

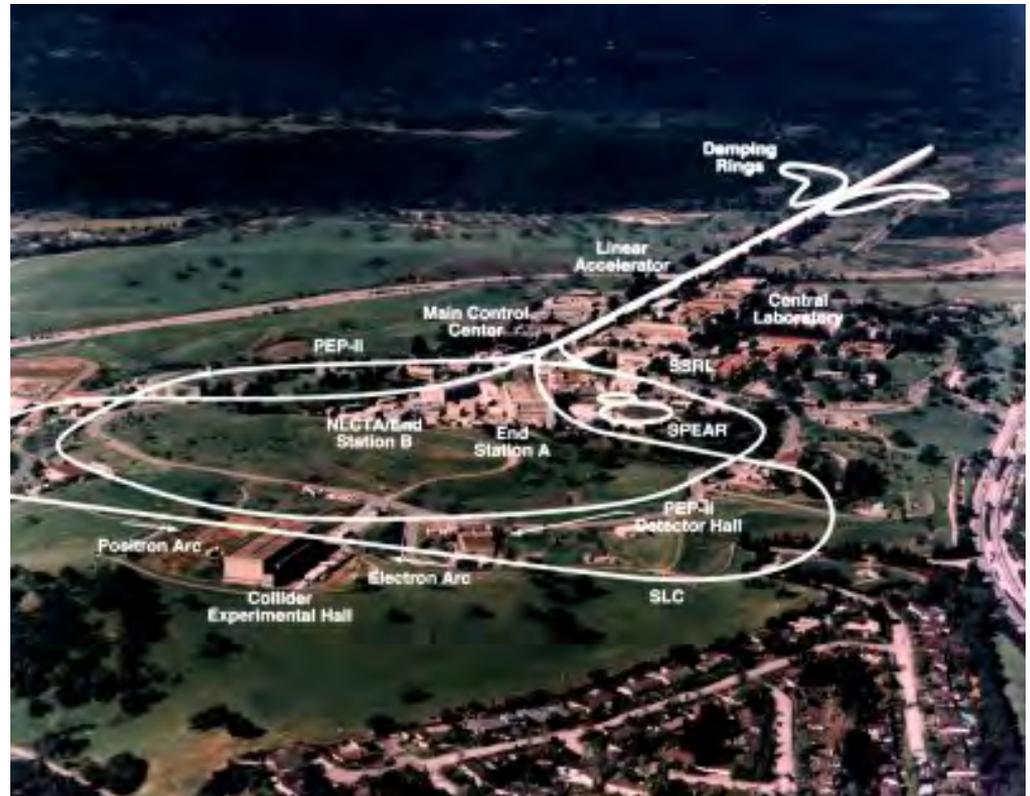
Reducing Fugitive Emissions of SF₆ at SLAC National Accelerator Laboratory

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- Multi-purpose laboratory
 - Two-mile linear accelerator
 - Research in astrophysics, photon science, accelerator and particle physics
- High demand for electricity
 - Historical peak is ~50 MW
 - No onsite generation
 - Purchased electricity
 - Scope 2 emissions
 - 80% - 90% of total



Current GHG Reporting

- The Climate Registry (TCR)
 - Voluntary reporting since 2007
- California Air Resources Board (CARB)
- DOE Pollution Prevention Tracking and Reporting System (PPTRS)

Reducing Fugitive Emissions

- Identify locations where SF₆ is used
 - Utility systems / Research labs / Other
- Perform surveys to detect leaks
 - High-tech and low-tech approaches
- Take corrective actions
 - Immediate / short-term / long-term

Reducing Fugitive Emissions

Identify locations where SF₆ is used

- Chemical Management System (CMS)
 - Purchases / Deliveries / Contacts
- Electrical utilities
 - No generating station onsite
 - Substations throughout site
 - Circuit breakers
 - Switch gear

Reducing Fugitive Emissions

SLAC Utility Equipment Containing SF₆

Equipment Specifications					SF ₆ Gas Charge		
Name	Location	MFR	TYPE	Rated Voltage	Weight (lbs)	Operating Pressure	
B-01	MSS	Siemens	TCP 242-40	242 kV	195	87 psig	@ 70°F
B-02	MSS	Siemens	TCP 242-40	242 kV	195	87 psig	@ 70°F
B-03	MSS	Siemens	SP-72.7-31.5-3	72.5 kV	15	75 psig	@ 70°F
B-10	MSS	Hitachi	FPTM-20-63A PA	25.8 kV	95	70 psig	@ 68°F
B-11	MSS	Hitachi	FPTM-20-63A PA	25.8 kV	95	70 psig	@ 68°F
B-12	MSS	Hitachi	FPTM-20-63A PA	25.8 kV	95	70 psig	@ 68°F
SW-1	MHE 1	Joslyn Power	PG6-44-15/40	15.5 kV	11.2	2-10 psig	@ 75°F
SW-3	MHE 3	Canada Power	PG6-44-15/40	15.5 kV	11.2	2-10 psig	@ 75°F
SW-61A	SUB 548	Canada Power	PG6-44-15/40	15.5 kV	11.2	2-10 psig	@ 75°F
SW-61B	SUB 548	Joslyn Power	PG6-44-15/40	15.5 kV	11.2	2-10 psig	@ 75°F
SW-64	SUB 549	Canada Power	PG6-44-15/40	15.5 kV	11.2	2-10 psig	@ 75°F
TOTAL:					746	pounds	

Identify locations where SF₆ is used (continued)

- Research labs
 - Insulation / Quenching
- Support facilities
 - Test equipment
- Typically low-volume use
 - Recordkeeping challenges

Perform surveys to detect leaks

- High-tech approach
 - Video camera for utility equipment
- Low-tech approach
 - Top-off records indicate leaking units
 - Bubble detector for smaller leaks
- Older equipment more likely to leak
 - Circuit breakers
 - Switch gear

Take corrective actions

- During survey
 - Tighten fittings
- Post-survey
 - Replace seals and/or piping
 - Set up PM programs and procedures
 - Upgrade / replace existing equipment
 - Obtain SF₆ gas-recovery cart & cylinder

Portable SF₆ Recovery Cart



Research-related emissions reductions

- Design changes in equipment
 - New electron gun uses no SF₆
 - O-ring seals re-machined
 - Single-pass systems converted
 - Closed loop
 - Collection device added

Reducing Fugitive Emissions

Future steps to control emissions

- Quantify leak rates in Master Substation
 - Breakers serviced in Feb-Mar 2010
- Engineering controls
 - Consider SF₆ fittings: no dead space
- Administrative controls
 - Develop procedures for gas carts
- Continue weighing cylinders to track use
- Continue to reduce onsite inventory