# Proton Plan
# Cost and Schedule Status
# April 2005

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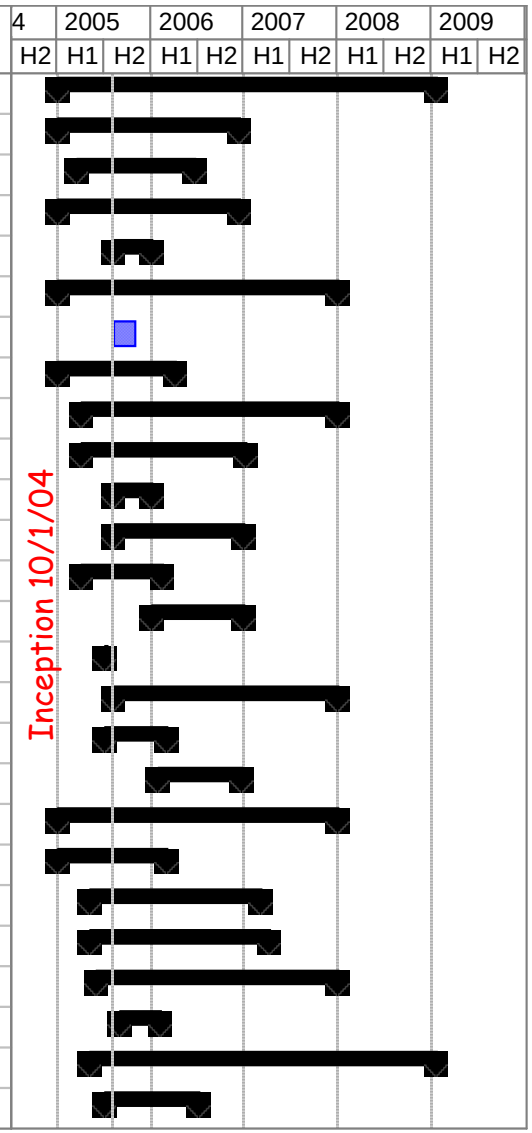
# Resource Loaded Schedule Progress

- Recently we have performed a schedule review/update with all level 3 Managers.
  - The areas that need more work are:
    - Booster 400MEV Line Reconfiguration – New Scope
    - Booster Chopper
    - MI Collimation
    - MI Extraction Kicker Modifications
    - MI RF Upgrade – Break into four AIP packages
- We are compiling estimate information in Microsoft Project via hyperlinks.
- We have reviewed contingency with all level 3 Managers.
  - The guidelines for contingency allocation are:
    1) If the task is complete …..0% cont.
    2) If the task is > than 70% complete ….20% cont.
    3) If we have firm vendor quotes……20% to 30% cont.
    4) If we have an engineers estimate….30% to 40% cont.
    5) If the estimate is top down …40% to 60% cont. depending on if we have done it before.
    6) WAG….60% to 100% cont. None of these at this time.
- Within a month we will be prepared to have a baseline review.

