Initial SF6 circuit breakers are two pressure design.
  - Adding SF6 gas to the low pressure system.

- Early 2000 determination to discontinue adding SF6 gas to energized circuit breakers.
  - Circuit breaker manufactures don’t support adding SF6 gas while circuit breaker is energized.
  - Safety concerns that adding SF6 gas will stir up contaminates in circuit breaker tank causing an internal arc flash.
  - Modern circuit breakers are single pressure system. Last two pressure circuit breakers was removed from PG&E system in 2006.
Several factors reflected the need to change our practice of clearing circuit breakers from service to add SF6 gas.

- Directive to perform more work practices without clearing equipment.
- Transmission load path restriction make it difficult to clear equipment.
- Efficiencies gained by not clearing equipment.
- Possible fines from ISO.
Approached in late 2013 by Vaughan Williams of EMT to demo the Smartfill unit.

January 27, 2014 a demo was performed on a energized circuit breaker.

Work Methods & Procedures group immediately realized the potential in the Smartfill.

- Clearances are reduced.
- Reduced cost for adding gas.
- Operation is safely performed.
Smartfill unit
Development of an information bulletin detailing steps to safely add SF6 gas.

- Safety precaution on SF6 gas.
- Cutting out Low Pressure Tripping.
- Smartfill unit location and connection.
  - Hose connections and Opening gas valves.
- Data entry and programming instructions.
  - Target pressure.
  - Flow rate.
  - Start delay.
- Traffic Light indicator.
  - Red, Alarm occurred.
  - Orange, Unit is Filling.
  - Green, Standby

- Completion of filling process.
  - Closing valves.
  - Disconnection of hoses.
  - Clearing alarms on circuit breaker.
  - Resetting and Cutting in the Low Pressure Tripping.
Development of a training video showing the procedures to add SF6 gas.

- Follows the guidance in bulletin.
- 7 minute duration.
- Stored on PG&E internal video library.
- Allows review of filling procedure.

Scheduled training with 21 headquarters.

- Training needed to demonstrate proper use of unit.
- Ensure employees that filling while energized is SAFE.

Smartfill units have been used successfully since 7/2014.
SF6 Reduction/usage program

- Identification of SF6 leaks.
- When SF6 gas needs to be added to a circuit breaker.
  - Work notification is created.
  - Work Methods & Procedure specialist is notified to identify location of leaks.
  - FLIR GF306 camera is used for leak identification.
  - Leak report created and sent to headquarters.
  - Repairs are identified, parts ordered, and circuit breaker clearance is scheduled.
  - Follow-up leak detection is performed after repairs.
Tracking of SF6 usage is recorded by weight and reported yearly per CCR title 17, subarticle 3.1.
- SF6 bottles weighed before and after use.
- Usage is electronical recorded and stored.

Currently working to procure a SF6 testing device that will capture and return SF6 gas to circuit breaker or storage container.
Questions?