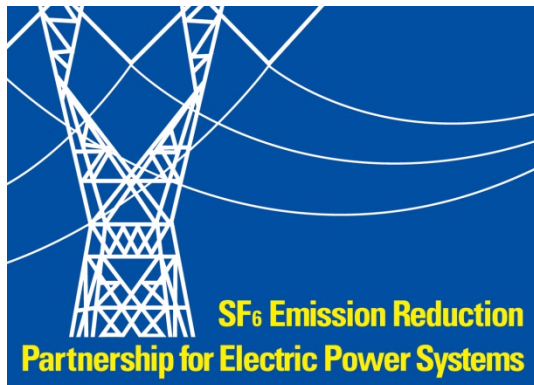


SF₆ Gas Storage Inventories: Strategies for Tracking

We will be starting in just a few minutes....

Tell us: What topics are you interested in for future webinars?
Please send your responses to the webinar organizers via the question box





SF₆ Gas Storage Inventories: Strategies for Tracking

Volha Roshchanka

May 8, 2019

Webinar Housekeeping Items

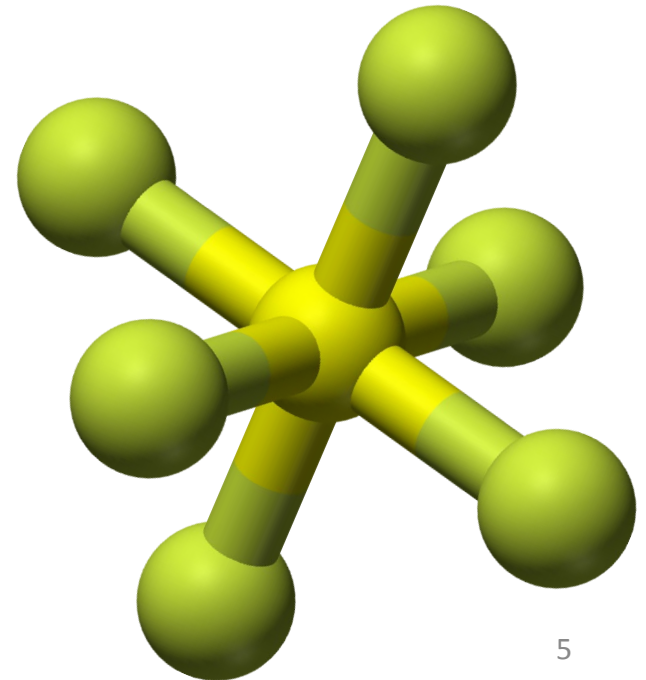
- ▶ Webinar is being recorded.
- ▶ Recording will be available on EPA's partnership website
 - ▶ <https://www.epa.gov/f-gas-partnership-programs/electric-power-systems-partnership>
- ▶ All lines will be muted during the presentation.
- ▶ Q&A after each presentation and at end of webinar.
 - ▶ You may submit questions at any time during the presentation using the chat feature.
 - ▶ Email partnership at: SF6Partnership@epa.gov

About the Partnership

- ▶ Formed in 1999 between EPA and 48 Charter Partners
- ▶ Designed to cost-effectively reduce SF₆ emissions from electrical transmission operations
- ▶ Currently **90** Partner utilities representing approximately **50%** of total U.S. grid transmission miles
- ▶ Total 2017 nameplate capacity of partners = **10.65 million lbs**

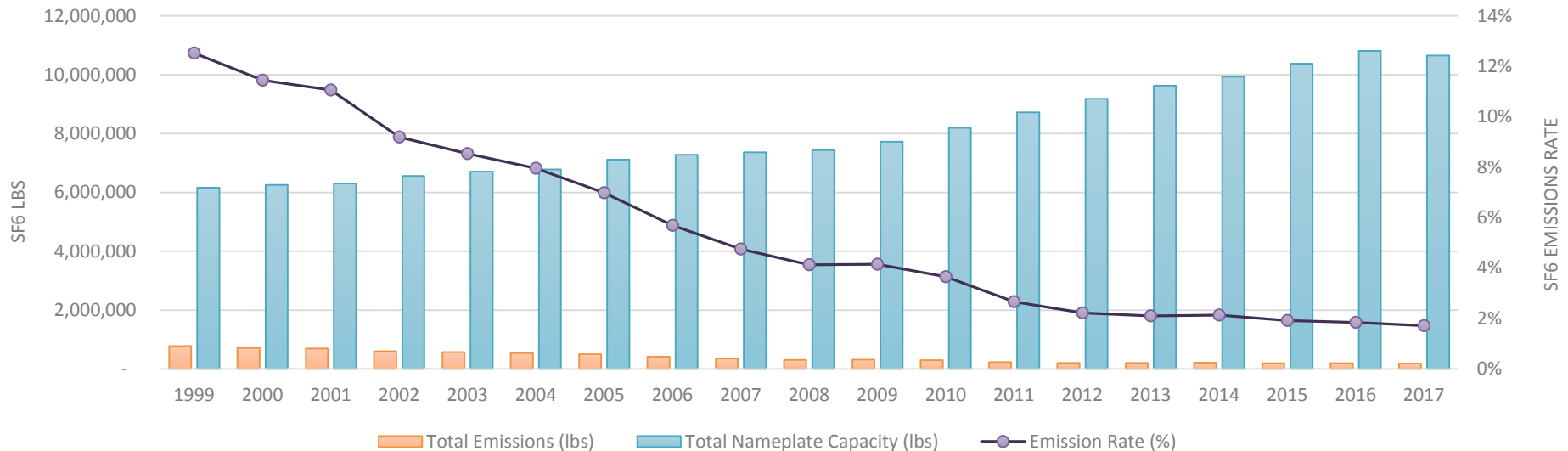
Sulfur Hexafluoride: Potent, Long-lived GHG

- ▶ SF_6 is a man-made gas emitted primarily from:
 - ▶ electrical transmission and distribution equipment
 - ▶ manufacture of electronics / semiconductors
 - ▶ production of magnesium
- ▶ SF_6 lasts ~3,200 years in the atmosphere
- ▶ SF_6 has a high global warming potential (GWP) compared to CO_2 over 100 year time scale:
 - ▶ 1 pound of SF_6 = 11.4 tons of CO_2 GWP
 - ▶ SF_6 GWP = 23,500 times CO_2