# Proton Plan Schedule - Level 3 Summary

| WBS | Task Name | Start | Finish |
|---|---|---|---|
| 1 | Proton Plan | Thu 9/30/04 | Fri 10/17/08 |
| 1.1 | Linac Upgrades | Thu 9/30/04 | Fri 9/8/06 |
| 1.1.1 | Linac PA Vulnerability | Wed 12/15/04 | Mon 3/20/06 |
| 1.1.2 | Linac Quad Power Supplies | Thu 9/30/04 | Fri 9/8/06 |
| 1.1.3 | Linac Instrumentation Upgrade (descoped) | Mon 5/2/05 | Fri 9/30/05 |
| 1.2 | Booster Upgrades | Thu 9/30/04 | Mon 10/1/07 |
| 1.2.1 | Determine Rep Rate Limit | Mon 5/2/05 | Fri 7/29/05 |
| 1.2.2 | OrBump System | Thu 9/30/04 | Tue 1/3/06 |
| 1.2.3 | Corrector System | Tue 1/4/05 | Mon 10/1/07 |
| 1.2.4 | 30 Hz Harmonic | Mon 1/3/05 | Mon 10/2/06 |
| 1.2.5 | Gamma-t System | Mon 5/2/05 | Fri 9/30/05 |
| 1.2.6 | Alignment Improvements | Mon 5/2/05 | Fri 9/29/06 |
| 1.2.7 | Drift Tube Cooling | Tue 1/4/05 | Mon 11/14/05 |
| 1.2.8 | Booster RF Cavity #20 | Mon 10/3/05 | Wed 9/27/06 |
| 1.2.9 | Booster Solid State RF Pas (descoped) | Fri 4/1/05 | Fri 4/1/05 |
| 1.2.10 | Booster Instrumentation Upgrade (descoped) | Mon 5/2/05 | Fri 9/28/07 |
| 1.2.11 | Booster Dump Relocation | Fri 4/1/05 | Fri 12/2/05 |
| 1.2.12 | Booster Chopper | Tue 11/1/05 | Wed 9/20/06 |
| 1.3 | Main Injector Upgrades | Thu 9/30/04 | Mon 10/1/07 |
| 1.3.1 | Large Aperture Quads | Thu 9/30/04 | Thu 12/1/05 |
| 1.3.2 | Main Injector Collimation System | Tue 2/1/05 | Fri 12/1/06 |
| 1.3.3 | NuMI Multibatch Operation | Mon 2/7/05 | Tue 1/2/07 |
| 1.3.4 | Main Injector RF Upgrade | Tue 3/1/05 | Mon 10/1/07 |
| 1.3.5 | Instrumentation Upgrades (descoped) | Wed 6/1/05 | Mon 11/7/05 |
| 1.4 | Management | Tue 2/1/05 | Fri 10/17/08 |
| 1.5 | Proton Study Group | Fri 4/1/05 | Fri 3/31/06 |



