Energy Sciences ESH Management Review; FY15

Ackerman, Cowell, Taylor *11/30/2015*

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Scope

- ***"Senior Management shall"…*Evaluate ESH program**
  - Adequacy – does it meet requirements & is it implemented appropriately
  - Suitability- does it "fit" operations & systems
  - Effectiveness- is it achieving the desired results

    - **NSLS II**
    - **CFN, Chemistry, CMPMS, ST**

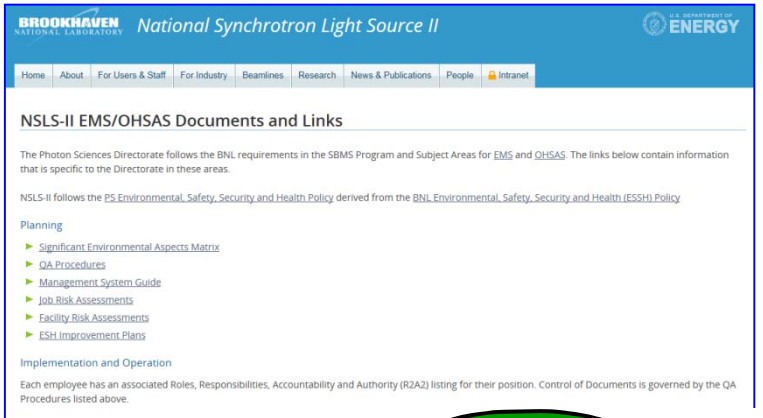
- **Expected Outcome:**
  - Provide feedback and direction
  - Identify areas where improvements are needed

Agenda

- ESH Programs & Communication
- ESH Performance
  - Injuries
  - Audits & Assessments
  - Tier I
  - Hazardous waste generation
  - Radiation exposure
  - Events
- Changing Circumstances
- FY 15 / 16 Goals
- Summary / Feedback

FY 15 ESH Programs / Management Systems

- Program web pages
  - Significant aspects matrix
  - JRA's / FRA's
  - Procedures
- Work planning (Operations & Science)
  - Enhanced Work Plans; Green sheets
  - BNL Electronic ESR
  - PASS II
  - Qualification matrix



Significant Environmental Aspects

- Regulated industrial waste
- Hazardous waste
- Radioactive waste
- Liquid discharges
- Atmospheric discharges
- Chemical storage/use
- Radioactive materials storage/use
- Historical monuments/cultural resources
- Nanomaterials
- Use of SF6
- Power consumption — Core

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ESH Communication

- NSLS II
  - Project Reviews
  - Advisory Committees
  - LSSOC
  - ESOC
  - Daily Installation Planning (plan of the day)
  - Weekly
    - Installation Planning
    - Maintenance
    - Operations
    - Various group meetings
  - BNL Lessons Learned

- Core Departments
  - All-Hands Meetings
  - Scheduled Dept. Chairs' meetings
  - E-mails to staff, guests and users
  - ESOC
  - CFN Newsletter
  - BNL Lessons Learned

Agenda

- ESH Management Systems
- ESH Performance
  - Injuries
  - Audits & Assessments
  - Tier I
  - Hazardous waste generation
  - Radiation exposure
  - Events
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Injuries
FY 15

0 Recordable Injuries

4 NSLS II First aid

• Fall; utility stub	Staff	Nov
• Puncture; finger; wire cutter	Staff	Dec
• Bump; head equipment table	User	Jan
• Irritation; eye; particle	Staff	May

Audits / Assessments

- Compressed Gas Self-Assessment
- DEC Hazardous Waste (Surprise!!)
- EPA RCRA
- BHSO Laser Safety
- BHSO Surveillance; 725 equip remove
- DOE IG Electrical Safety
- BHSO LOTO and EEI
- EMS/OHSAS Multi-Topic Internal
  - Biohazards
  - Pest management
  - EMS/OHSAS items:
    - Monitoring and measurement
    - Evaluation of compliance
    - Nonconformity, corrective, and preventive action
    - Control of records
    - Internal audit
    - Management review
- EMS/OHSAS External Surveillance
  - Training
  - Issues management
  - Objectives and targets
  - Operational controls
  - Emergency preparedness
- NSLS II: 5 IRR's (maturing)
  - 34 Pre-Start findings
  - 32 Post-Start findings
- Core: 14 ORE's/ERE's

- Few findings
- Value
  - Preparation
  - Bringing in additional expertise

2015 Audit
Noteworthy Practices

- Internal Multi-topic; NSLS II
  - LEED Gold; significant effort directed to maintain the rating
  - Facility will pay for disposal of User generated waste to promote compliance
  - Investigating and tracking low level events and issues as SCLS
  - Lessons Learned from NSLS I; paint lead bricks to reduce contamination
- Internal Multi-topic; Core
  - CFN EEI management
  - Chemistry spill control
- BHSO Laser; Core
  - CFN new Laser Safety User Orientation and Authorization Checklist

Tier I Highlights

Year	FY11	FY12	FY13	FY14	FY15
NSLS II Findings	825	1100	892	558	355
Core Findings	603	516	577	428	536*