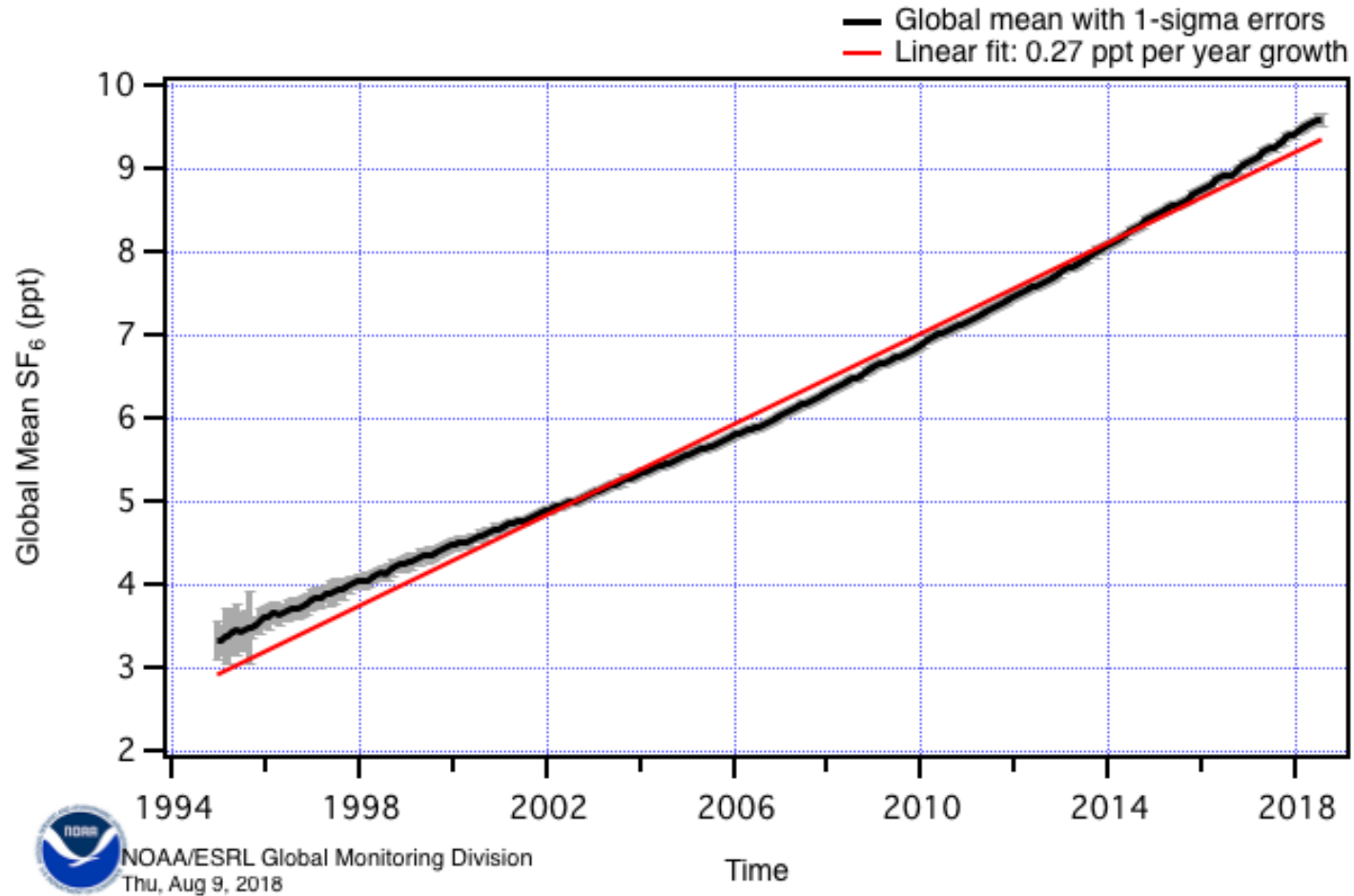


Partnership Accomplishments

- ▶ Between 1999 and 2017:
 - ▶ 75% decrease in SF₆ emissions of Partners
 - ▶ 86% decrease in emissions rate (emissions/nameplate capacity)
- ▶ Cumulative reductions of 7.2 million lbs. of SF₆ (compared to 1999 levels)



Global Mean Atmospheric Concentration of SF₆

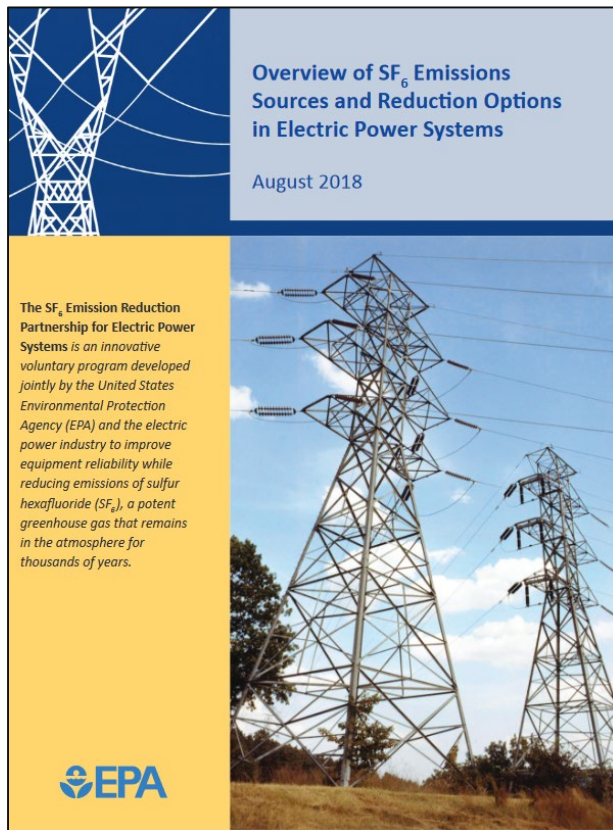


Data from NOAA: <https://www.esrl.noaa.gov/gmd/hats/combined/SF6.html>



2018-2019 Partnership Publications

- Published report: *Overview of SF₆ Emissions Sources and Reduction Options in Electric Power Systems*
- Corresponding “Overview Poster”
- Both available online: <https://www.epa.gov/f-gas-partnership-programs/electric-power-systems-partnership>



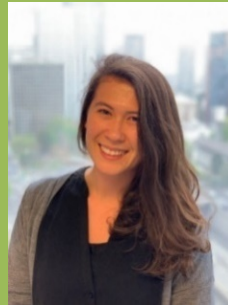
Partnership Planned Activities (2019-2020)

- Continue to update technical information:
 - *Case Study on Alternatives to SF₆ Circuit breakers*
- Webinars:
 - Please provide feedback on topics of interest
- 2020: Evaluating opportunities to host/co-host a Partnership event



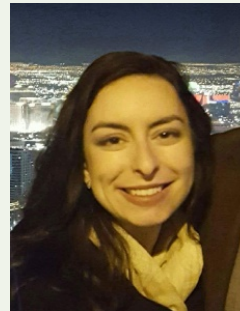
AGENDA: SF₆ Gas Storage Inventories

Kiyomi Morris
Seattle City Light



**Seattle City Light's Cylinder
Management Improvements**

**Carol Leiter &
Michelle Colletti**
Bonneville Power
Administration



**Bonneville Power
Administration's
SF₆ Inventory Tracking System**

This webinar will be recorded and posted to the partnership website

You may submit questions at any time during the presentation using the chat feature. Questions will be answered at the end of each presentation and at the end of the webinar



Seattle City Light



SF₆ PROGRAM

Cylinder Management Improvements

Kiyomi Morris | May 8th, 2019



SF₆ Emission Reduction
Partnership for Electric Power Systems

OVERVIEW

- Who is Seattle City Light?
- Who requires SF₆ reporting?
- How was City Light tracking SF₆ cylinders?
- What challenges do we face?
- What improvements were made?
- What are our best management practices?