# Proton Plan Costs - Level 3 Summary

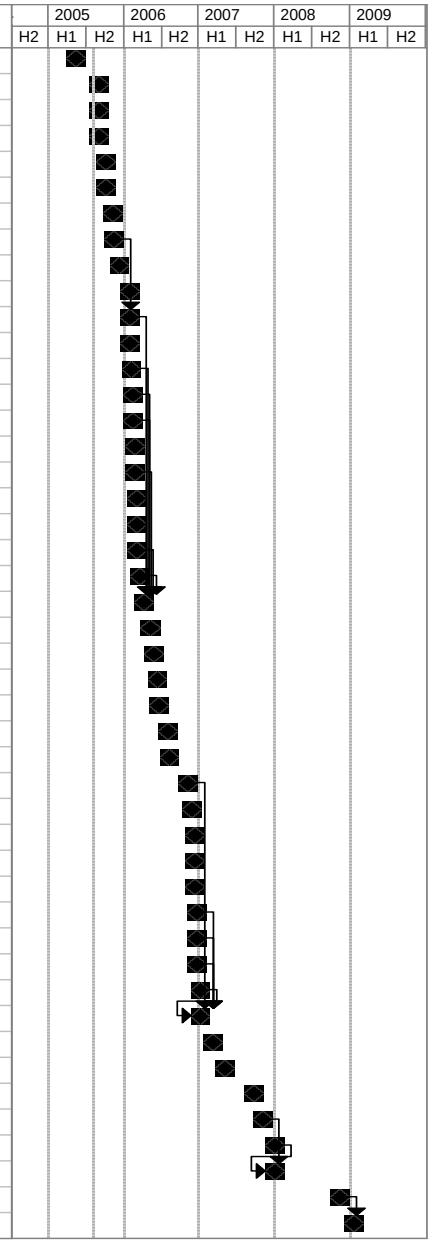
| WBS | Name | M&S Escalated, K | Cont. % | M&S W/ Cont., K | M&S & SWF Esc.+ Cont, K |
|---|---|---|---|---|---|
| 1 | Proton Plan | $16,916 | 31% | $22,210 | $31,851 |
| **1.1** | **Linac Upgrades** | **$2,097** | **9%** | **$2,287** | **$2,693** |
| 1.1.1 | Linac PA Vulnerability | $1,484 | 0% | $1,490 | $1,659 |
| 1.1.2 | Linac Quad Power Supplies | $613 | 30% | $797 | $1,033 |
| **1.2** | **Booster Upgrades** | **$2,697** | **41%** | **$3,816** | **$8,323** |
| 1.2.1 | Determine Rep Rate Limit | $0 | 40% | $0 | $18 |
| 1.2.2 | OrBump System * | $117 | 40% | $164 | $531 |
| 1.2.3 | Corrector System AIP Candidate FY05 | $1,034 | 40% | $1,451 | $4,690 |
| 1.2.4 | 30 Hz Harmonic | $1,019 | 40% | $1,426 | $1,671 |
| 1.2.5 | Gamma-t System | $0 | 0% | $0 | $103 |
| 1.2.6 | Alignment Improvements | $0 | 0% | $0 | $50 |
| 1.2.7 | Drift Tube Cooling | $3 | 40% | $4 | $12 |
| 1.2.8 | Booster RF Cavity #20 | $350 | 49% | $520 | $880 |
| 1.2.11 | Booster Dump Relocation | $112 | 45% | $164 | $259 |
| 1.2.12 | Booster Chopper | $62 | 40% | $86 | $106 |
| **1.3** | **Main Injector Upgrades** | **$12,107** | **33%** | **$16,086** | **$19,259** |
| 1.3.1 | Large Aperture Quads | $269 | 23% | $332 | $1,342 |
| 1.3.2 | Main Injector Collimation System AIP Candidate FY06 | $628 | 60% | $1,005 | $1,613 |
| 1.3.3 | NuMI Multibatch Operation | $300 | 47% | $440 | $758 |
| 1.3.4 | Main Injector RF Upgrade Four AIP Candidates FY06, FY07,FY08 | $10,909 | 31% | $14,308 | $15,546 |
| **1.4** | **Management** | **$16** | **40%** | **$22** | **$1,531** |
| **1.5** | **Proton Plan Phase I Study** | **$0** | **0%** | **$0** | **$45** |



