Implementing U.S. Department of Energy Standard 1189 for the Uranium Processing Facility at Y-12

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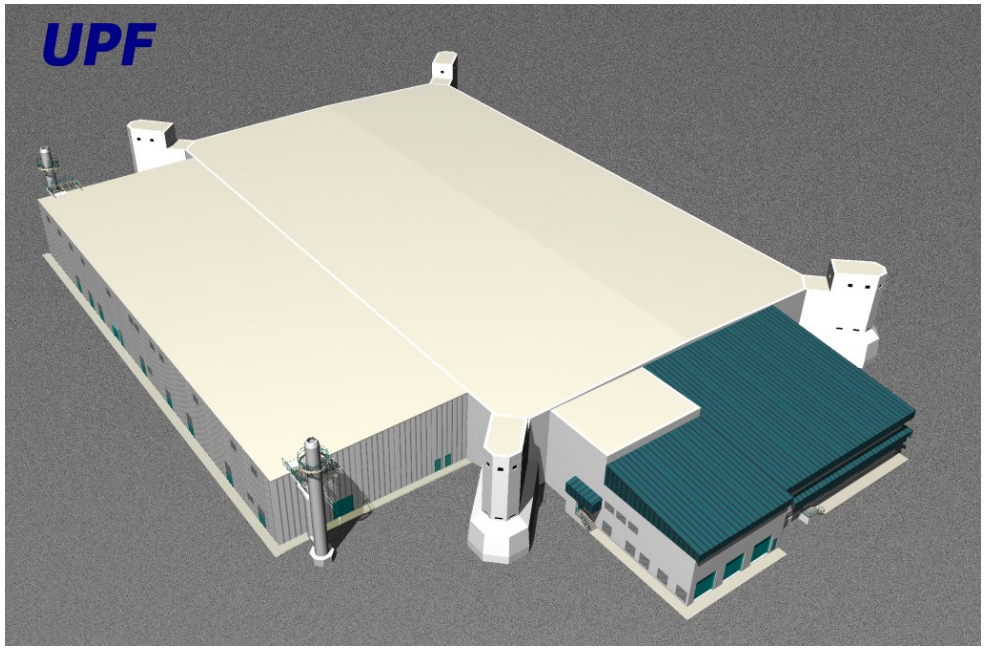
The Uranium Processing Facility

Ensures the Nuclear Weapons Complex has and maintains secure, safe, and efficient enriched uranium processing to meet the mission of the U. S. Department of Energy's National Nuclear Security Administration



- Consolidates operations
- Reduces overall plant footprint
- Dramatically improves the security posture
- Reduces overall plant operating cost through leveraging new technologies
- Provides efficient engineered facilities and processes
- Improves worker safety and health

UPF Functions and Operations

Functions

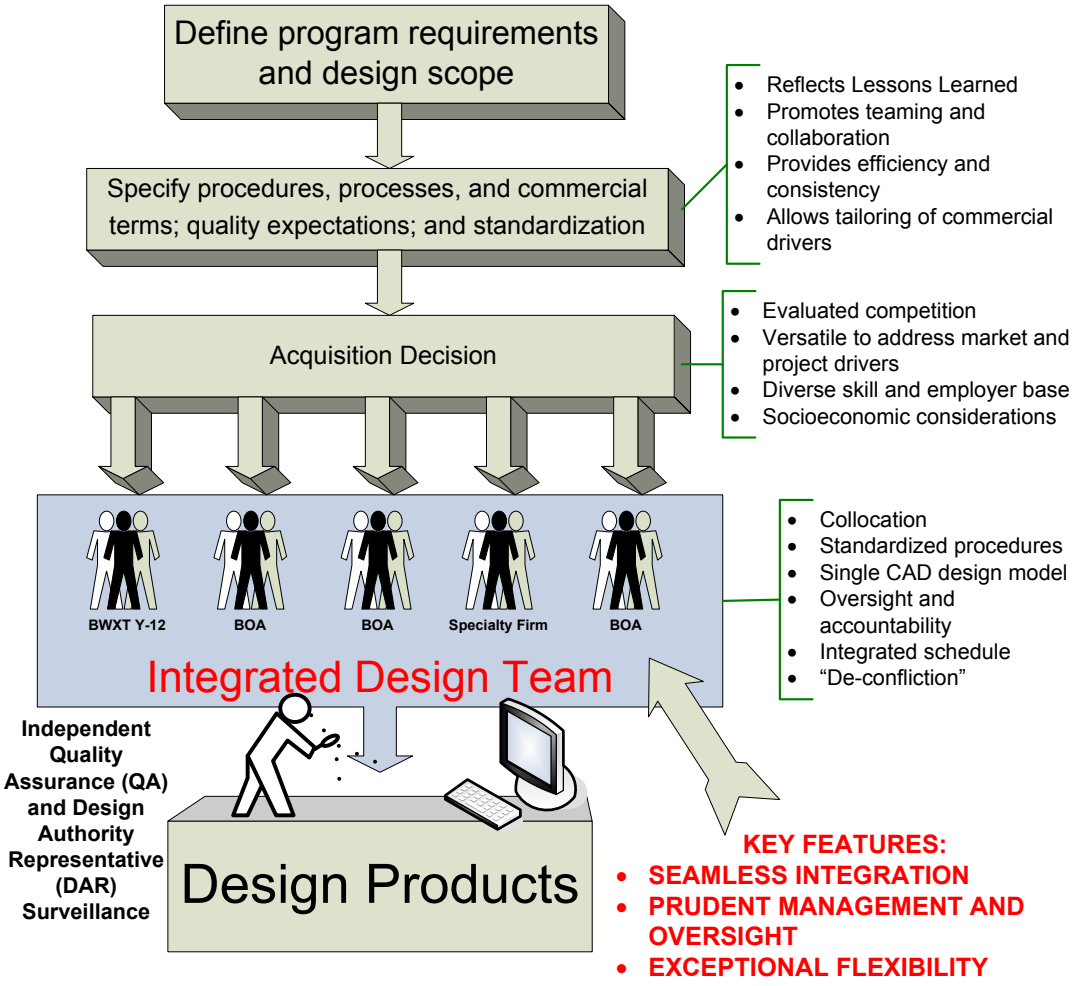
- Supports the weapons stockpile
- Underpins the Uranium Center of Excellence
- Provides uranium feed for Navy fuel
- Supports the disposition of excess highly enriched uranium