SEATTLE CITY LIGHT

General Information

- Publicly-Owned Electric Power Utility
- Servicing the Greater Seattle Area
- Carbon Neutral since 2005

Our Mission

Seattle City Light is dedicated to delivering customers affordable, reliable, and environmentally responsible electricity services.



WHO REQUIRES SF₆ REPORTING?

Reporting Entities

Federal



State

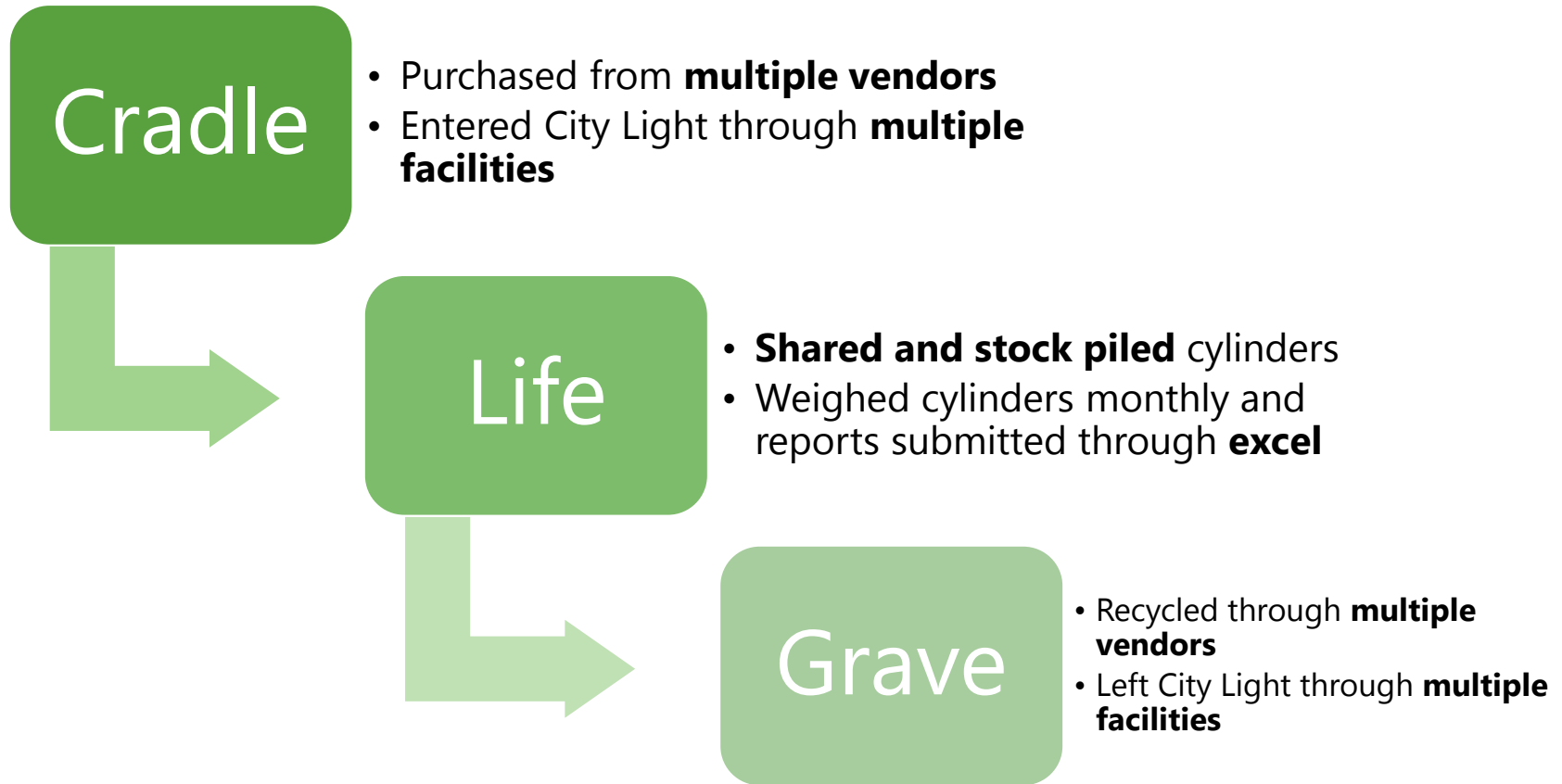


Local



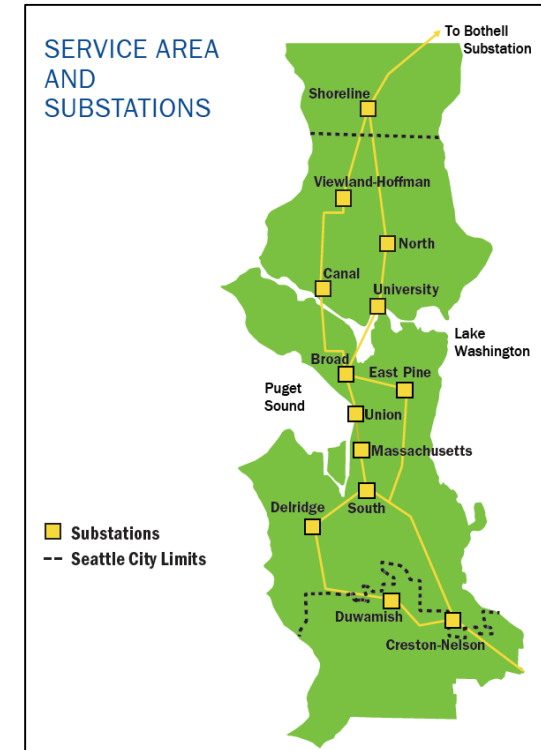
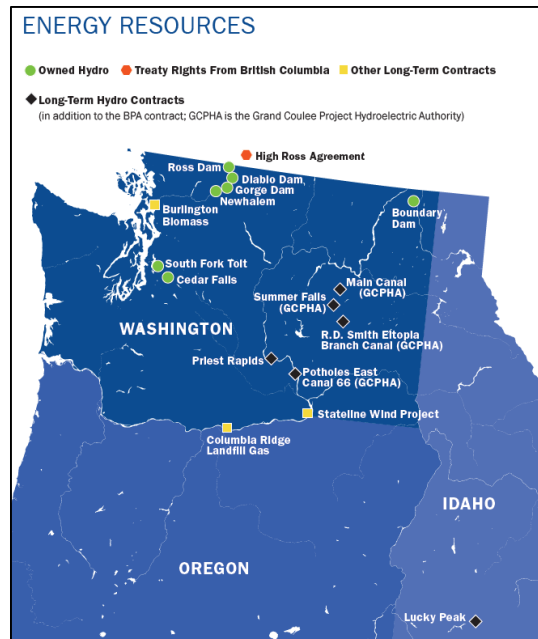
SF₆ CYLINDER TRACKING AT CITY LIGHT

How were we tracking SF₆ cylinders?



