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# DOE Accelerator Safety Workshop Review

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11<sup>th</sup> DOE LSO Workshop

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# Brief History and Framework of the DOE Accelerator Safety Program

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- DOE order 420.2c Safety of Accelerator Facilities
  - Complements:
    - 10 CFR 835 Occupational Radiation Protection
    - 10 CFR 851 Worker Safety and Health
      - RGDs and single room machines can be managed under these orders
    - 10 CFR 830 Nuclear Safety Management
      - Helps some facilities stay out of this area of regulation

*10 CFR 835 does not envision the hazard of short, intense radiation fields that can be produced by accelerators. That is the value of 420.2c. Bob May – Jefferson Lab*

*An unsafe accelerator safety issue negatively impacts all facilities. Dave Freeman SNS*

# Brief History and Framework of the DOE Accelerator Safety Program

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- DOE order 420.2c Safety of Accelerator Facilities
  - Requires:
    - Accelerator Safety Envelope
      - “Permit to operate” approved by DOE Site Office
      - Lists simple, clear, measurable operational parameters (e.g. number of protons per year to a given beamline)
      - Includes credited controls to ensure safe operation
    - Safety Assessment Document
      - Safety analysis that serves as the technical basis for the ASE.
    - Clearly defined roles and responsibilities for accelerator activities including those for training and procedures.

## Brief History and Framework of the DOE Accelerator Safety Program

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- An unreviewed safety issue (USI) process.
  - USI process supports configuration management efforts that helps to ensure facility and supporting safety documentation are current and periodically updated.
- An accelerator readiness review (ARR) program that ensures facilities are adequately prepared for safe commissioning and/or operations.
- Inventory of accelerators.

# Brief History and Framework of the DOE Accelerator Safety Program

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- **The current DOE Order for Accelerator Safety, DOE O 420.2C, approved on 7/21/11, re-certification submitted and pending**
- **The current DOE Guide for Accelerator Safety, DOE G 420.2-1, approved on 8/1/14**
- **DOE Technical Standard “Clearance and Release of Personal Property from Accelerator Facilities”, DOE-STD-6004-2016, approved on 5/17/16**
  - Thanks to the Contractor Writing Team
  - Thanks to the DOE Review Team
  - Special Acknowledgement to AU-20 and NA-50
- **Periodically review, revise or certify our directives**
  - We are required to review and verify continuing relevance of the Order, Guide and Technical Standard

# ASW Locations

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- 2004 – Fermi
- 2005 – Fermi (Guide)
- 2006 – SNS - 1<sup>st</sup> Wkshp
- 2007 – Argonne
- 2008 – Thomas Jefferson (TJ)
- 2009 – Brookhaven
- 2010 – SLAC/Berkeley
- 2011 – Argonne/Fermi
- 2012 – Los Alamos/Sandia
- 2013 – VTC
- 2014 – GTN (SNS/TJ)
- 2015 – Brookhaven (TJ/SNS)
- 2016 – Fermi
- 2017 – Thomas Jefferson

# Highlights

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- **“Community of practice”**
- **10 years of workshops = strong community**
- **There are more than 200 individuals on the Accelerator Community Monthly Call invitation list.**
- **Workshop attendance continues to grow.**
- **Fusion added to our Community (2015)**
- **International Invitation continues to expand year over year (European Spallation Source (ESS), Japan Proton Accelerator Research Complex (JPARC), European Organization for Nuclear Research (CERN)).**

# Accomplishments

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- **The Accelerator Community has put a significant effort into its Regulatory Framework:**
  - Order, Guide and Technical Standard
- **We have done an excellent job of:**
  - Building our Community of Practice
  - Collaborating together (HQ, Field and Sites)
- **Our community works issues:**
  - Emergency Management, Accelerator Readiness Review (ARR)s, Cyber



# ASW Intro Conclusion

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- **DOE is a stakeholder, Our Contractors are our partners, Operational Excellence is an Expectation.**
- **Looking forward to another Great Workshop!**

# Workshop Agenda

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- Major Accelerator Project Highlights
  - Jefferson Lab 12 GeV Upgrade
    - Had phased readiness reviews. 4 phases over more than 3 years, preceded by directors commissioning plan/ ARR plan review.
    - Performance based assessment: Properly constructed and tested beamline. Have talk in beamline tunnel. Have experts show people elements. Where is cabling to power supply? Are you going to include electrical protection here? Etc. Putting them in the field will give them a fuller picture as opposed to just giving them talks/PowerPoints.

