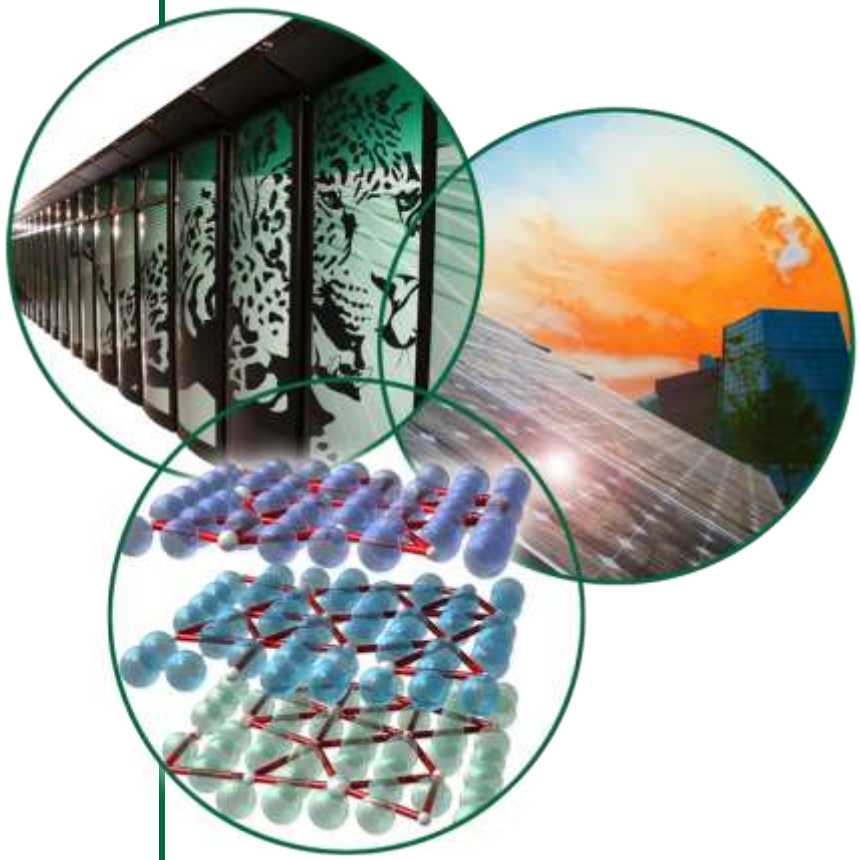
# PUP Overview, Management and Organization



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MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

# Outline

- Overview
  - PUP Scope
- Progress so far
  - Organization
  - WBS
- Project Management
  - Risks and Concerns

# PUP = Energy Increase

- Power Upgrade Project (PUP) will increase beam energy to 1.3 GeV (30% increase)
- Doubling SNS Power requires the Power Upgrade Project (PUP) AND R&D AND several Accelerator Improvement Projects to allow increased beam current (we call these CUAIPs). The latter will increase the beam current and implement target improvements which will result in the remaining power increase to >2MW

# Notional CUAIP Funding Profile

| CUAIP Title | FY2011 | FY2012 | FY2013 | FY2014 | FY2015 | Estimated Total Cost ($K) |
|---|---|---|---|---|---|---|
| CUAIP.01 Ion Source AIP | 0 | 0 | 1,890 | 928 | 0 | 2,818 |
| CUAIP.02 LEBT AIP | 0 | 0 | 1,925 | 865 | 0 | 2,790 |
| CUAIP.03 HVCM Upgrade AIP | 0 | 1,844 | 2,369 | 769 | 0 | 4,982 |
| CUAIP.04 Warm Linac Diagnostics AIP | 0 | 1,347 | 733 | 627 | 12 | 2,719 |
| CUAIP.05 Ring Current Diagnostics AIP | 0 | 0 | 1,756 | 2,343 | 0 | 4,099 |
| CUAIP.06 Laser Stripping | 0 | 0 | 419 | 3,527 | 0 | 3,945 |
| CUAIP.07 Ring Injection Dump Upgrade AIP | 0 | 0 | 1,317 | 1,416 | 1,186 | 3,920 |
| CUAIP.08 Inner Reflector Plug and Moderator AIP | 655 | 1,746 | 7,663 | 465 | 157 | 10,687 |
| CUAIP.09 Proton Beam Window AIP | 0 | 654 | 465 | 633 | 110 | 1,862 |
| CUAIP.10 Mercury Target AIP | 0 | 2,367 | 7,956 | 3,406 | 2,081 | 15,810 |
| CUAIP.11 Target Systems Upgrade AIP | 1,346 | 5,121 | 0 | 0 | 0 | 6,468 |
| CUAIP.12 Integrated Controls for Beam Current Upgrades | 0 | 427 | 956 | 1,502 | 0 | 2,884 |
| **Total** | **2,002** | **13,505** | **27,447** | **16,481** | **3,548** | **62,984** |

