# Mechanical Systems and Operations (MSO) Scope

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May 8, 2013

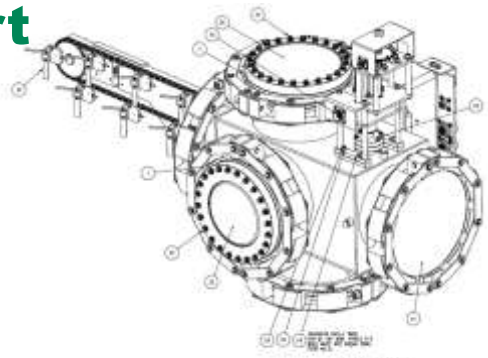
# What We Do: Central Utilities

- Design, install, operate, maintain, and improve mechanical and process systems across the Neutron Sciences Directorate

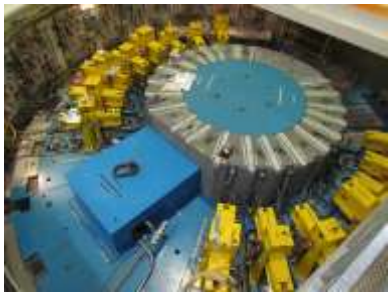
- Chilled Water / Tower Water / Condenser Water system design, operation and maintenance
- Heating Water / Compressed Air / Central Exhaust system design, operation and maintenance
- Chilled Water capacity – 4800 Tons
- Cooling Tower capacity – 48 MW
- Compressed Air capacity – 1100 cfm @150 psig
- Primary pumps – 14
- Cooling Tower fans – 4
- Central Exhaust Facility fans – 10

# What We Do—Accelerator & Beam Transport

- Water cooling system design, operation and maintenance
- Stripper foil QA, testing, & installation
- Accelerator component and magnet design
- Accelerator structure cooling and resonance control (RFQ, DTL, CCL)
- RF component, magnet (316), and magnet power supply (130) cooling
- Beam dump (2) & collimator (3) cooling
- 30 water loops, 36 pumps, > 35 miles of piping, ~4,000 hoses, 400 flexible couplings
- Vacuum system ($10^{-8}$ – $10^{-9}$ torr) design, operation, and maintenance; including 152 ion pumps, 23 scroll pumps, 19 turbo pumps, 6 cryo pumps

