



Environment, Safety, Health & Assurance

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August 13, 2013

To: Tom Wessels
Shawn Nelson
Topical Appraisal File 2013

From: Dan Kayser

Subject: Scope: Topical Appraisal Report 2013, SF₆ Inventory and DOE Requirements

The scope of the SF₆ Inventory and DOE Requirements topical appraisal is to review past reports for accuracy and verify that the reports are meeting regulatory and DOE requirements.

TOPICAL APPRAISAL REPORT

SF₆ Inventory and DOE Requirements

August 13, 2013

Dan Kayser,
Environmental Specialist

1.0 Scope:

The scope of the **SF₆ Inventory and DOE Requirements** topical appraisal (TP) is to review current applicable regulations and inventory for compliance with:

1. Executive Order (E.O.) 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*. This E.O. established an integrated strategy toward sustainability in the Federal government and makes reduction of greenhouse gas (GHG) emissions a priority for Federal agencies.

Ames Laboratory has two sources of SF₆. 1) There are two underground switchgears that contain 19.5 lbs each. 2) Research equipment containing SF₆. There are two electron microscopes and one power supply.

2.0 Dates:

This review was conducted July-August 2013.

3.0 Methodology:

The methodology used to conduct the topical appraisal included the following: Review of applicable executive orders, applicable regulations, site sustainability plan guidance and site sustainability plans for the Ames Laboratory.

3.1 References:

The following references were consulted for informational purposes and / or to ensure that the current program is in compliance:

- Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*.
- FY 2013 Site Sustainability Plan Guidance, Goal 1.1 Specifically for sulfur hexafluoride (SF₆) discusses capture and storage equipment, leak detection and repair, and/or preventative maintenance programs used to minimize release.
- 40 CFR Part 98.
- DOE Occurrence, Investigation and Reporting requirements.
- The ABCs of GHG Chicago PowerPoint.

3.2 Program Documentation:

FY 2013 Ames Laboratory Site Sustainability Plan (no document number).

3.3 Training:

There is no specific training required.

3.4 Personnel Interviewed:

Mike Vaclav, Engineer, Facilities & Engineering Services (F&ES). Mike provided a current SF₆ inventory and indicated that repairing/replacing the switchgear would be too costly based on the amount of SF₆ leaking from the switchgear (~2.7 lbs/yr).

4.0 Assessment Results & Discussion

Executive Order, *Federal Leadership in Environmental, Energy, and Economic Performance*, requires the reduction of scope 1, 2, and 3 greenhouse gas (GHG) emissions. Sulfur hexafluoride (SF₆) is a GHG with a global warming potential 23,900 times stronger than carbon dioxide (CO₂) making it the most potent GHG. There is no legal requirement for the Laboratory to remove or stop using SF₆.

The Laboratory does not meet any of the reporting criteria of 40 CFR Part 98, Subpart A, *Mandatory Greenhouse Gas Reporting*.

DOE's Occurrence, Investigation and Reporting requirements require DOE facilities to report SF₆ releases according to guidance under Group 5 – Environmental 5A(4) which states, “Any discrete release of sulfur hexafluoride (SF₆) due to an event or DOE operation equal to or exceeding 115 pounds (1,247 metric tons of CO₂e according to 40 CFR Part 98, Subpart A, Table A-1, *Global Warming Potentials*) or 115 pounds more than the normal release quantity if the SF₆ release is a common byproduct of the operation”. [Note: For this criterion, discrete means the event or operation has defined start and stop points less than seven full days apart.]

DOE also has an agency sustainability goal (1.1) to capture SF₆ leaks or stop using it all together. The DOE has stated that sites with SF₆ emissions need to have a capture program by September 2012. Ames Lab does not have a capture program.

The Laboratory has two underground switchgears each with a capacity of 19.5 pounds of SF₆ each. One of these switchgears has a small leak which releases approximately 2.7 pounds over the duration of one year. The Laboratory also has research equipment (electron microscopes) that contain SF₆. Microscopes were purchased in 1992, 2000, and 2006. Typically 1-2 pounds of SF₆ is released each year due to microscope maintenance activities. Losses are reported to DOE via the Laboratory's Site Sustainability Plan. The Laboratory's SF₆ releases are far below other National Laboratory releases. Other laboratories have reported releases of 300 to 1,940 pounds. Ames Laboratory releases are also well below DOE's 115 pound limit.