*ST included

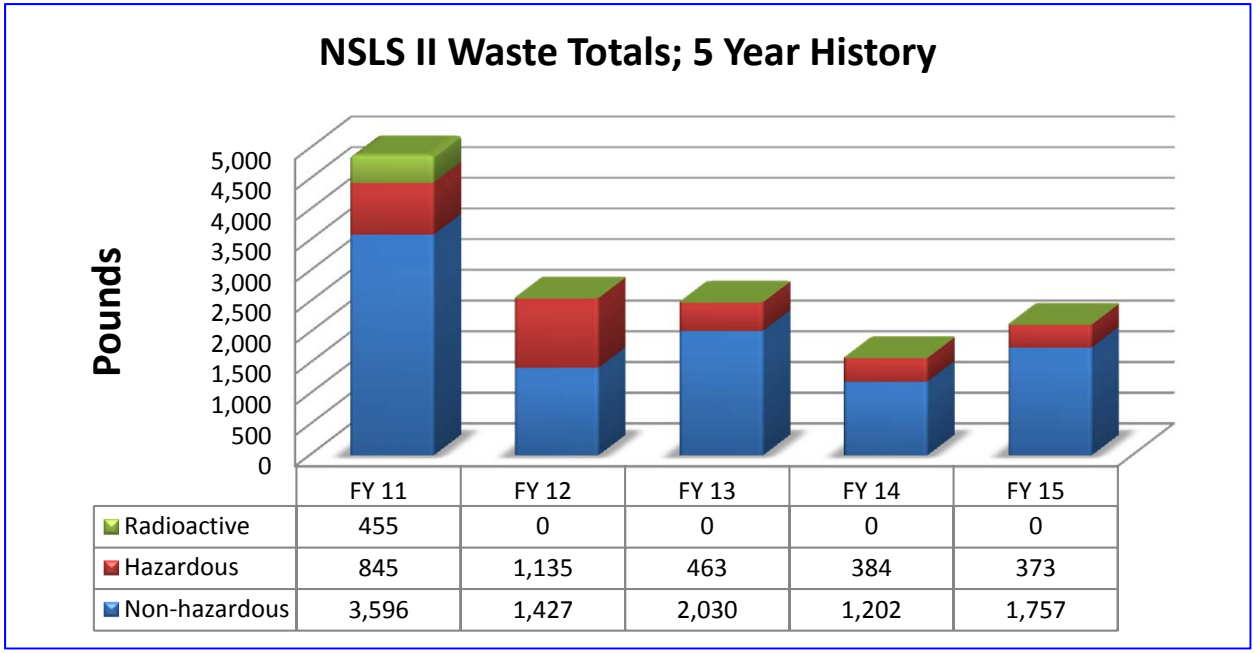
Top 5 NSLS II findings:

1. EEI Required
2. Compressed gas safety (tags, caps, regulators)
3. Unsecured ladder in storage
4. Missing safety posting
5. Soldering station configuration (sign, isolation tape, tray)

Continued vigilance

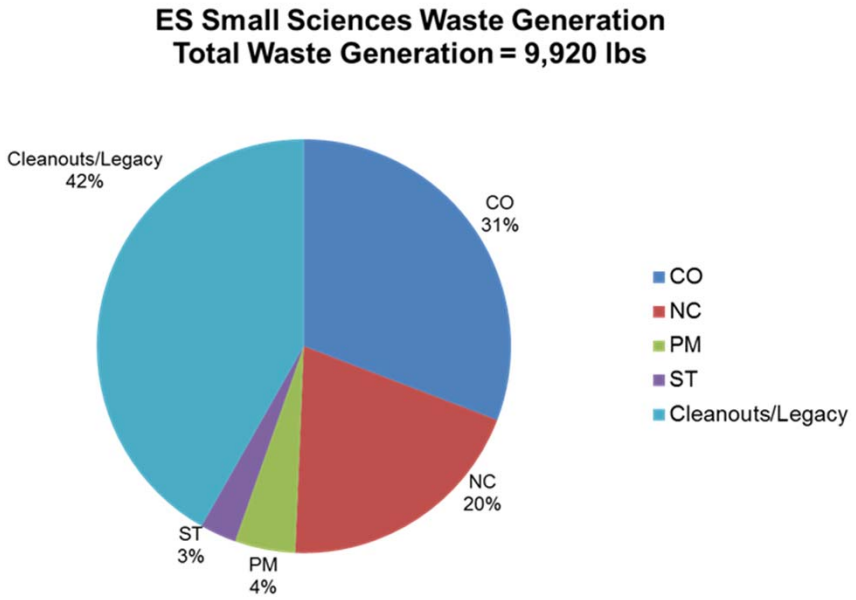
Top 5 Core findings:

1. Hazard Information Placards
2. Work environment; lighting
3. Compressed gas safety (tags, caps, regulators)
4. EEI Required
5. Housekeeping



- Small totals
- Haz waste will rise with Users

- Legacy – 42%
- NC – 497 Users



Radiation Dose Measurements; NSLS II

January to November 2015

- Collective Dose Goal = 200 Person-mrem
- Administrative Control limit = 100 Person-mrem