- **These data have not been looked at in several years**

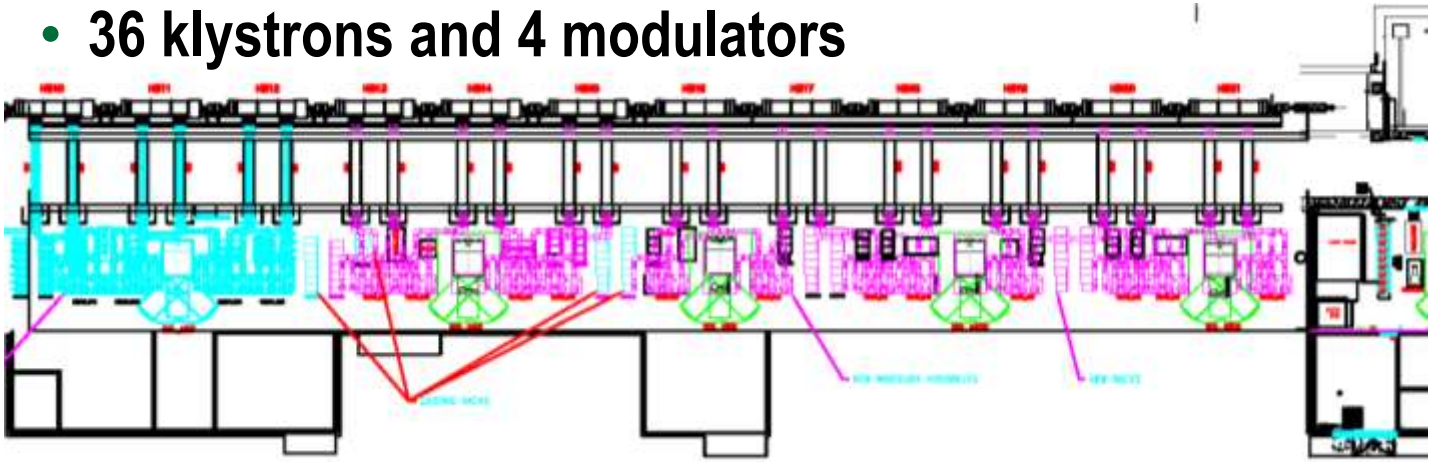
# PUP Scope

- **INCLUDES:**
  - upgrades to the superconducting linac and associated support systems
  - upgrades to the Ring and associated support systems
  - upgrades to the integrated control systems for the SCL, Ring and new substation.
  - expansion/extension/modification of the site infrastructure to support the above upgrades
- **DOES NOT INCLUDE**
  - upgrades to increase beam current
  - R&D