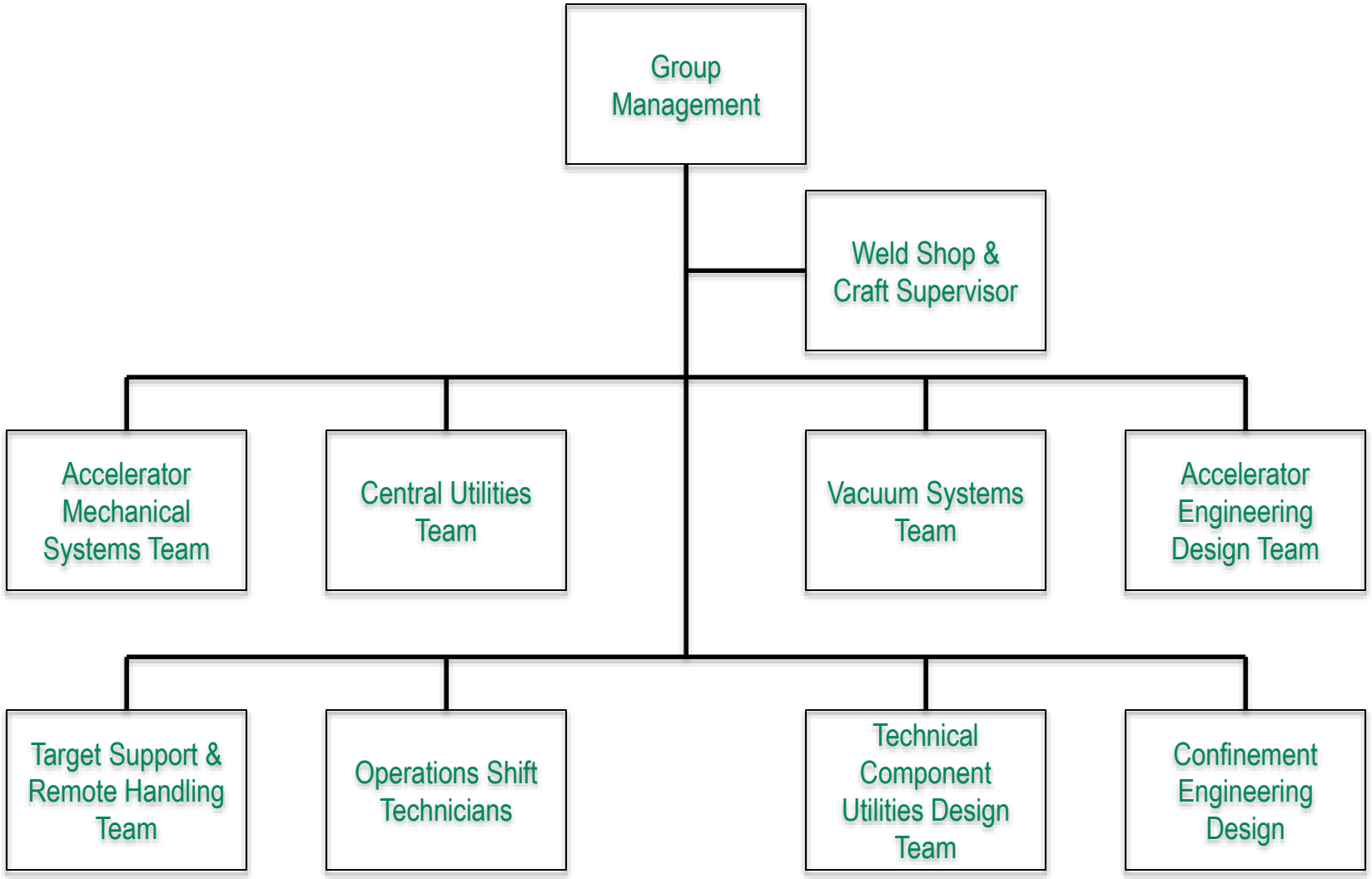


# What We Do: Target & Beam Lines



- Mercury loop operation & maintenance (~380 gallons of activated mercury, 21.5 tons)
- Cryogenic hydrogen and helium system operation & maintenance
- Water cooling system design, operation & maintenance
- Gas handling system design, operation & maintenance
- Radioactive material confinement system design, operation & maintenance (5)
- 8 Water Loops / 14 pumps; 3 hydraulic systems
- Remote handling equipment
- Target Building support systems (42 HVAC, 2 waste)
- Instrument & target vacuum system ($10^{-6}$ – $10^{-7}$ torr) design, operation & maintenance; including 6 vessels (40,000 – 200,000 liters), 131 scroll pumps, 12 turbo pumps, 6 large rough pumps, 5 Polycold compressors, 7 cryo pumps

# MSO Structure



# Who we are (59 people)

**Accelerator Mechanical Systems (RF, magnet & accelerator structure cooling), $880 K***

| | |
|---|---|
| 3 | Engineers |
| 1 | Technician |
| 3 | MRMs |

**Accelerator Engineering Design (Accelerator component design & fabrication), $80 K***

| | |
|---|---|
| 4 | Engineers (1 vacant) |
| 2 | Designers |

**Central Utility Systems (24/7 site tower water, chilled water, compressed air, heating water operation & performance trending), M&S: $1,160 K, Labor: $1,565 K (re-charge accounts)**

| | |
|---|---|
| 1 | Manager |
| 5 | Engineers (3 vacant) |
| 1 | Technician |
| 2 | MRMs |

**Vacuum Systems (Accelerator & beam line vacuum, stripper foils, HFIR maintenance support), $1,760 K***

| | |
|---|---|
| 1 | Manager |
| 3 | Engineers |
| 5 | Technicians |
| 2 | MRMs |

**Technical Component Utilities Engineering Design (Target and beam line water & gas system design & operation, HFIR beam line design support), $20 K***

| | |
|---|---|
| 1 | Engineer |
| 1 | Designer |

**Target Support and Remote Handling (Target system maintenance & radioactive waste disposal), $625 K***

| | |
|---|---|
| 1 | Manager |
| 7 | Technicians |
| 3 | MRMs |

**Operations Shift Technicians (24/7 target system & Bldg. 8700 operation & performance trending), $475 K***

| | |
|---|---|
| 7 | Technicians |

**Confinement Engineering Design (Target confinement & waste system design & operation), $0 K***

| | |
|---|---|
| 1 | Engineer |

**Group Management (& MRM Supervision)**

| | |
|---|---|
| 2 | Managers |
| 1 | Administrative Professional |

*FY13 M&S Budget Request Total: $3,840 K
FY13 Labor Budget Request Total:$11,720 K

# How We Plan

- Spares, Maintenance, and Improvements—greatest risk first:
  - Address known sources of downtime (linac flow sensors, targets)
  - Address end-of-life issues (Ion pumps, water hoses, flex couplings)
  - Address predictable sources of downtime (Off-normal chemistry, vibration & oil analysis results, equipment obsolescence, critical spares)
  - Identify & correct failure modes of equipment (Triscroll vacuum pumps, Sector Gate Valves, stripper foil mechanisms, MOTS)
  - Update maintenance procedures and planned maintenance schedules to capture lessons-learned (target changes, Triscroll vacuum pump rebuilds, ion pump rebuilds)
- Upgrades—accomplish according to priority:
  - RAD assigned priority, NScD Five Year Plan, DOE expectations

# Potential Future Performance Issues

- Water system chemistry
- Water system cooling hose and flexible coupling end-of-life
- Central Utilities capacity (user modification & use impacts)
- Warm linac vacuum system design (O-rings vs. ion pumps)
- Stripper foil fabrication & performance (sole source)
- Instrument, neutron guide & collimator material selection & vacuum design
- Mercury target module failure modes vs. lifetime
- Mercury loop contaminant build-up
- HOG system delay times vs. radioactive air emissions
- TN-RAM cask availability for waste disposal