CHALLENGE 1: ACQUISITIONS AND DISPOSALS

- **Multiple** vendors and entry points
- Cylinder and gas **costs varied**
- **No efficient way** to verify purchases or sales



CHALLENGE 3: CYLINDER MANAGEMENT

- **Too many** extra cylinders
- Multiple **entry points**
- Multiple storage **locations**
- **Movement** between locations



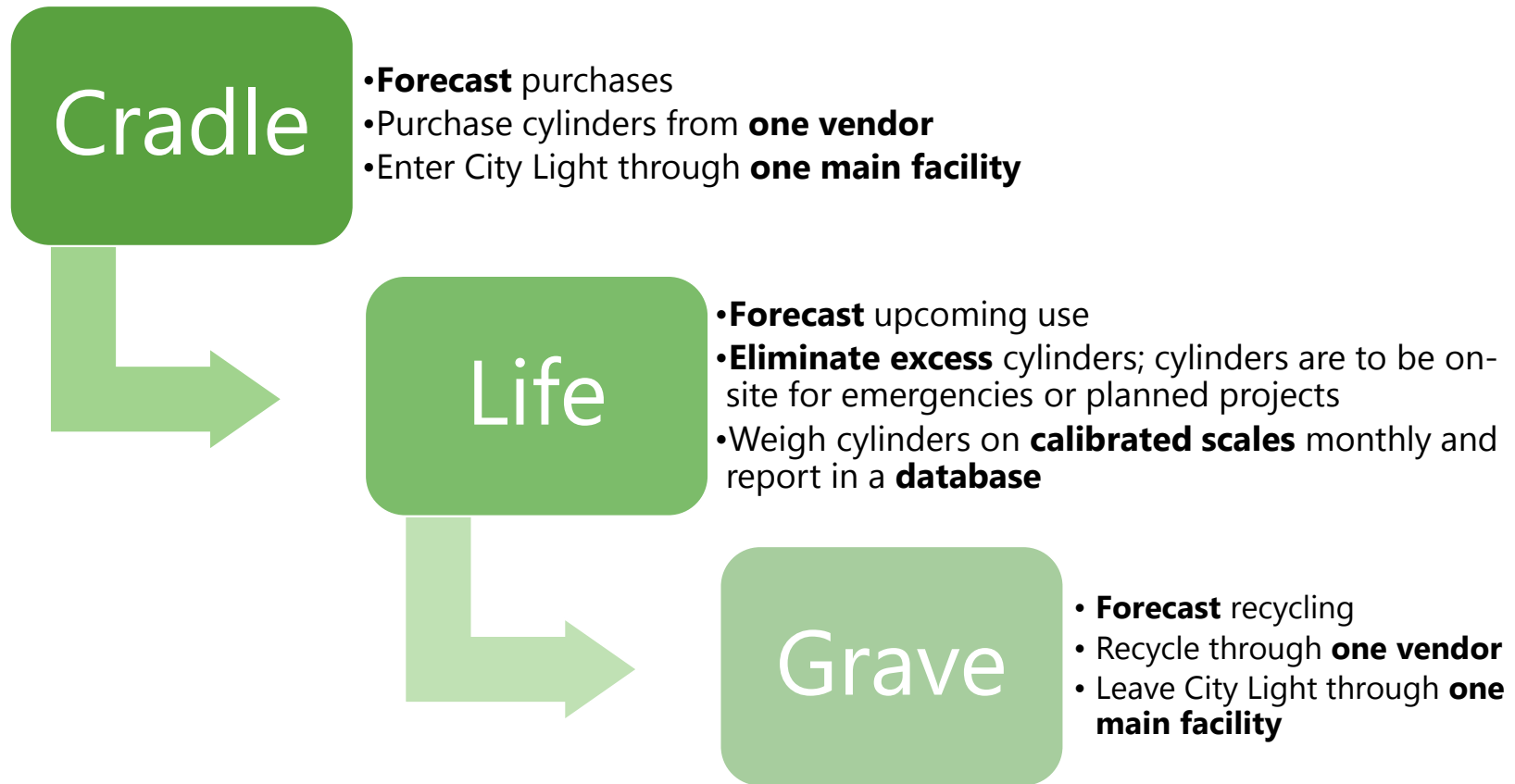
BASIC STEPS TO OVERCOME OUR CHALLENGES

- Research effective strategies
- Consult internal and external entities
- Establish and execute new procedures
- Provide resources and trainings



SF₆ CYLINDER TRACKING AT CITY LIGHT

How are we tracking SF₆ cylinders today?



DATA REP

Report SF6 Activity Page

Report SF6 Activity

Environment Reporting Page

EPA and GHG Reporting

Inventory ("IB" - "IE")	Purchases and Acquisitions ("P")	Nameplate Capacity ("C")
<p>Cylinders</p> <p>Cylinders On-Site All Cylinder Activity</p>	<p>Purchases</p>	<p>Equipment Inventory</p> <p>All Equipment Energized Equipment</p>
<p>Equipment Spares</p> <p>Spares On-Site</p>	<p>Sales and Disbursements ("S")</p> <p>Sales</p>	<p>Capacity Changes</p> <p>Commissioning Retirement</p>
<p>Leaks</p> <p>Leaks</p>		

Exit Database

Return to Previous Page

Previous Page

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Submission

BEST MANAGEMENT PRACTICES

- Minimize the number of SF₆ sources
- Streamline and simplify the movement of SF₆
- Use personalized real-time tracking applications or databases
- Maintain and audit your SF₆ inventory, tools and equipment
- Engage with field personnel on SF₆ management and safety
- Stay up to date on technology and management practices



THANK YOU

Questions?