* Orbump Magnet costs are collected in Run II

# All Milestones

| WBS | Task Name | Start | Finish |
|---|---|---|---|
| 1.1.1.1.2 | Linac Task Force Phase 1 Report Issued | Mon 2/14/05 | Mon 2/14/05 |
| 1.3.4.1.1.4 | Review MI RF Upgrade Prototype Test (Internal) | Thu 5/26/05 | Thu 5/26/05 |
| 1.3.2.1.2.2 | Review Concept for MI-8 Collimation System | Tue 5/31/05 | Tue 5/31/05 |
| 1.5.2 | Submit Preliminary Proton Study Group Report | Wed 6/1/05 | Wed 6/1/05 |
| 1.1.1.1.4 | Linac Task Force Phase 2 Report Issued | Thu 6/30/05 | Thu 6/30/05 |
| 1.1.2.1.5 | Linac Quad Power Supplies Design & Dwgs Complete | Fri 7/1/05 | Fri 7/1/05 |
| 1.2.2.1.2.6 | OrBump Magnets Ready for Install on Girder | Mon 8/1/05 | Mon 8/1/05 |
| 1.2.2.1.3.4 | OrBump Stripline Assy Complete | Wed 8/10/05 | Wed 8/10/05 |
| 1.2.2.1.4.5 | OrBump Girder Assy Complete | Wed 9/7/05 | Wed 9/7/05 |
| 1.2.4.1.1 | 30 Hz Harmonic Project Decision | Fri 10/28/05 | Fri 10/28/05 |
| 1.4.2 | Start 2005 Shutdown | Tue 11/1/05 | Tue 11/1/05 |
| 1.5.3 | Submit Final Proton Study Group Report | Tue 11/1/05 | Tue 11/1/05 |
| 1.3.2.2.4 | MI-8 Collimators Installation Complete | Mon 11/7/05 | Mon 11/7/05 |
| 1.3.3.1.3.1.4 | Barrier Bucket Cavity Installation Complete | Mon 11/14/05 | Mon 11/14/05 |
| 1.2.11.3.14 | Booster Dump Relocation Installation Complete | Tue 11/15/05 | Tue 11/15/05 |
| 1.2.2.2.10 | OrBump Power Supply Ready for Installation | Mon 11/21/05 | Mon 11/21/05 |
| 1.3.1.3.5 | Large Aperture Quad P.S. Installation Complete | Mon 11/21/05 | Mon 11/21/05 |
| 1.3.2.1.3.2 | Review Concept for MI Collimation System | Mon 11/28/05 | Mon 11/28/05 |
| 1.2.3.3.3 | Corrector PS Design Complete | Tue 11/29/05 | Tue 11/29/05 |
| 1.3.1.2.3 | Large Aperture Quads Align/Install Complete | Thu 12/1/05 | Thu 12/1/05 |
| 1.2.2.3.2.6 | OrBump System Installation Complete | Fri 12/16/05 | Fri 12/16/05 |
| 1.4.3 | Finish 2005 Shutdown | Tue 1/3/06 | Tue 1/3/06 |
| 1.3.4.1.1.7 | Review MI RF Upgrade Plan | Thu 2/2/06 | Thu 2/2/06 |
| 1.2.3.1.5 | Corrector Prototype Magnet Complete | Mon 2/20/06 | Mon 2/20/06 |
| 1.1.2.1.7 | Linac Quad Tank #1 Commissioning Complete | Tue 3/14/06 | Tue 3/14/06 |
| 1.1.1.1.6 | Linac Task Force Complete | Mon 3/20/06 | Mon 3/20/06 |
| 1.3.4.2.2 | Upgrade Plan Complete | Wed 5/3/06 | Wed 5/3/06 |
| 1.2.8.1.3.4 | RF Cavity #20 Misc Control Modules Ready for Installation | Fri 5/5/06 | Fri 5/5/06 |
| 1.4.4 | Start 2006 Shutdown | Mon 8/7/06 | Mon 8/7/06 |
| 1.2.8.1.4.5 | RF Cavity #20 Solid State Driver Amplifier Ready for Installation | Mon 8/21/06 | Mon 8/21/06 |
| 1.1.2.2.3.4 | Linac Quad Installation Complete | Fri 9/8/06 | Fri 9/8/06 |
| 1.2.8.1.1.4 | RF Cavity #20 Ferrite Bias Supply Ready for Installation | Wed 9/13/06 | Wed 9/13/06 |
| 1.2.8.1.2.5 | RF Cavity #20 Misc Control Modules Ready for Installation | Wed 9/13/06 | Wed 9/13/06 |
| 1.2.8.1.7 | RF Cavity#20 Installation Complete | Fri 9/15/06 | Fri 9/15/06 |
| 1.2.12.6.6 | Booster Chopper Installed | Wed 9/20/06 | Wed 9/20/06 |
| 1.3.2.3.4 | MI Collimation System Install/Align Complete | Wed 9/20/06 | Wed 9/20/06 |
| 1.2.4.2.4 | 30Hz Installation Complete | Mon 10/2/06 | Mon 10/2/06 |
| 1.4.5 | Finish 2006 Shutdown | Mon 10/2/06 | Mon 10/2/06 |
| 1.3.2.4 | Main Injector Loss Mitigation Complete | Fri 12/1/06 | Fri 12/1/06 |
| 1.2.3.4.5 | Corrector PS Fabrication Complete | Tue 1/30/07 | Tue 1/30/07 |
| 1.2.3.2.4 | Corrector Magnets Ready for Installation | Thu 6/21/07 | Thu 6/21/07 |
| 1.4.6 | Start 2007 Shutdown | Mon 8/6/07 | Mon 8/6/07 |
| 1.2.3.5.5 | Corrector Installation Complete | Mon 10/1/07 | Mon 10/1/07 |
| 1.4.7 | Finish 2007 Shutdown | Mon 10/1/07 | Mon 10/1/07 |
| 1.4.8 | Start 2008 Shutdown | Mon 8/11/08 | Mon 8/11/08 |
| 1.4.9 | Finish 2008 Shutdown | Fri 10/17/08 | Fri 10/17/08 |