It is presumed to be very costly to repair or replace the leaking switchgear. Two requests for estimates have been made to Facilities & Engineering Services. An estimate will give the Lab a quantitative number to give to DOE.

Recovery equipment cost is estimated at \$9-15K for a Dilo SF₆ recovery system (see attached quote).

Based on the amount of SF₆ released, it is not cost effective to purchase recovery equipment. The Laboratory requested a waiver, via the FY 2013 Site Sustainability Plan, from purchasing the SF₆ recovery requirement based on volumes verse cost. Two requests were made to F&ES on the status of the waiver with no response.

4.1 Strengths:

The Laboratory does not store or use large quantities of SF₆.

4.2 Noteworthy Practices: NA

4.3 Findings:

Level 1 Findings: None

Level 2 Findings: None

Level 3 Findings:

- 1) The Laboratory does release small (<5 lbs.) amounts of SF₆ annually. However, at this time it appears it isn't cost effective for the Laboratory to purchase recovery equipment. There has not been a response from DOE regarding the Laboratory's request, exempting the Laboratory from purchasing SF₆ recovery equipment based on discrete releases verses cost.
- 2) An estimate to repair and/or replace the leaking switchgear should be included in the next (FY2014) Site Sustainability Plan.

5.0 Overall Conclusions:

The Laboratory is aware of its SF₆ releases and will continue to monitor them. If releases should increase to amounts listed in 40 CFR Part 98 (i.e. 25,000 mt), and/or DOE reportable limits (115 pounds) the Laboratory will consider making repairs and/or purchasing recovery equipment provided funding is available to do so.

6.0 Sulfur Hexafluoride (SF₆) Inventory

- 1) Discrete releases from one of two electrical switch gears. Switchgear total capacity is 39 pounds (19.5 lbs ea.)
- 2) Wilhelm Hall electron microscope room 224. There are two large cylinders used for microscope maintenance. Vendor Air Gas and Matheson.
- 3) Wilhelm Hall electron microscope room 209. There is one large cylinder used for microscope maintenance. Vendor is Matheson.
- 4) Wilhelm Hall 137A power supply. There is one medium (HP20) cylinder of SF₆ used for maintenance. Vendor is Air Gas.

On average there is less than two pounds/year of SF₆ releases from electron microscope maintenance activities and less than 3 pounds from leaking switchgear.

SF₆ Cylinder Storage

LOCATION	CYL ID NUMBER	WEIGHT (Lbs.)	TARE (Lbs.)	NET SF ₆ (Lbs.)
Room 209 HWH	051466758	192	115 (est)	77
Room 137A HWH	051227812	44	15	29
Room 224 HWH	051227858	201	115	86
Room 224 HWH	051227867	145	118	27
NET SF ₆				219



DILO Company, Inc.
Odessa, FL 33556

QUOTATION

Date	Quotation #
2/27/2013	Q-10245

Customer
Ames Laboratory Attn: Dan Kayser kayser@ameslab.gov

Ship To

Validity	Terms	Account #	Project	FOB	Lead Time
90 Days	prepay			Odessa, FL	8-10 Weeks ARO

Item	Description	Qty	Price	Total
D-310-R005 220V	Portable mini SF6 processing module Includes 16' service hose with DILO DN8 couplers, 6' discharge hose with ball valve and CGA590 connection 220 V 50/60 Hz, single phase The following line item is the optional booster pump for the D-310-R005:	1	9,000.00	9,000.00
B093R10	Portable vacuum compressor unit 1.3 m3/h vacuum compressor, pressure gauge, DN8 couplers, final vacuum < 10 mbar	1	7,239.45	7,239.45
other item	D-600-R001: Stationary Recovery System (208-240V) 1 ea. B093R10 vacuum compressor 1 ea. MPC-05 compressor 1 ea. Control box with input & output pressure gauges 1 ea. mounting tray with handles 1 ea. CGA-590 cylinder connection 1 ea. 16' service hose	1	12,746.10	12,746.10
other item	D-610-R001: Portable Recovery System (208-240V), capable of recovery and filling 1 ea. B093R10 vacuum compressor 1 ea. MPC-05 compressor 1 ea. control box from D-309 1 ea. Welded dolly 1 ea. CGA-590 cylinder connection 1 ea. 16' service hose	1	14,940.00	14,940.00

Phone #	Fax #	E-mail	Sales Tax (0.0%)	USD 0.00
727-376-5593	866-281-1119	sales@dilo.com	Total	USD 43,925.55