SF₆ Inventory Tracking System

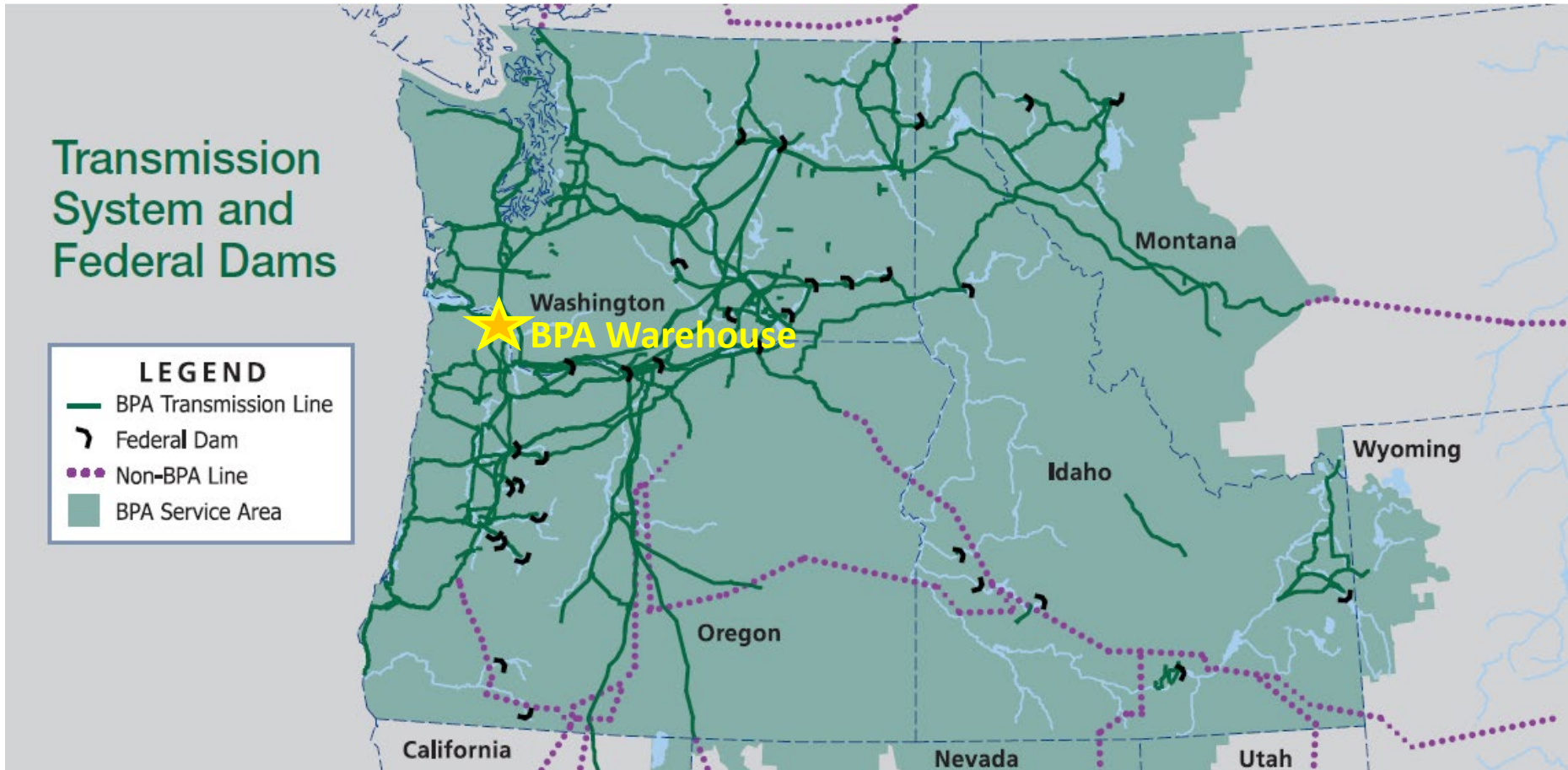
Carol Leiter & Michelle Colletti

May 8, 2019

Bonneville
POWER ADMINISTRATION



BPA Service Area



BPA provides ~27% of the electrical power generated in the Pacific NW

BPA has 261 Substations

1,825 pieces of SF₆-containing equipment

Inventory of BPA-Owned, SF₆ Gas Equipment In Service

SF ₆ in BPA Breakers (O-series)	504,104 lbs.
SF ₆ in BPA SF ₆ Bushings (no "-series" no.)	336 lbs.
SF ₆ in BPA Circuit switchers - fillable only (ID-series)	1,692 lbs.
SF ₆ in BPA CT's (C-series)	33,298 lbs.
SF ₆ in BPA LLS-II Disconnect interrupters (no "-series" no.)	85 lbs.
SF ₆ in BPA Gas Insulated Substation (GIS)	170,725 lbs.
SF ₆ in BPA High-Speed Ground Switches (D-series)	900 lbs.

BPA SF₆ Tracking System

BPA Starting Inventory (bottles & equip blankets)		AMOUNT (lbs.)
1. Beginning of Year Inventory		86,516
	Sub total (A)	86,516
Items That ADD to the BPA Inventory		
3. SF6 purchased from producers or distributors in cylinders		45,585
4. SF6 provided by equipment manufacturers with/inside equipment		1,050
5. SF6 returned to the site after off-site recycling		0
11. Total nameplate capacity (proper full charge) of retired equipment		890
	Sub total (B)	47,525
Items that SUBTRACT from the BPA Inventory:		
6. Sales of SF6 to other entities, including gas left in equipment that is sold		172
7. Returns of SF6 to supplier		0
8. SF6 sent to destruction facilities		0
9. SF6 sent off-site for recycling & reclamation		26,088
10. Total nameplate capacity (proper full charge) of new equipment		10,040
	Sub total (C)	36,301
BPA Ending Inventory (bottles & equip blankets)		
2. End of Year Inventory - Warehouse, Sub Maint & Construction		93,037
	Sub total (D)	93,037
		4,703
Emission Rate (optional)		AMOUNT (lbs.)
	Total Nameplate Capacity at End of Year	711,139
		PERCENT (%)
	F. Emission Rate (Emissions/Capacity)	0.66%

BPA Cylinder Inventory



Warehouse



Substation maintenance



Construction crews



NEW GAS CYLINDERS RECEIVED FROM VENDOR

BPA Warehouse Inventory



Warehouse Notification - Receipt of Purchase



[Redacted] - NSLW-WHSE

Leiter, Carol P (BPA) - EP-AMPN-2

RE: SF6 purchased and weighed 6/23/2016

 You forwarded this message on 11/22/2016 12:10 PM.

Approximately 115# per cylinder and we received in 73 full cylinders in March from Concord.



2016.03 - (from
Concorde).xlsx...

Sent from my Verizon Wireless 4G LTE smartphone

Purchase Notification Attachment

Vendor - Purchased From

SF6 INVENTORY - (Good, Usable)

Substation / Location	Meas. date	Bottle SN	bottle <u>TOTAL</u> weight (lbs)	bottle <u>Tare</u> (lbs)	bottle cap (lbs)	<u>calc'd</u> SF6 (lbs)
P-47	6/23/2016	482304	236.7	120.4	1.5	114.8
P-47	6/23/2016	158123	239.8	123.2	1.5	115.1
P-47	6/23/2016	1368372	233.1	116.6	1.5	115.0
P-47	6/23/2016	7139135	237.9	120.8	1.5	115.6
P-47	6/23/2016	7141034	238.5	121.4	1.5	115.6
P-47	6/23/2016	3911039	232.0	112.6	1.5	117.9
P-47	6/23/2016	7801	232.0	114.6	1.5	115.9
P-47	6/23/2016	7137168	237.5	120.4	1.5	115.6