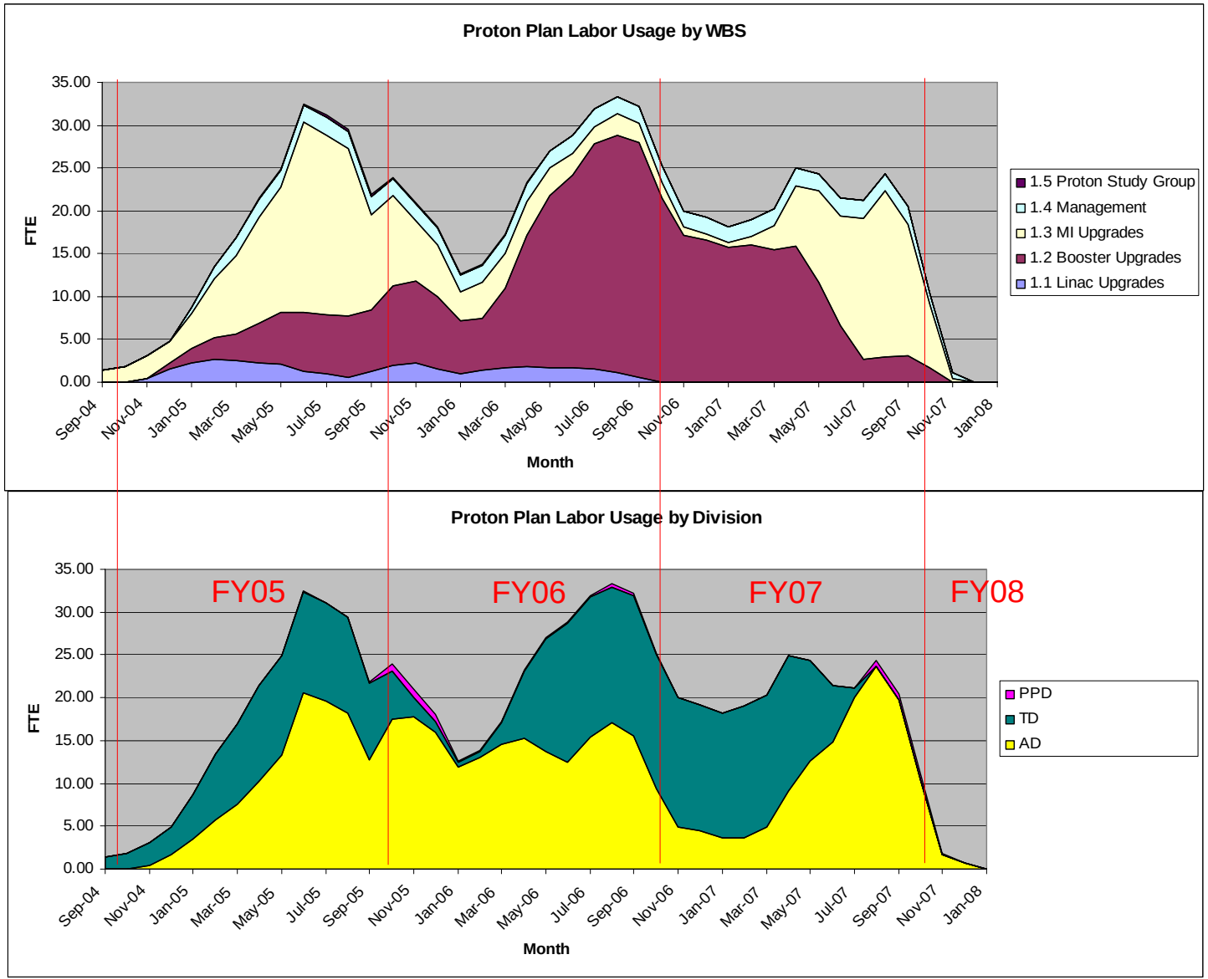
# Progress as of April 30, '05

| WBS | Name | Planned % | Actual % | A/P % |
|---|---|---|---|---|
| 1 | Proton Plan | 4.5% | 4.1% | 91% |
| 1.1 | Linac Upgrades | 6.2% | 5.5% | 88% |
| 1.2 | Booster Upgrades | 4.1% | 2.8% | 68% |
| 1.3 | Main Injector Upgrades | 4.1% | 4.2% | 101% |
| 1.4 | Project Management | 6.7% | 6.7% | 100% |
| 1.5 | Proton Study Group | 8.2% | 8.2% | 100% |