~ 500 TLD's issued each month

Collective Dose = 0* Person – mrem

** Radiation Exposure Investigations: 80 mrem from medical procedures; storage*

- 2014: 20 person-mrem *(NSLS)*
- 2013: 54 person-mrem *(background accumulation; late badge return; NSLS)*

NSLS II

- 46 interlocked ARM's
- 115 Passive area monitors (TLD's)
- Personnel dosimeters on all

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NSLS II Radiological Survey Summary

- Storage Ring:
  - 300 mA stored beam with ID gaps open.
- Front Ends (Phase 1 – slits; Phase 2 – shutter; Phase 3 – fault study)
  - Phase 1: 150 mA 08ID
    225 mA 18ID
  - Phase 1 & 2: 225 mA ID's 03, 05, 10, 11, 17, 23, & 28
  - Phase 3: inj. beam ID's 03, 04, 05, 08, 10, 11, 17, 23, & 28.
    (1.5 nC; 0.3 Hz)
- Beamlines
  - Commissioning Comprehensive Radiation Surveys (CCRS)
    - 75 mA ID's 05 & 10
    - 150 mA ID's 03, 11, 23, & 28

Normal Ops: All measured values at background

- Localized radiation leaks at 28ID FOE (bottom of door and roof) mitigated to background – lead shielding repositioned and added.
- Existing monitoring and shielding adequate to meet PS shielding policy

Events *(No Injuries)*
FY 15; 12 total

NSLS II

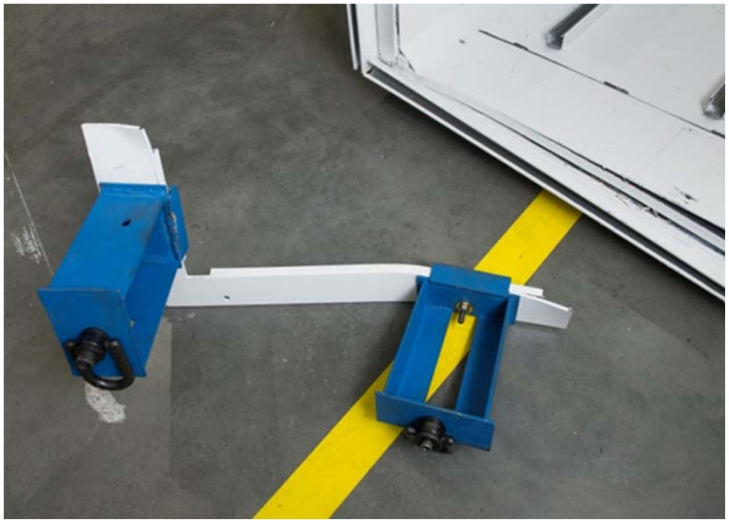
• Active interlock mistake; test mode	**SCLS**	Oct '14
• Safety shutter air valve LOTO clip damaged	**SCLS**	Nov '14
• Fault study procedure error	**SCLS**	Nov '14
• ACMI fails to disable LINAC	**SCBNL**	Jan
• Booster power supply failure; significant downtime	**SCBNL**	Jul
• Weld failure; Fallen hutch panel	**SCBNL**	Aug
• Unauthorized modification to Man-lift	**SCBNL**	Sep
• Unauthorized Booster entry	**SCBNL**	Sep

Core

• CFN Chemical Splash	**SC3**	Dec '14
• CFN Chlorine Gas Detector Alarm	**OE**	Feb
• Chemistry Electrical Shock	**SC2**	Jun
• Chemistry Nanoparticle Smoking Waste	**SCBNL**	Sep

Equipment drop; Hutch panel; Weld failure
NSLS II; Contractor

SCBNL; Management concern
August 17, 2015



Location:

Bldg. 740; ID11

Event :

Hutch panel dropped during installation

Description:

During hutch installation at 11ID, one of the wall panels was being lifted into place when a weld failed on the panel lifting plate and the panel was dropped to the ground. The drop was controlled. No injury. Lead/Steel 'Bump-out' panel – 11' x 4' ; ~4,500 lbs

Analysis:

- Failed welds; lack of fusion to base metal; insufficient heat in weld zone
- Operator error, process variables including base material, filler, & welding equipment

Corrective Actions:

- Load testing (basis to restart installation)
- Training
- Tasks, equipment, materials, and procedures evaluated / modified (welding and inspection)
- Extent of condition; inspection

Ackerman; 11/23/2015

Agenda

- ESH Management Systems
- ESH Performance

NSLS II

- Changing Circumstances
- FY 15 / 16 Goals
- Summary / Feedback

NSLS II Changing Circumstances

Change	Impact to NSLS II
Instrument commissioning / User operations.	• 4 IRR's completed. NSLS II and BNL staff.
Decay mode to Top-off	• TOSS design / implement • Another IRR. NSLS II, BNL, & SLAC staff. • Update Authorization Basis Documents • PPS reconfigured

Change control expands	• Safety System Work Permits
	• Component labeling & configuration checklists
	  – Beamlines
	  – TOSS
	• Training