BPA Warehouse Inventory of New SF₆

SF6 Report
 Covering the Month of:
 Sub Maint District / Constr Foreman: Whse
 Dilo K091R37 ID (BPA No.):



SF6 INVENTORY - (Good, Usable)						
Substation / Location	Meas. date	Bottle SN	bottle TOTAL weight (lbs)	bottle Tare (lbs)	bottle cap (lbs)	calc'd SF6 (lbs)
p-1	4/4/2019	2433973	232.9	116.4	1.5	115.0
p-1	4/4/2019	7092023	238.3	121.8	1.5	115.0
p-1	4/4/2019	703796	235.3	118.8	1.5	115.0
p-1	4/4/2019	491501	224.9	108.4	1.5	115.0
p-1	4/4/2019	46572	233.5	117	1.5	115.0
p-1	4/4/2019	15880	231.4	116.4	1.5	113.5
p-1	4/4/2019	29193	229.3	112.8	1.5	115.0
p-1	4/4/2019	624301	231.7	115.2	1.5	115.0

Purchase History Supplied by Vendor

Purchase History

<i>Cylinder Size</i>	<i>Serial Number</i>	<i>Purchase Date</i>	<i>P O Number</i>	<i>Fill</i>	<i>Cust Cyl No</i>	<i>Batch Number</i>	<i>Invoice Number</i>	<i>Ship To Location</i>
60.00	396579	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	397455	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	397366	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	115845	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	398410	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	398570	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	396711	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	311124	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	311098	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	115834	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	338894	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	115878	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	115771	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA
60.00	115800	2018-02-20T00:00:00	00069680-00010	25		K-1417-B2ONL	37439	Vancouver, WA



INTERNAL INVENTORY ADJUSTMENTS

Inventory Adjustment – warehouse to field

Material request (MR) to send gas from warehouse to field

TIMI010 - MATERIAL REQUEST - [PROD]

File Edit Navigate Options View Help

Select for details; Execute to add new Material Request.

Deliver To Facility= TBL Type= M Request Status= APPROVED 04/18/2019

Material Request= 00442071 Responsible= DWM0283 Priority= 99 MSDS MATERIAL

Reference= WO 00196535 01 Days Needed= Job Type= ME

Project= 0001062 Parts= 1 Dept= TFKJ

Need Date= 05/03/2019 Holds= Group= GRHQSUBS

Estimated Value= \$5,279 IBD Link= eError

Issue Facility: ROS Direct Ship:

Deliver To: GARR

Title: Direct Expense work - Blanket

Group ID: FC Cost Center: TFKJ Activity: TUCD

Account: 600000 Sub-Account: User Defined: 99

W/O Type: ME Discipline:

Notes

Execute

Previous

Next

BOM

Compatible Units

Model

Quantity Status

Accounting

* Quantity	U	Catalog ID	Q Level	Stock Type	Reserve	Description	MSDS	Standard Procedure	Accounting	Actual	Available
8	Y	0000895198	0	S	<input checked="" type="checkbox"/>	GAS, SULFUR HEXAFLUORID					8 538
					<input type="checkbox"/>						
					<input type="checkbox"/>						
					<input type="checkbox"/>						

Warehouse Inventory of Gas Issued

Warehouse MR tracking

ISSUED TO MR						
Substation / Location	Meas. date	Bottle SN	bottle	bottle	bottle	calc'd SF6
WRNR 12/22/15 MR#	6/9/2014	652162	234.7	118.0	1.5	115.2
PAUL 2/25/2016 MR#	6/9/2014	584745	238.3	123.2	1.5	113.6
PAUL 2/25/2016 MR#	6/9/2014	1541239	226.0	112.6	1.5	111.9
PAUL 2/25/2016 MR#	6/9/2014	695648	229.1	114.0	1.5	113.6
PAUL 2/25/2016 MR#	6/9/2014	939200	236.2	122.0	1.5	112.7
PAUL 2/25/2016 MR#	6/9/2014	9424	226.3	109.6	1.5	115.2

Crew Monthly Report

SF6 Report

Covering the Month of: Jan 2019
 Sub Maint District / Constr Foreman: _____
 Dilo K091R37 ID (BPA No.): 249381



RETIRED SF6 EQUIPMENT

Substation	Evac date	SER Tag No.	Dispatch ID (xxxx, A-xx, B-xx, L-xx)	SF6 equip nameplate weight (lbs)	foreign- owned
					N
					N

NEWLY-INSTALLED SF6 EQUIPMENT

Substation	Fill date	SER Tag No.	Dispatch ID (xxxx, A-xx, B-xx, L-xx)	SF6 equip nameplate weight (lbs)	foreign- owned
					N
					N

NOTES:

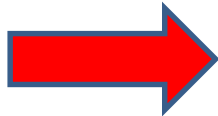
- Tare weight = weight of the bottle + valve (with cap OFF).
- Tare weight may be stamped on the upper shoulder of the cylinder, preceded by "TW". If it's not, use these tare weight values: **Large bottle: 115 lbs / small bottle: 29 lbs.**
- If you weigh the bottle with the cap ON, select 1.5 lbs in the bottle-cap weight column.

SF6 STAGED FOR RETURN TO WHSE

Substation / Location	Meas. date	Bottle SN	bottle TOTAL weight (lbs)	bottle Tare (lbs)	bottle cap (lbs)	calc'd SF6 (lbs)	TR No.

SF6 INVENTORY - (Good, Usable)

Substation / Location	Meas. date	Bottle SN	bottle TOTAL weight (lbs)	bottle Tare (lbs)	bottle cap (lbs)	calc'd SF6 (lbs)
ASHE Small Bottles	12/1/2019	396610	34.5	28.6	-	5.9
	12/1/2019	310954	36.6	28.4	-	8.2
	12/1/2019	397679	32.0	28.9	-	3.1



Crew Inventory

Maint Dist / Construction Crew Foreman	date	balance SF6 (lbs)	inventory & transfer comments	tracking doc
Warehouse	12/30/2014	40,216.4	Reported Balance	monthly report
Alvey	12/30/2014	2,882.6	Reported Balance	monthly report
Ashe	12/30/2014	679.1	Reported Balance	monthly report
Bell	12/30/2014	2,873.3	Reported Balance	monthly report
Burley	12/30/2014	1,528.0	Reported Balance	monthly report
Celilo	12/30/2014	1,513.6	Reported Balance	monthly report
Chemawa	12/30/2014	1,206.9	Reported Balance	monthly report
Covington	12/30/2014	3,161.6	Reported Balance	monthly report
Custer	12/30/2014	1,292.9	Reported Balance	monthly report
Garrison	12/30/2014	581.0	Reported Balance	monthly report
Idaho Falls	12/30/2014	1,061.7	Reported Balance	monthly report
Kalispell	12/30/2014	245.4	Reported Balance	monthly report
Keeler	12/30/2014	1,585.0	Reported Balance	monthly report
Lewiston	12/30/2014	998.1	Reported Balance	monthly report
Longview	12/30/2014	1,593.8	Reported Balance	monthly report
Malin	12/30/2014	685.0	Reported Balance	monthly report
McNary	12/30/2014	808.0	Reported Balance	monthly report
North Bend	12/30/2014	1,372.7	Reported Balance	monthly report
Olympia	12/30/2014	3,337.0	Reported Balance	monthly report
Pasco	12/30/2014	660.5	Reported Balance	monthly report
Port Angeles	12/30/2014	369.6	Reported Balance	monthly report
Redmond	12/30/2014	1,334.2	Reported Balance	monthly report
Ross	12/30/2014	1,723.4	Reported Balance	monthly report
Sickler	12/30/2014	1,590.7	Reported Balance	monthly report
Snohomish	12/30/2014	7,404.5	Reported Balance	monthly report
The Dalles	12/30/2014	333.8	Reported Balance	monthly report
Maitland	12/30/2014	40.0	Reported Balance	monthly report
Mayer	12/30/2014	-	Reported Balance	monthly report