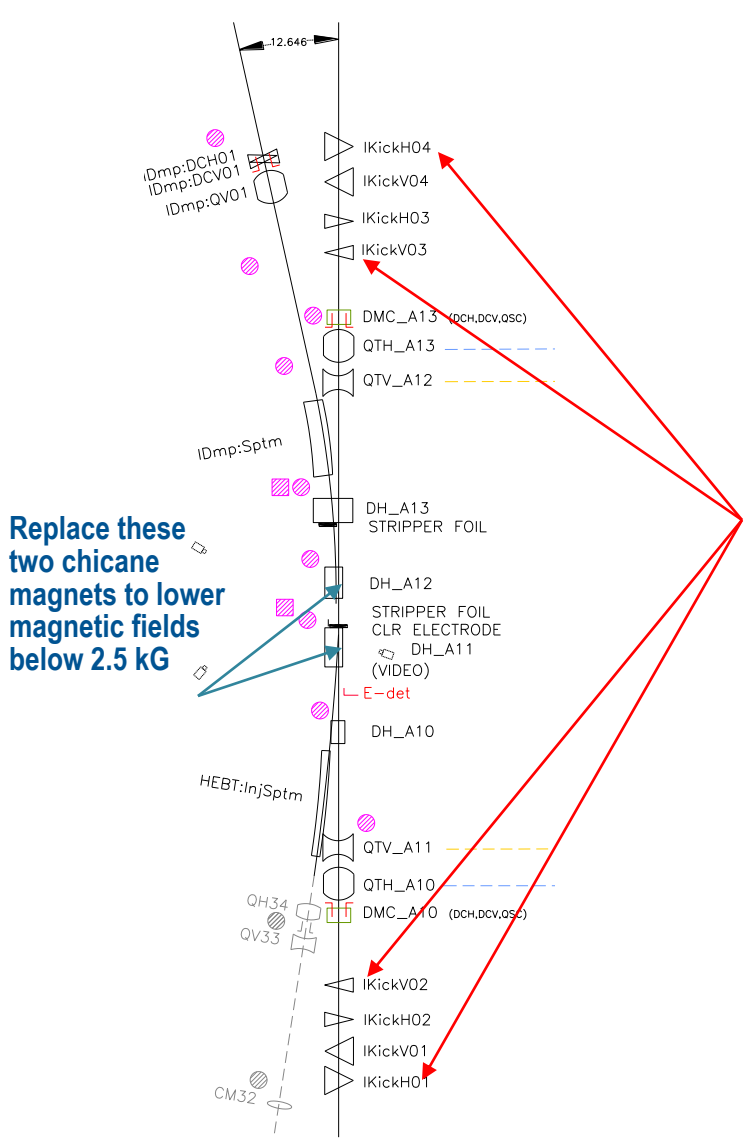
# SCL PUP Scope

- Procure/fab and install 9 cryomodules to fill out the SCL

- Provide RF power for these new cryomodules
  - 36 klystrons and 4 modulators



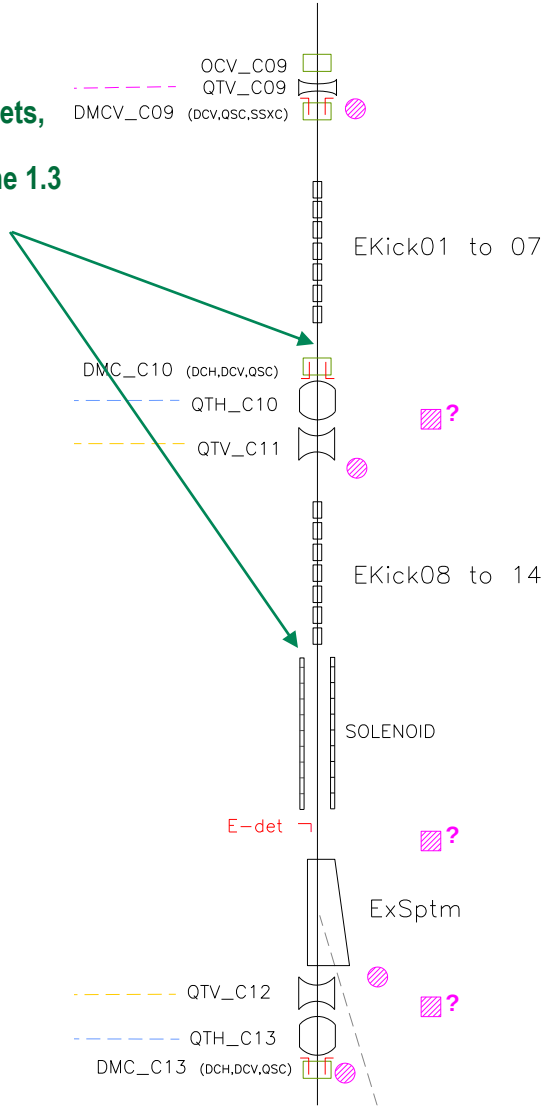
# Ring PUP Scope




**Replace these two chicane magnets to lower magnetic fields below 2.5 kG**

**The short vertical and horizontal injection kickers need new or upgraded power supplies to provide the needed kick angles for the 1.3 GeV beam**