Operations

- Processing (chemical, metallurgical, and mechanical)
- Component production
- Assembly and disassembly
- Dismantlement
- Quality verification, surveillance, and certification
- Packaging and shipping

Project Execution Strategy

- Project management will use an **Integrated Project Team (IPT)** consisting of members from NNSA, Y-12, and external subject matter experts
- An **Integrated Design Team (IDT)** consisting of Y-12 staff, subcontract designers, and specialty designers will integrate the design model
- Safety will be integrated into the design through a **Safety-in-Design Integration Team (SDIT)**



UPF and DOE-STD-1189

- 2005
  - Project received CD-0 approval
  - Integrated Project Team formed
- 2006
  - BWXT Y-12 committed to develop a safety basis strategy, called the Safety Design Strategy (SDS)
- 2007
  - SDS and Preliminary Hazard Analysis (PHA) submitted as part of CD-1 package
  - Y-12 Site Office directed the project to use the March 1, 2007, draft of DOE-STD-1189
    - SDS is based on this version

DOE-STD-1189 Implementation Timeline

- June 2007: YSO issued Safety Evaluation Report (SER)
  - Approved the PHA and SDS
- June 2007: BWXT Y-12 issued letter to YSO documenting key technical parameters for UPF
- August 2007: DOE approved CD-1 with no conditions
- September 2007: DOE technical direction letter received

UPF Key Technical Parameters Letter

- Intent was to define our approach to several key parameters with far reaching (long lasting) project implications
  - Use ICRP-72, *Age-Dependent Doses to the Members of the Public from Intake of Radionuclides*,
  - Use seismic design criteria from ANS 2.26, *Categorization of Nuclear Facilities Structures, Systems, and Components for Seismic Design*
  - Use Damage Ration of 1.0 for integrated confinement strategy
  - Use medium Airborne Release Fraction vs. bounding for bulk metal fires
  - Perform a formal comparison of HGSYSTEM/WAKE vs. MACCS2

YSO Response

- Since UPF must proceed with preliminary design, YSO provided following technical guidance for natural phenomena (NP) categorization of credited Structures, Systems, and Components (SSCs).
  - UPF structure will be **SDC-3** for seismic and **PC-3** for all other applicable NP hazards
  - All SSCs credited in safety basis documents to prevent a nuclear criticality accident will be designed and constructed as **SDC-3/PC-3**
  - All SSCs credited as “safety class” or “safety significant” for protection of public will be designed and constructed as **SDC-3/PC-3**

YSO Response (cont.)

- All SSCs credited for facility worker protection only (except nuclear criticality accidents) will be **SDC-2/PC-2**
- SDC-3/PC-3 for these SSCs may be appropriate for NP events with the potential for a prompt worker fatality, immediately life-threatening injuries, and/or permanently disabling injuries
- All SSCs preventing or mitigating release of hazardous materials exceeding ERPG-3 at the emergency response boundary will be **SDC-3/PC-3**

YSO Response (cont.)

- All other SSCs will follow direction in DOE-STD-1189 for determining SDC and PC
- Preliminary limit states will be defined in accordance with ANS 2.26 and DOE-STD-1189 within 6 months after CD-1 approval
- Limit states may be redefined as the design process and safety basis process moves forward

Preliminary Safety SSC

- Fire suppression system
- Criticality Accident Alarm System (CAAS)
- Facility structure
- Primary and secondary confinement ventilation
- Electrical system for confinement system
- Fire barriers
- Process equipment that serves a confinement and/or criticality safety function