USED SF₆

CYLINDERS RETURNING TO VENDOR

Crew Monthly Report

SF6 Report

Covering the Month of: Feb 2017
 Sub Maint District / Constr Foreman: Willburn
 Dilo K091R37 ID (BPA No.): 219693/249422



RETIRED SF6 EQUIPMENT

Substation	Evac date	SER Tag No.	Dispatch ID (xxxx, A-xx, B-xx, L-xx)	SF6 equip nameplate weight (lbs)	foreign- owned
					N
					N

NEWLY-INSTALLED SF6 EQUIPMENT

Substation	Fill date	SER Tag No.	Dispatch ID (xxxx, A-xx, B-xx, L-xx)	SF6 equip nameplate weight (lbs)	foreign- owned
					N
					N

SF6 STAGED FOR RETURN TO WHSE

Substation / Location	Meas. date	Bottle SN	bottle TOTAL weight (lbs)	bottle Tare (lbs)	bottle cap (lbs)	calc'd SF6 (lbs)	TR No.
Bell shipping	12/22/2016	843773Y/BELL0048	121.9	115.8	1.5	4.6	70565
Bell Yard	12/22/2016	TW-H-939188/BELL0044	128.1	115.0	1.5	11.6	70565
Bell Yard	12/22/2016	ICC3A1800/BELL0045	132.8	115.0	1.5	16.3	70565
Bell Shipping	12/22/2016	C308883/BELL0039	33.2	29.0	1.5	2.7	70565

SF6 INVENTORY - (Good, Usable)

Substation / Location	Meas. date	Bottle SN	bottle TOTAL weight (lbs)	bottle Tare (lbs)	bottle cap (lbs)	calc'd SF6 (lbs)
					-	-
					-	-



Warehouse Notification - Gas Sent in from Field

From: [REDACTED] - NSLW-WHSE
Sent: Friday, January 15, 2016 2:20 PM
To: Leiter,Carol P (BPA) - EP-AMPN-2
Cc: [REDACTED] NSLW-WHSE
Subject: TR 65585

Carol, I have 17 cylinders of gas that came in from ASHE in TR 65585. Hoping you have some information that has worked its way back to you. The serial numbers are:

482304, 525239, 482307, 158123, 24655, 2670, 811751, 495745, 676998, CM00016, 525238, 624838, 14220, 592482, 646008, 516480, 939189.

If I don't hear from you today, have a great weekend!!



ASHE	2/20/2016	811640	155.3	123.8	1.5	30.0	65585
ASHE	2/20/2016	652097	125.5	118.2	1.5	5.8	65585

Inventory Adjustment – field to warehouse

Transportation request (TR) to send gas from field to warehouse















Please choose a transportation status query
 Transportation Request

REQUESTOR ID GPL2449	REQUESTOR PHONE 360-610-8835	TR NUMBER 68930	STATUS Delivered	SHIP DATE 12/12/16	DELIVERY DATE 12/13/16	Hot? <input type="checkbox"/>
DATE REQUESTED 8/29/2016	REQUESTED DELIVERY DATE 8/29/2016	WORK ORDER 00248443	WO TASK 11	MATERIAL REQUEST	LOAD ID 14653	
PICKUP LOCATION ALVY	DELIVERY LOCATION ROSS	DELIVERY_INSTRUCTIONS Pick up as you can @ Alvey				

COMMENTS:

LINE NBR	ITEM LOCATION	HAZ	QTY	UNIT DESCRIPTION	WEIGHT
14	Alvey	<input type="checkbox"/>	3	EA	1200
DOT/DESC: 500 Kv Arrestors **Return to Stock**					
13	Alvey	<input type="checkbox"/>	1	PALLET	150
DOT/DESC: Unused Yt's					
12	Alvey DEL 08/31	<input checked="" type="checkbox"/>	18	BOTTLES	1800
DOT/DESC: Sulfur hexafluoride, Compressed, 2.2, UN1080 ERG126					
11	Alvey DEL 08/31	<input type="checkbox"/>	36	BOTTLES	3600
DOT/DESC: empty dry air bottles					

Tracking Documentation

 2016.09.23 (TR 68930) - ALVY 164.6#	9/30/2016 4:20 PM	Outlook Item
 2016.09.23 - JDay (TR69053) 154.7#	9/30/2016 4:18 PM	Outlook Item
 2016.09.23 - Keeler (TR 68481) 18.5#	9/30/2016 4:19 PM	Outlook Item
 2016.09.23 - TR 69162 from Alvey 116.5#	9/26/2016 4:44 PM	Outlook Item
 2016.09.30 SF6 INV - (Whse - reclaim) 02	9/30/2016 5:26 PM	Microsoft Excel W...
 2016.10.6 (TR 68930) - ALVY 674.5	12/13/2016 2:22 PM	Outlook Item
 2016.10.6 (TR 69386) - NBON 229.9#	12/13/2016 2:06 PM	Outlook Item
 2016.10.6 (TR 69697) - PAUL 3742.4#	12/12/2016 3:01 PM	Outlook Item
 2016.10.6 (TR 69901) - ASHE 144#	12/13/2016 2:08 PM	Outlook Item
 2016.10.6 (TR 69343) - SAPO 171.2#	10/27/2016 4:17 PM	Outlook Item
 2016.10.6 (TR 69387) - NBON 298.3#	12/12/2016 3:09 PM	Outlook Item
 2016.10.6 (TR 69616) - SNOH 88#	12/12/2016 3:11 PM	Outlook Item
 2016.10.6 (TR 69950) - GOSH 50.6#	12/13/2016 2:44 PM	Outlook Item
 2016.10.6 (TR70117) - ALBA 52.1 #	12/12/2016 2:52 PM	Outlook Item