**Two new extraction kicker magnets, PFNs, charging supplies, and controls are needed to deflect the 1.3 GeV beam**



# Cost Range

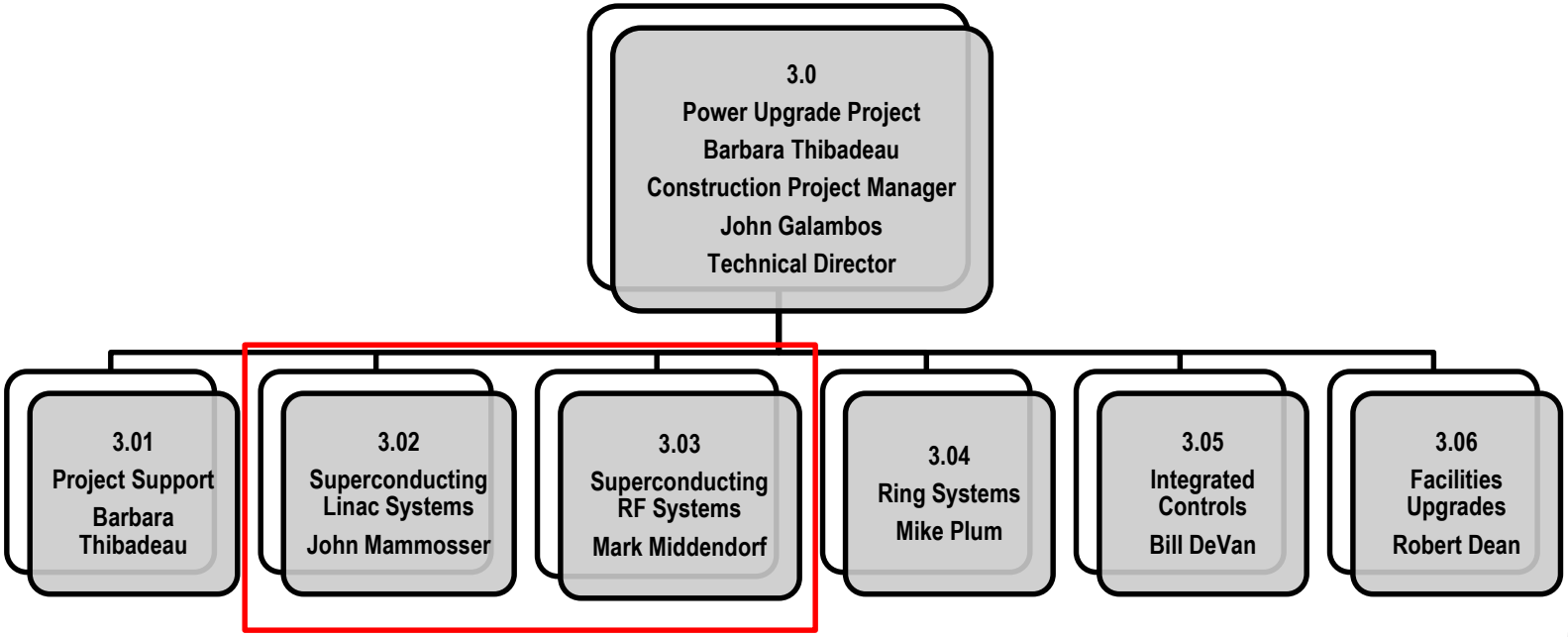
| WBS | Description | Est. Minimum Cost ($ in M) | Est. Maximum Cost ($ in M) |
|---|---|---|---|
| 3.0 | Power Upgrade Project | 89.6 | 96.1 |
| 3.1 | Project Support | 5.8 | 5.8 |
| 3.2&3.3 | Superconducting Linear Accelerator (SCL) Systems | 66.0 | 66.5 |
| 3.4 | Ring Systems | 10.7 | 13.9 |
| 3.5 | Integrated Controls Systems | 5.3 | 6.0 |
| 3.6 | Facility Modifications | 1.8 | 3.8 |