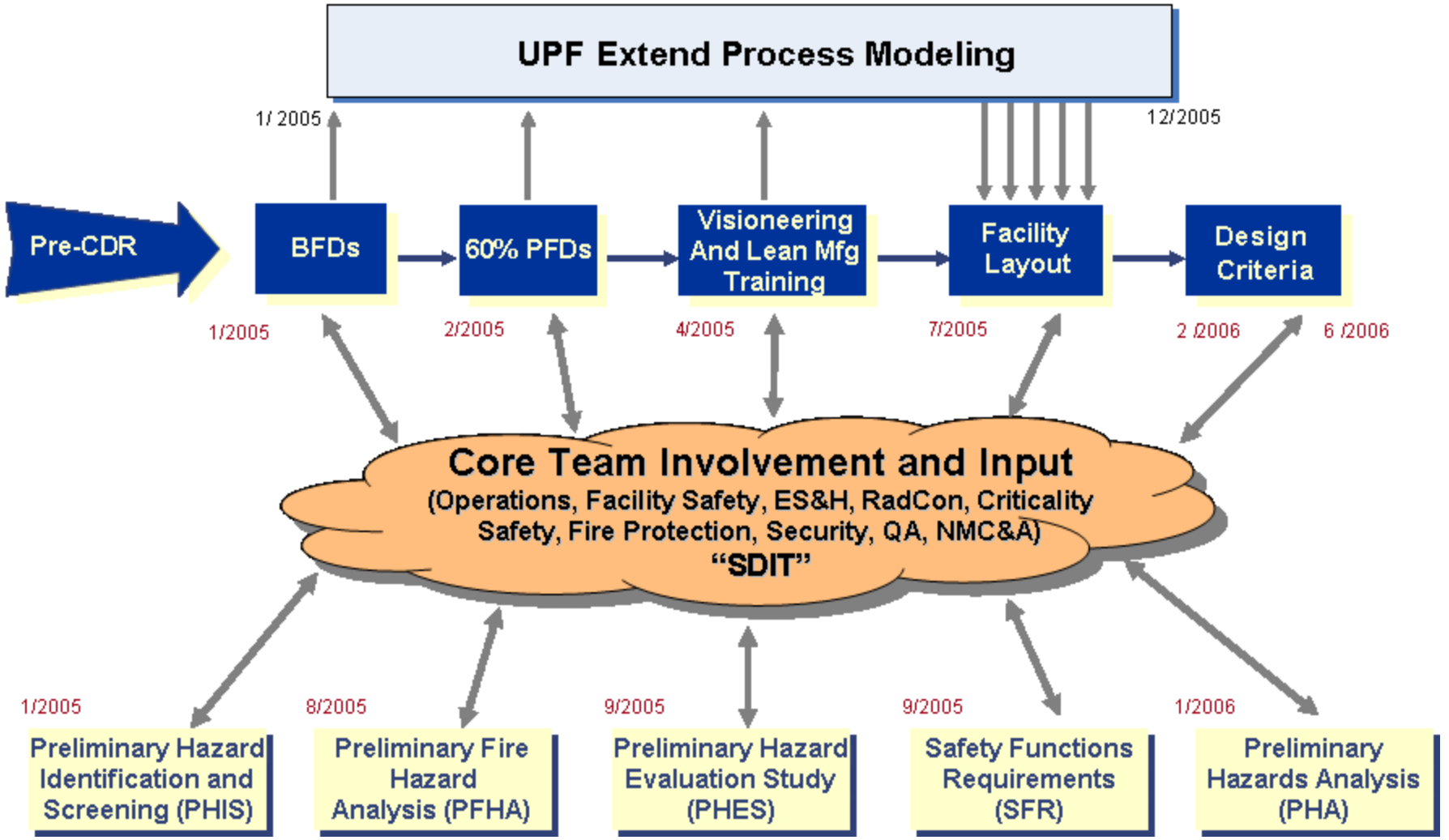
Additional Safety SSC

- SER added the following safety significant SSC
  - Portions of glovebox inerting system (based on confinement strategy)
  - Fire fighting water supply (tanks, pumps, piping system, etc.)
  - Backup electrical power supply for:
    - Fire system pumps
    - Glovebox inerting system
    - Local fire alarm panel(s), detection, and annunciation
    - CAAS detection and annunciation

UPF Safety-in-Design Strategy

- Defined in Integrated Management Plan
  - Identifies the safety-in-design integration process
  - Links all project plans and work processes together
  - Establishes an integrated, collegial project design execution approach involving all functions and stakeholders throughout the project's life cycle
    - Safety-in-Design Integration Team (SDIT)

Integrating Safety and Security into Design



Safety-in-Design Integration Team

- Composition specified as core team plus other subject matter experts as needed
- Works collaboratively with Integrated Design Team (IDT)
- Achieves consensus with IDT on low composite risk design solutions
- Elevates conflicts to Design Authority Representative, affected Functional Area Manager, and/or Authority Having Jurisdiction

Nuclear Safety Strategy

- MAR minimization – new technologies, minimize storage capacity, sizing of systems
- Defense-in-depth – multiple barriers to prevent/ mitigate releases
- Criticality accidents precluded primarily through passive design features
- Administrative controls minimized to the extent practical through engineered controls
- Minimizing risk to workers through design and engineered controls
  - Example: no PPE for routine operations as a goal
- No active, safety class SSC
  - Example: fire barriers for compartmentalization of MAR