Readiness Reviews FY15
5 Total

- 03ID, 05ID, 10ID, & 11ID Beamline 10/2014
- Cells 08 and 18 Damping Wigglers 12/2014
- NSLS II Facility User Readiness 06/2015
- Cells 16 and 17 ID's and FE's (ABBIX) 07/2015
- Top Off Safety System (TOSS) 08&09/2015

- Beamlines & Support laboratory User Readiness: ongoing; procedure

Get Ready

- Planning & analysis
  - Hazard ID
  - Controls defined
  - Commissioning docs
- Hardware
  - Design review (PDR, FDR)
  - Travelers (QA)
- Competence
  - JTA's

Review

- Tailored review plan
- Instrument Readiness Plan
- Report (findings)
- ATS

Safety System Work Permits FY15
Change Control

- Permit = tool to drive process
  - Unmodified 'Return to Service'
  - Documented change control
- Systems
  - Rad Safe Components (Shielding, hutches, shutters, masks, collimators, stops, exclusion zones, labyrinths, …)
  - PPS, ODH, ARM's, Waveguide

- 272 SSWP's completed in FY 2015
- Workers, Operations, ESH, and Authorization Basis Manager (USI)
- Permits drive inspection requirements, controls application.
- New beamlines and TOSS = added configuration control burden

EXAMPLE SAFETY SYSTEM WORK PERMIT FOR PROCEDURE REFERENCE ONLY

NSLS-II Safety System Work Permit # EXAMPLE

Accelerator ☐ LINAC ☐ Booster ☐ Ring | ☐ RF Blockhouse | LASER # | Beamline #

To be completed by person requesting the permit

Today's date: Estimated start date: Estimated end date:

Description of work:

Personnel performing work:

Configuration Control ☐ Shielding ☐ RSC ☐ Other

Controls:

USI: ☐ Exempt ☐ Non-Exempt (ABM Signature Req'd)

☐ Lock Out & Yellow Tag:

☐ Lock Out Tag Out:

☐ Other:

Lockouts placed by: Date:

Return to service requirements:

☐ New installation traveler required

☐ FLOCO / Operator inspection

☐ Safety staff inspection

☐ Other:

☐ Radiation survey conditions:

Approved by: Date:

Released by: Date:

Return to service: Date:

Rad survey by: Date:

Posted by: Date:

Permit closed by: Date:

PPS Configuration Control ☐

Controls:

USI: ☐ Exempt ☐ Non-Exempt (ABM Signature Req'd)

☐ Lock Out & Yellow Tag:

☐ Lock Out Tag Out:

☐ Other:

Lockouts placed by: Date:

Return to service requirements:

☐ Full test:

☐ Partial test:

☐ Functional test:

☐ PPS cabinets secure and locked

☐ Other:

Approved by: Date:

Released by: Date:

Return to service: Date:

Feedback / Comments:

WHITE copy to be posted at work site, when work is complete file in control room; BLUE and YELLOW copies kept in control room; PINK copy to RCD

Agenda

- ESH Management Systems
- ESH Performance

NSLS II

- Changing Circumstances
- FY 15 / 16 Goals
- Summary / Feedback

NSLS II FY15 EMS/OHSAS Goals

- **Complete 5 SHSD manual lifting surveillance guides and 5 SHSD laceration protection surveillance guides.**

  (Complete) 6 laceration; 3 ladder surveillances were completed.

- **Implement an ESH review program to identify, evaluate, and control the risks presented by User experimentation.**

  (Complete) The Safety Approval Form (SAF) module within PASS is operating and in use.

- **Optimize recycling and reuse of chemicals and Beryllium articles from building 725.**

  (Complete) Bldg. 725 Be articles are inventoried; much was recycled.

- **Implement slip simulator training; train 25% of the NSLS II staff.**

  (Complete) & 104 personnel trained = 25%; positive feedback

NSLS II FY15 EMS/OHSAS Goals

- **Generate a summary report to characterize the radiation measurements collected during linac, booster, and storage ring commissioning. Use the data to identify any needed controls for managing personnel radiation doses.**

  Ongoing Fault study data in SAD; Tech notes. (130 & 169)

- **Bring machine shops into compliance with SBMS. Configure 5 machines each month with required hardware.**

  Ongoing 54 machines configured in compliance; End of year $20k spent on parts; $8k allocated for 2016 for installation of purchased equipment; working well with SHSD

- **Implement the BNL program for print management as a sustainable business practice directed at improving environmental stewardship performance.**

  Ongoing Program advertised; voluntary participation; double sided printing.

Draft NSLS II FY 16 EMS/OHSAS Goals

- Implement rf ID tags for CMS tracking.
- Complete 24 ESH surveillance cards for manual lifting, lacerations, & slips/trips//falls.
- Implement Environmentally Preferable Purchasing (EPP) purchasing guidelines
- Implement Electronic Product Environmental Assessment Tool (EPEAT) purchasing requirements for computer purchases.
- Complete trip simulator training for 90% of NSLS II staff.