# Critical Decision Dates

| Decision | CD-1 | Current Goal |
|---|---|---|
| CD – 0 Approve Mission Need | Nov 04A | Nov 04A |
| CD – 1 Approve Alternative Selection and Cost Range | Jan 09 | Jan 09A |
| CD – 2 Approve Performance Baseline | Dec 11 | Jan 11 |
| CD – 3A Approve Start of Long-Lead Procurements | Jan 12 | Oct 11<br>*(klystrons, transmitters, transmitter controls waits for FY12 funding)* |
| CD – 3B Approve Start of Construction | Dec 12 | Aug 12 |
| CD – 4 Project Complete | Dec 15 | >Dec 15<br>*($16M is a lot to spend in one year)* |

# Project Status

- Jun09- Started getting ready in anticipation of FY10 funding ($2M arrived Jan10). Since then we've:
  - Established the project team
  - Identified the resources required to complete CD-2 requirements
  - Arranged weekly project meetings
  - Detailed the WBS structure and opened account numbers



# Current Activities

- Updating CDR assumptions to current operating experience
  - e.g. CDR assumed 12 klystrons/modulator. We are currently operating at ~10/modulator. Hence, PUP scope includes 4 modulators.
  - e.g. CDR assumed piezo electric tuners and HEBT cavities might be needed. They are not and they are not in the PUP scope.
- Defining interface points between WBS elements
  - e.g. where does Ring Systems scope end and Integrated Controls scope begin?
- Identifying CUAIP and STS interfaces
  - e.g. new couplers will be able to handle higher current
- Identifying infrastructure (e.g. space, cooling, electrical) requirements
  - e.g. adding 4 modulators will require:
    - additional cooling skid which will require additional space and increase demand on DI water system

# Plan to CD-2- very aggressive

| | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Identify STS and CUAIP PUP dependencies | | | | | | | | | | | | | |
| Final design for direct (or near copy) items | | | | | | | | | | | | | |
| CDR update complete | | | | | | | | | | | | | |
| Preliminary Design | | | | | | | | | | | | | |
| Develop cost estimates and schedule | | | | | | | | | | | | | |
| Preliminary Design Review | | | | | | | | | | | | | |
| Modify baseline based on recommendations from the review | | | | | | | | | | | | | |
| Develop contingency assessments | | | | | | | | | | | | | |
| Complete Risk Analysis | | | | | | | | | | | | | |
| Update PEP | | | | | | | | | | | | | |
| Update Hazard Analysis | | | | | | | | | | | | | |
| Internal CD-2 Review | | | | | | | | | | | | | |
| Incorporate comments from internal review | | | | | | | | | | | | | |
| DOE SC CD-2 Review | | | | | | | | | | | | | |
| CD-2 Approved | | | | | | | | | | | | | |

- Guidance from Program Office in Dec 09 was that CD-2 needs to be approved by Jan 2011 in order to get into FY13 budget

# Risks and Concerns

| Risk | Mitigation |
|---|---|
| **Technical Risk** | |
| EXTREMELY LOW<br>Know NOW how to achieve 1.3 GeV | Including an additional modulator in the baseline (4 vs 3) assumes no improvement from current modulator performance |
| **Resource Risk** | |
| Expertise required for PUP is the same expertise required for SNS reliability | SNS operations improving<br>less time fighting fires=more time for other things.<br><br>Key areas where we need to augment the staff already identified. Once the detailed baseline is established, we'll have the full set of resource requirements<br><br>Conservative schedule (earlier start did not result in earlier completion) allows less than 100% availability of these critical resources. |

# Risks and Concerns (con't)

| Risk | Mitigation |
|---|---|
| **Schedule Risk** | |
| **Planning for the capability to deliver >2MW could delay the schedule.**<br>**PUP is extremely easy to accomplish if accomplished in a vacuum.**<br>**Desire is to implement decisions that avoid (or minimize) modifying or replacing or relocating equipment to accommodate CUAIP or STS and thus disrupting operations** | **Identifying decision points and proceed with the best technology at that time** |

# Summary

- PUP has a talented team and low technical risk
  - These are the people currently operating the facility and, in many cases, the people who were part of the initial construction
- Excellent odds for success!