# Workshop Agenda

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- SLAC LCLS II Project
  - Putting together ARR team. Integrate ARR into project planning
  - Transition To Operations criteria are documented system-by-system.
  - Operational performance needed to declare a system ready to be transferred from the project to LCLS
- Fermilab LBNF/DUNE Project
- Fermilab Mu2e Project

# Workshop Agenda

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- International Accelerators
  - European Spallation Source
    - Greenfield site. What format to do readiness review?
  - JPARC
    - Reviews and return to operations after 2011 earthquake (8 mo downtime) and 2013 radioactive material release (11 mo downtime)
  - European Synchrotron Radiation Facility
    - How to recycle/release IFB material under French law

# Workshop Agenda

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- Recent Lessons Learned
  - ASE Violation at NSLS II
  - Fermilab Controlled Access Violation
  - LOTO incident at Fermilab
  - Tritium Management at Fermilab
- Decommissioning and Sustainability
  - SLAC linac Dismantlement Lessons Learned
  - DOE Material Release in Practice
    - SLAC: 3803 tons of materials removed for recycling \$1.6MM in revenue

# Workshop Agenda

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- Laser Safety
  - Petr Prochazka ELI Beamlines
  - BELLA Laser Plasma Accelerator
  - Jamie Santucci reflective eyewear.
- Decommissioning and Sustainability
  - BNL NSLS
  - LLNL repurposing legacy accelerator
  - Discussion of Status of Tech Standard Gail Mattson BNL
- Fusion
  - DOE Fusion program overview
  - Recent safety issues and lessons learned at DIII-D
  - NSTX-U first year operating results
  - Z Machine

# Workshop Agenda

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- Work planning and controls
  - Fermilab Shutdown planning
  - NNSA Z Machine WPC
  - Working with IMPACT at CERN
  - Jlab ATLis
- Operational experience
  - Instrument Readiness Review process at NSLS-II
- Cyber informed engineering – Virginia Wright INL
  - body of knowledge and methodologies to characterize and mitigate risks presented by the introduction of digital technology into formerly analog environments.

# Workshop Agenda

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- Operational experience
  - Instrument Readiness Reviews at NSLS II
    - IRRs and ARR done in FY14: Electrical, Fire, Pressure cryogenics, Lead, Radiation
    - Review Credited controls, documentation requirements, and personnel qualification
    - Schedule IRR 6 weeks before the operators are planning on operating the beamline.
    - ~40 criteria
    - Have 7 person review team (all from BNL)
    - Interview staff, Read documents, Inspect instrument,
    - Team reviews details, makes observations, Issues findings
  - MC Benchmarking Measurements at Jlab
  - ORNL Leadership training
  - User Facility Challenges - APS
    - Provide 5000 hours of x-rays per year with 95% availability
    - Had 5720 experiments in FY15 (1000 in 1999) with 21242 total people performing experiments
    - Use Experiment Safety Assessment Form, which uses defined hazard categories with assigned hazard controls (graded low, med, high)



# EFCOG Electrical Safety Task Group Workshop

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- July 2016 at Fermilab
  - EFCOG Best Practice 192: Guide to Incorporating Risk Assessment into Integrated Safety Management for Electrical Safety
  - <http://efcog.org/wp-content/uploads/2016/07/Risk-Assessment-Best-Practice192.pdf>
  - Guide to incorporate Risk Assessment into Hazard Analysis.
  - See also Randy Paura's talk on Thursday

# Take-aways

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- Several other related communities exist and produce work that we can learn from.
- Some areas of potential interest
  - Facility approval process
  - Configuration management
  - Training
  - Legacy facility issues
  - Incorporating risk management