Agenda

- ESH Management Systems
- ESH Performance

Core

- Changing Circumstances
- FY 15 / 16 Goals
- Summary / Feedback

Core Program Changing Circumstances

Change	Impact
Renovate Chemistry Upgraded labs	• ERE's / ORE's • Clean-up and waste generation

Agenda

- ESH Management Systems
- ESH Performance

Core

- Changing Circumstances
- FY 15 / 16 Goals
- Summary / Feedback

Core Program FY15 EMS/OHSAS Goals

- **Assess one ESH "Opportunities for Improvement": Determine if there are unexamined spaces between IFM and Line**

  (Complete) Reviewed Tier 1 reports, interviewed staff; no gap areas found, subject area improvements planned.

- **Implement Machine Shop Safety Plan improvements for 555 & 734**

  (Complete) Building 734 shop is operational; 555 is close

- **Replace CMS bar codes with RFID Tags in Buildings 480 and 734**

  (Complete)

- **Improve Safety Performance of Students**

  (Complete) Developed and communicated action plan; no student injuries

Core Program FY15 EMS/OHSAS Goals

- **50% reduction of slips/trips/falls**
  20% staff trained on trip simulator
  (Complete) Implemented targeted communication program for proper footwear

- **50% reduction laceration injuries**
  (Complete) $200 Safety Solution award (Chemistry) for PPE; risks and glove choices communicated through training and all-hands meeting

- **Environmental cleanup; Shops in 510; remediate acid baths in 555**
  (Complete)

Draft Core Program FY16 EMS/OHSAS Goals

- Implement corrective actions from four ES significant events
- Improve accuracy of CMS by resolving all “not found” items identified after post RFID re-inventory.
- Implement measures that maintain low injury rates from lacerations and slips/trips/falls:
  1. Complete four surveillance cards
  2. Encourage additional staff participation in slip simulator training
- Ensure that purchasing staff are aware of ePro changes that allow easy access to EPP purchases.

Detection of Chlorine Gas (Operational Emergency) Center for Functional Nanomaterials, February 14, 2015

Description: Fire Rescue responded to an emergency call from a worker who reported an odor and a detectable level of gas on the chlorine monitor at the CFN Cleanroom. The gas alarm activated, resulting in a building-wide evacuation, and an Operational Emergency was declared.

Facts: The process that uses chlorine was not in use at the time. The worker was using an allowed etching process that produces fluorine as a residual by-product that is exhausted from the building. The worker had disregarded a hood alarm that often activates spuriously.

Cause(s): The HVAC system shut down because of extreme cold weather. As a result, and unbeknown to the worker, the exhaust ventilation system in the clean room went down and fluorine was not drawn out. A small amount of fluorine accumulated in the exhaust duct and was detected by the (F-sensitive) chlorine monitor.

Main Corrective Action(s):

- Install an audible exhaust alarm with strobe light (awaiting installation within the next two weeks)
- Provide interlock to reactive ion etchers (same as exhaust alarm)
- Train CFN staff and users on new alarm (waiting for alarm installation)
- Reset fume-hood alarms to prevent spurious responses (completed)

Agenda

- ESH Management Systems
- ESH Performance
- Changing Circumstances
- FY16 Goals
- Summary / Feedback

Purpose of Review

- *"Senior Management shall"…* Evaluate ESH program
  - Adequacy – does it meet requirements & is it implemented appropriately
  - Suitability- does it "fit" operations & systems
  - Effectiveness- is it achieving the desired results

- Expected Outcome:
  - Identify areas where improvements are needed
  - Provide feedback and direction

FY 14 Comments

- **NSLS II**
  - Track events and issues that do not reach ORPS thresholds – SCLS; ATS
- **Core**
  - Focus on student safety – 'Student Safety Communications Plan'

END

Presentation and Minutes will be posted at:

NSLS II: http://www.bnl.gov/ps/esh/EMS-OHSAS/default.asp

Core: https://intranet.bnl.gov/energysci/esh/program.php

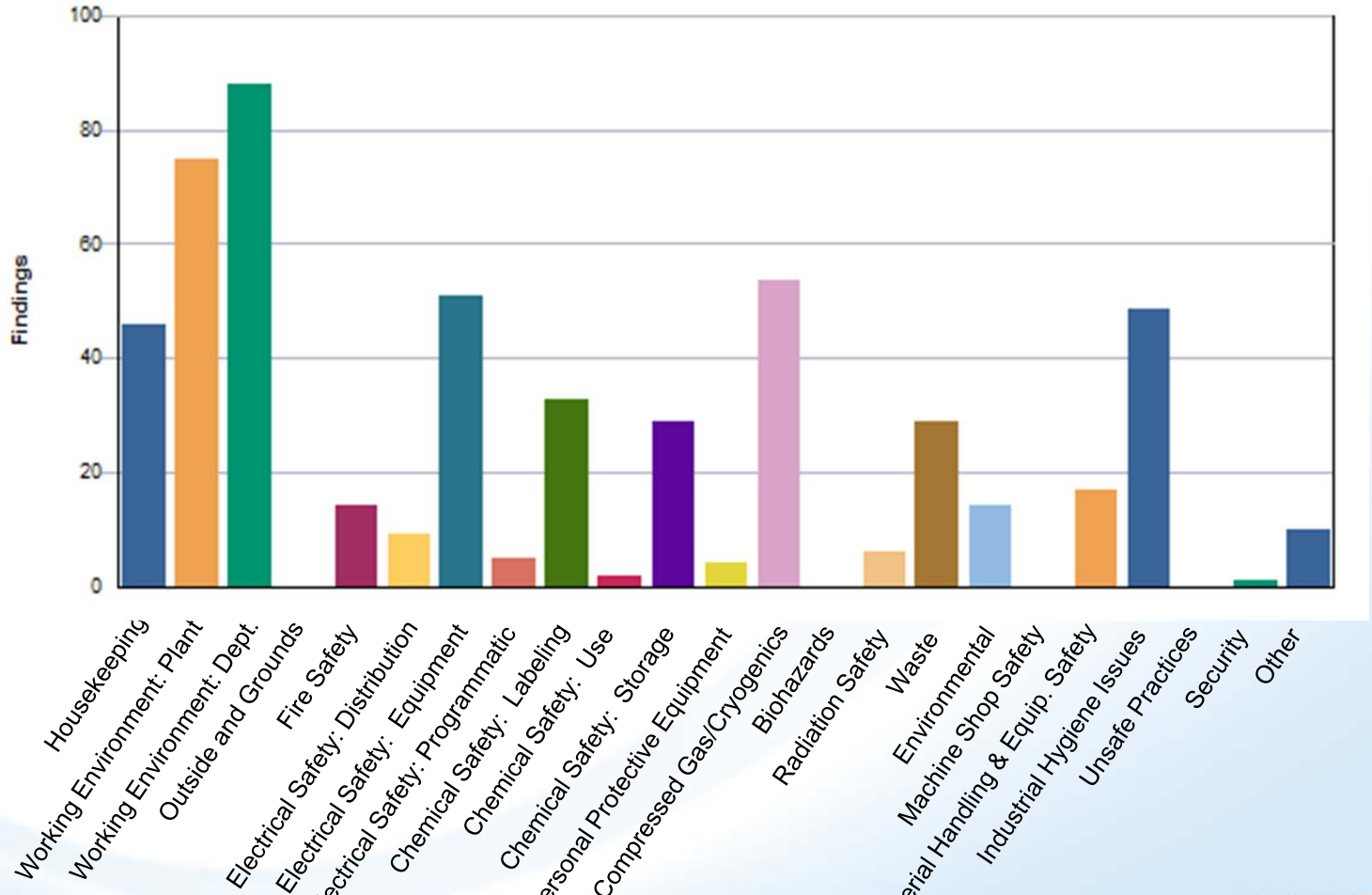
Questions / Comments

Please sign the attendance sheet

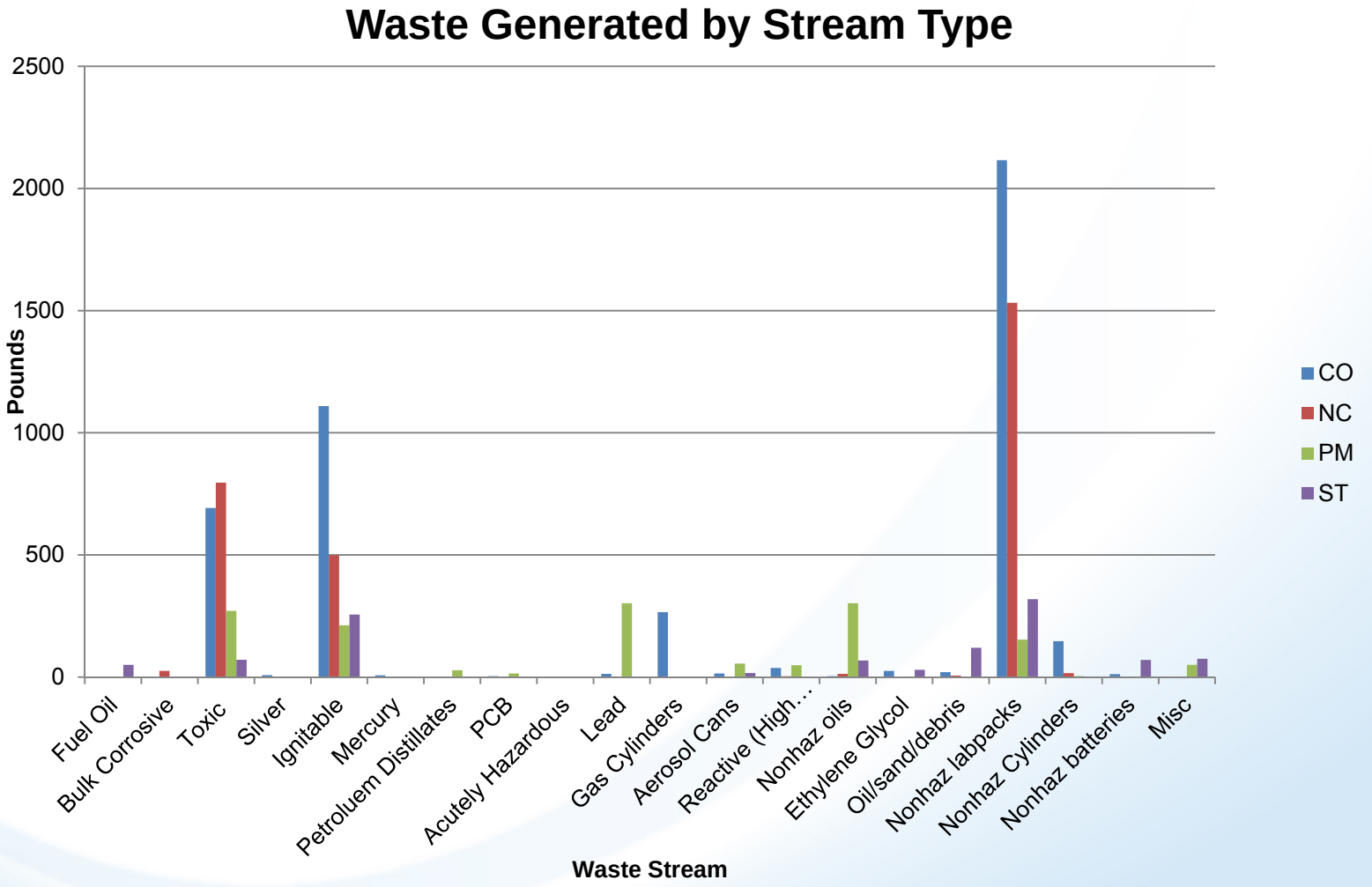
Reference
Core

Tier I ES Directorate Small Science Findings by Category Fiscal Year 2015

Total Findings=536



Waste Statistics

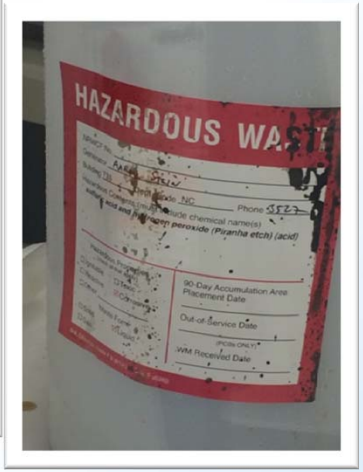


Significant Event Summaries

SC-3, Evacuation and First Aid
Center for Functional Nanomaterials, December 4, 2014

Description: A user from The City University of New York created an unexpected chemical reaction by selecting an incompatible acid waste container when disposing of organic solvent waste in the Center for Functional Nanomaterials clean room.

The clean room is monitored by a toxic gas sensor system which prompted a general building evacuation due to sulfur compound cross sensitivities of the hydrogen bromide chemical sensor.



Initial line organization investigation focused on issues related to incorrect disposal.

ES&H investigation is looking at the disposal issues, as well as several aspects of the response by the Fire Department and Waste Management.

Significant Event Summaries

