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# PXIE Operational Readiness

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PIP-II Machine Advisory Committee

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# Overview

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- Safety Regulations and Requirements
- Three Safety Significant Project Phases
- Requirements for Each Phase
- Summary

# Safety Regulations and Requirements

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- Regulations
  - Occupational Safety & Health Administration (OSHA)
    - 10 CFR 1910 General Industry Safety Requirements
    - 10 CFR 1926 Construction Safety Requirements
  - Occupational Radiation Protection 10 CFR 835
  - Safety of Accelerator Facilities DOE O 420.2C
    - DOE G 420.2-1A Implementation Guide
- Fermilab Implementation
  - Fermilab Environment, Safety and Health Manual (FESHM)
  - Fermilab Radiological Control Manual (FRCM)
- Requirements provide an integrated approach to hazard controls

# Project Phases

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- Three safety significant phases of operations
  - LEBT, RFQ, MEBT
    - Beam energy  $\leq 2.1$  MeV
  - HWR, SSR1, HEBT
    - Beam energy 10 – 25 MeV
  - PIP-II
    - Beam energy 800 MeV
    - Integrates into existing accelerator complex
- Safety requirements escalate at each phase

# LEBT, RFQ, MEBT

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- Beam energy under neutron production threshold
  - No radiological concerns from operations
- Operations covered under 10 CFR 835, 1910, and FESHM
- Requirements
  - Hazard Analysis (HA) of proposed operations
  - Operational Readiness Clearance (ORC) Review
    - SMEs review installation for compliance with FESHM
  - Division Head Authorization for Commissioning and Operations

# HWR, SSR1, HEBT

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- Beam energy creates a radiological area
- Operations covered under 10 CFR 1910, DOE O 420.2C, FESHM, and FRCM
- Requirements
  - PXIE enclosure meets an exemption in DOE O 420.2C
  - HA for proposed operations
  - Oxygen Deficiency Hazard (ODH) analysis
    - Cryogenic Safety Review
  - Radiation Shielding Assessment
    - Preliminary Shielding Assessment already completed
  - Configuration management of interlock systems and radiation shielding
  - ORC Review
  - Division Head Authorization for Commissioning and Operations

# PIP-II

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- Beam energy creates a radiological area and PIP-II linac integrates into the existing complex
- Operations covered under 10 CFR 1910, DOE O 420.2C, FESHM, and FRCM
- Requirements
  - Unreviewed Safety Issue Determination
    - Already completed
  - Project Hazard Assessment Document
  - Preliminary Shielding Assessment
  - Oxygen Deficiency Hazard (ODH) analysis
    - Cryogenic Safety Review

# PIP-II

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- Radiation Shielding Assessment
- Safety Assessment Document
  - Approved by Director
  - Concurrence from DOE Fermi Site Office (FSO)
- Accelerator Safety Envelope
  - Approved by Director and FSO Manager
- Accelerator Readiness Review (ARR)
  - Readiness review by external SMEs
- Closeout of ARR Pre-Start Findings
- Division Head Authorization for Commissioning and Operations



# Summary

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- Fermilab has an established ES&H organization
  - PIP-II Project integrated with the ES&H organization
- ES&H Regulations well understood
- Laboratory processes in place to manage each phase of the project
  - Contractor Assurance Program
  - Safety Configuration Management
  - ORC Committee
  - Shielding Assessment Review Subcommittee
  - SAD Review Subcommittee
  - ARR Process in place

# Thank you

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