Warehouse Inventory of Cylinders of Used SF₆

CAT ID 895198 SF6 STAGED FOR RETURN TO WHSE


Substation / Location	Meas. date	Bottle SN	bottle TOTAL weight (lbs)	bottle Tare (lbs)	bottle cap (lbs)	calc'd SF6 (lbs)	TR No.
jday p-1	12/20/2018	1001265	172.5	115.2	1.5	55.8	80248
jday p-1	12/20/2018	482345	144.5	115.6	1.5	27.4	80248
jday p-1	12/20/2018	542454	143.3	115.6	1.5	26.2	80248
jday p-1	12/20/2018	135736	138.5	115.0	1.5	22.0	80248
jday p-1	12/20/2018	539405	229.6	113.2	1.5	114.9	80248
jday p-1	12/20/2018	5927	146.6	121.5	1.5	23.6	80248
jday p-1	12/20/2018	3264100	146.6	115.6	1.5	29.5	80248
jday p-1	12/20/2018	101723	138.4	120.0	1.5	16.9	80248
jday p-1	12/20/2018	676981	140.4	117.2	1.5	21.7	80248
jday p-1	12/20/2018	538106	114.1	112.4	1.5	0.2	80248
jday p-1	12/20/2018	655075	154.0	116.8	1.5	35.7	80248


Return to Vendor


E-mail notice of reclaim shipment

 [Redacted] NSSM-4400-2 [Redacted]

Release 9 - **Vendor**

 You replied to this message on 3/6/2018 11:16 AM.

 REL 9_PO.pdf
.pdf File

 REL 9_2nd reclaim load 12.15.2016.xlsx
.xlsx File

Good afternoon, Bob.

Attached is Release 9, its Terms and Conditions and our Excel worksheet showing our Reclaim Load. Please sign, date, scan and email back the P.O. (first 2 pages) at your earliest convenience.

Thank you so much and have a wonderful Holidays!

BPA Warehouse Inventory

SF6 Report
 Covering the Month of: Dec 2018
 Sub Maint District / Constr Foreman: Whse Reclaim
 Dilo K091R37 ID (BPA No.): 249377



CAT ID 895198 SF6 STAGED FOR RETURN TO WHSE

Substation / Location	Meas. date	Bottle SN	bottle <u>TOTAL</u> weight (lbs)	bottle <u>Tare</u> (lbs)	bottle cap (lbs)	<u>calc'd</u> SF6 (lbs)	TR No.
jday p-1	12/20/2018	1001265	172.5	115.2	1.5	55.8	80248
jday p-1	12/20/2018	482345	144.5	115.6	1.5	27.4	80248
jday p-1	12/20/2018	542454	143.3	115.6	1.5	26.2	80248
jday p-1	12/20/2018	135736	138.5	115.0	1.5	22.0	80248
jday p-1	12/20/2018	539405	229.6	113.2	1.5	114.9	80248
jday p-1	12/20/2018	5927	146.6	121.5	1.5	23.6	80248
jday p-1	12/20/2018	3264100	146.6	115.6	1.5	29.5	80248
jday p-1	12/20/2018	101723	138.4	120.0	1.5	16.9	80248
jday p-1	12/20/2018	676981	140.4	117.2	1.5	21.7	80248
iday p-1	12/20/2018	538106	114.1	112.4	1.5	0.2	80248

Warehouse Inventory Tracking Spreadsheet

Maint Dist / Construction Crew Foreman	location	date	inventory & transfer comments	SF6 Inv (+)	SF6 Inv (-)	tracking doc	SF6 (lbs)
Warehouse		12/30/2017	2018 BOY inventory			EOY 2017 documentation	49,095.3
Warehouse			Calculated Balance				53,233.8
Warehouse		11/30/2018	WAREHOUSE STOCK INVENTORY			115-lb: 457 ea (Whse & HVER)	52,555.0
Warehouse		11/30/2018	WAREHOUSE STOCK INVENTORY			25-lb: 56 ea (Whse & HVER)	1,400.0
Warehouse		11/30/2018	RECLAIM INVENTORY	\\HFILE\PUBLIC\SF6		SF6 INV (Whse - reclaim).xls	2,359.9
Warehouse		11/30/2018	Reported Balance (total Whse)				56,314.9
Warehouse			Reported vs. Calculated (neg is unaccounted for loss, pos is unaccounted for excess)				3,081.1
WHSE => FIELD: BES / MR							
Morgan	Whse	1/10/2018	115-lb: 1ea		115.0	MR 00418461	
BEMA	Whse	2/6/2018	115-lb: 3ea		345.0	MR 00419856	
ASHE	Whse	2/21/2018	115-lb: 24ea		2,760.0	MR 00420522	
VENDOR PURCH & CMO RETURNS: BPA Purchasing / Warehouse "Reclaim" report							
Vendor	Whse	2/1/2018	115-lb: 389ea	44,735.0		2018 Concord SF6 Purcahse BPA - PO 00069680-00010	
Vendor	Whse	2/1/2018	25-lb: 34ea	850.0		2018 Concord SF6 Purcahse BPA - PO 00069680-00010	
Vendor	Whse	date	115-lb / 25-lb: XXea	-		tracking doc	
BPA => VENDOR (Reclaim): BPA Documentation of what was sent in							
Vendor	Concord	1/12/2018	115-lb : 195ea		8,214.9	2018.01 - (to Concord) load 1	
Vendor	Concord	1/16/2018	115-lb: 181ea / 25-lb: 34ea		7,141.9	2018.01 - (to Concord) load 2	
Vendor	Concord	12/20/2018	115-lb: 167 ea / 25-lb: 61 ea		3,843.9	2018.12 - (to Concord) load 1	
Vendor	Concord	12/27/2018	115-lb : 168ea		6,887.6	2018.12 - (to Concord) load 2	
FIELD => WHSE (impure, wet, faulted, blanket, excess, empty): Monthly Report, TR & e-mail							
OSTD	Whse	1/19/2018		367.6		2018.01.19 (TR 75252) - OSTD to WHSE - 367.6#	
ASHE	Whse	1/19/2018		921.4		2018.01.19 (TR 75217) - ASHE to WHSE - 921.4#	

Lessons Learned

Communication

Multiple data sources/cross checking

- Warehouse inventory verified with visual count
- Material Request (MR) system used to track cylinders sent to field crews and compared to warehouse inventory
- Transportation Request (TR) system used to track cylinders returned to warehouse for reclaim

Lessons Learned

- ▶ Built in **redundancy** helps reduce errors
- ▶ **Group Effort:** Accuracy of the emissions calculation is dependent upon the accuracy and timeliness of other data sources



Questions?

Bonneville Power Administration SF₆ Inventory Tracking System

Carol Leiter

cpleiter@bpa.gov

Michelle Colletti

mkcolletti@bpa.gov



SF₆ Gas Storage Inventories: Strategies for Tracking

Questions?

THANK YOU!

SF₆ Emission Reduction Partnership for Electric Power Systems

<https://www.epa.gov/f-gas-partnership-programs/electric-power-systems-partnership>

SF6partnership@epa.gov

Get involved – contact for opportunities to collaborate!

Volha Roshchanka

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202-343-9160