Employee Receives Minor Shock from Power Supply (SC-2), Chemistry Department, June 30, 2015

Description: A researcher received shocks when he touched external components of a laser power supply while performing laser safety interlock tests during laser installation in a renovated lab in Building 555.

After shocks from a cable connector and a keyed on/off switch, the researcher pulled the power plug. The event was reported, the area closed and an investigation began.

Findings: The ground wire of the three-prong electrical plug connecting the power supply to the 120 VAC wall receptacle was loose. The external component voltages were at 55.9 VAC when the ground wire was disconnected, even with the power supply switch in the "off" position.

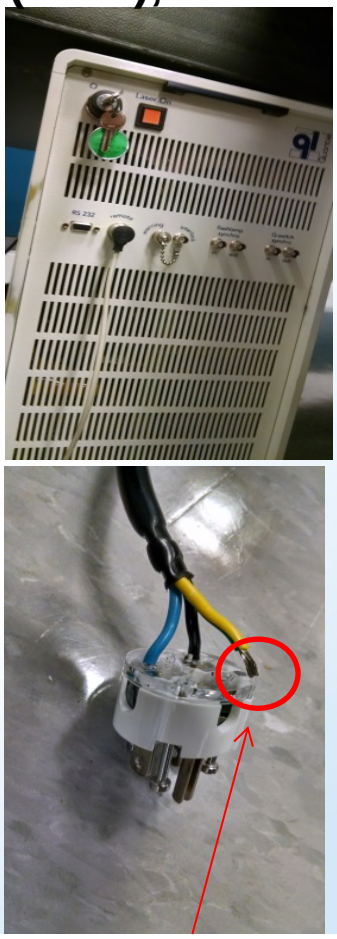
Cause(s): *Direct:* A loose ground wire on the laser power plug caused an intermittent loss of ground continuity. The move of the laser to the new lab may have contributed: no problems in 10 years of use in the old lab.

Root: Poor workmanship of the field-installed plug (2005) on the power supply led to a loose ground wire.

Contributing: The need to inspect this legacy equipment was missed during initial installation and in previous EEI and Tier 1 inspections.

Corrective Action(s):

- Laser: Field-installed plug removed & legacy laser is being replaced.
- Department: Chemistry Dept. is identifying & inspecting all in-use electrical equipment to ensure NRTL or EEI certification.
- Laboratory: Enhancing focus on field installed plugs in EEI program and recommend surveillance of field-installed plugs on scientific equipment.



Laser system power supply plug with shroud removed

Significant Event Summaries

Disposal of Nanoparticle Waste Causes Smoking Condition (SC-BNL), Chemistry Department, September 23, 2015

Description: A guest scientist disposed of 100-500 mg of dry nanomaterial catalyst waste that was pyrophoric into a waste container intended for nanomaterials-contaminated gloves/wipes. The pyrophoric waste and the adjacent combustible material (gloves/wipes/plastic bag) led to smoke. Another scientist used a nearby fire extinguisher to quench the contents. No injury or laboratory damage occurred. Fire personnel responded.

Cause(s): Nanomaterial waste was placed into a waste container intended only for nanomaterials-contaminated gloves/wipes (incorrect waste container). Normal procedure is to add water to the dry nanomaterial and place the resulting aqueous suspension into an aqueous nanomaterials waste container.

- The ESR guidance for disposal of nanomaterials was not specific.

- The guest scientist was departing the next day and was cleaning up the lab space and disposing of accumulated nanomaterial catalysts that had been synthesized and used during the preceding year. The amount of nanomaterial and the time pressure to complete before departure were unusual.

Corrective Action(s):

- Revise the relevant ESR with more details: The reactive nature of the synthesized catalysts will be described and guidance will be clarified to indicate wasting material by adding water.
- Develop operator aid and place in lab.
- Brief CO staff during staff meeting as to need for increased supervision during lab cleanup by departing visitors.

Work Planning

	Chemistry	CFN	CMPMSD	ST
ESR's	40	37	35	10
Work Permits	2 (+ Matrix)	19	5 4 contractor PHA 3 WPW	9
Chemicals (holdings)	8,930	2,985	2,868	817
SAF's (CFN)		250		
Users (CFN)		497		

Reference
NSLS II

ESH Program Responsibilities

EMS Significant Aspects

Programs

- Experiment safety review
- Work planning support
- Emergency planning
- Environmental management
- Hazardous waste management
- Industrial hygiene
- Industrial safety
- Radiation safety
- Construction Safety
- Safety system configuration control
- Self-assessment
- Risk assessment
- Interlock certification (rad & laser)
- Tier I inspections
- Compliance audits
- Training
- Configuration management
- Readiness Planning

Significant Aspects

- Industrial waste
- Hazardous waste
- Unbound nano-particulate
- Atmospheric discharge
- Liquid discharge
- Chemical storage

FY 15 Work Planning

- Operations (includes installation, testing, and maintenance)
  - ~40 Enhanced Work Plans; 100's reviewed
  - Manager & Work Control Coordinators
  - Primary Reviewer (ESH)
- Science
  - Proposal, Allocation, Safety, & Scheduling (PASS II)
    - Commissioning
    - User Operations
- Science Facility
  - NSLS II laboratories: BNL ESR's
  - Beamline: BNL ESR's

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NSLS-II EMS/OHSAS Documents and Links

The Photon Sciences Directorate follows the BNL requirements in the SBMS Program and Subject Areas for EMS and OHSAS. The links below contain information that is specific to the Directorate in these areas.

NSLS-II follows the PS Environmental, Safety, Security and Health Policy derived from the BNL Environmental, Safety, Security and Health (ESSH) Policy

Planning

- Significant Environmental Aspects Matrix
- QA Procedures
- Management System Guide
- Job Risk Assessments
- Facility Risk Assessments
- ESH Improvement Plans

Implementation and Operation

Each employee has an associated Roles, Responsibilities, Accountability and Authority (R2A2) listing for their position. Control of Documents is governed by the QA Procedures listed above.

- Process Assessments
- Training Program Procedures
- Training Courses
- EMS/OHSAS Group
- Work Planning and Control
- Local Emergency Plans

Checking and Corrective Action

- QA Procedures
- Assessment Tracking System

Management Review

- Presentation
- Notes

EMS / OHSAS

FY15 Activity

- EMS/OHSAS/ISM Review group meetings
- Process Assessments reviewed / revised
- Significant Aspects matrix reviewed / revised
- Resolved 2014 Management Review comments
  - Non-ORPS event tracking – SCLS; ATS
- Internal Multi-Topic Compliance Audit
- NSF Surveillance Audit

No Significant Findings

Readiness Reviews FY15
Findings

NSLS-II Reviews	Pre-Start Findings			Post-Start Findings		
	Total	Open	Closed	Total	Open	Closed
Beamline IRR 3, 5, 10, & 11	32	0	32	21	0	21
Cell 08 and 18 Damping Wigglers	0	0	0	2	0	2
NSLS-II Facility User Readiness						
IRR for Cells 16 and 17 ID's and FE's	1	0	1	6	3	3
TOSS	1	0	1	3	0	3
Total	34	0	34	32	3	29