# Effort for April '05

| WBS | WBS Name | Actual FTE | Plan FTE |
|---|---|---|---|
| **1** | **Proton Plan** | **18.2** | **18.6** |
| 1.1 | Linac Upgrades | 1.8 | 2.3 |
| 1.2 | Booster Upgrades | 5.3 | 4.6 |
| 1.3 | Main Injector Upgrades | 9.0 | 9.5 |
| 1.4 | Project Management | 2.1 | 2 |
| 1.5 | Proton Study Group | 0.0 | 0.2 |

# Proton Plan SWF Planned Usage



# M&S Spending– Direct, No Contingency

| M&S Spending by Obligation In $K | | Planned | | | | | Inception To date Costs | | | %Used |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate | | | | | | | | ITD Obl+RIP |
| | | FY05 | FY06 | FY07 | FY08 | Total | Actual | Obl. | Obl+RIP | /Total Est |
| 1 | Proton Plan | 2,661 | 3,360 | 10,886 | 9 | 16,916 | 244 | 1,844 | 1,855 | 11% |
| **1.1** | **Linac Upgrades** | **1,493** | **604** | **0** | **0** | **2,097** | **0** | **1,463** | **1,463** | **70%** |
| 1.1.1 | Linac PA Vulnerability | 1,481 | 3 | 0 | 0 | 1,484 | 0 | 1,463 | 1,463 | 99% |
| 1.1.2 | Linac Quad Power Supply | 12 | 600 | 0 | 0 | 613 | 0 | 0 | 0 | 0% |
| **1.2** | **Booster Upgrades** | **339** | **2,231** | **128** | **1** | **2,698** | **39** | **116** | **120** | **4%** |
| 1.2.1 | Determine Rep Rate Limit | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0% |
| 1.2.2 | Orbump System | 117 | 0 | 0 | 0 | 117 | 20 | 96 | 100 | 85% |
| 1.2.3 | Corrector System | 166 | 741 | 128 | 0 | 1,034 | 11 | 11 | 11 | 1% |
| 1.2.4 | 30 Hz Harmonic | 33 | 986 | 0 | 0 | 1,019 | 6 | 6 | 6 | 1% |
| 1.2.5 | Gamma T System | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0% |
| 1.2.6 | Alignment Improvements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0% |
| 1.2.7 | Drift Tube Cooling | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0% |
| 1.2.8 | Booster Cavity #20 | 0 | 350 | 0 | 0 | 350 | 2 | 2 | 2 | 1% |
| 1.2.11 | Booster Dump Relocation | 23 | 89 | 0 | 0 | 112 | 0 | 0 | 0 | 0% |
| 1.2.12 | Booster Chopper | 0 | 62 | 0 | 0 | 62 | 0 | 0 | 0 | 0% |
| **1.3** | **Main Injector Upgrades** | **827** | **521** | **10,754** | **5** | **12,107** | **204** | **264** | **272** | **2%** |
| 1.3.1 | Large Aperature Quads | 253 | 17 | 0 | 0 | 269 | 204 | 200 | 208 | 77% |
| 1.3.2 | MI Collimation System | 204 | 424 | 0 | 0 | 628 | 0 | 0 | 0 | 0% |
| 1.3.3 | NuMI Multibatch Operation | 220 | 81 | 0 | 0 | 300 | 0 | 64 | 64 | 21% |
| 1.3.4 | MI RF Upgrade | 150 | 0 | 10,754 | 5 | 10,909 | 0 | 0 | 0 | 0% |
| **1.4** | **Management** | **3** | **4** | **4** | **4** | 15 | **0** | **0** | **0** | **0%** |
| **1.5** | **Proton Study Group** | **0** | **0** | **0** | **0** | 0 | **0** | **0** | **0** | **0%** |

# Spares on the Proton Plan

- We are building spare equipment on the following subprojects:
  - Linac Quad Power Supplies (3 spares out of 34 total) - EQ
  - Orbump Magnets (2 spares out of 6 total) – Costs in Run II
  - Booster Correctors (12 spares out of 60 total) – Plant
  - Large Aperature Quads (2 spares out of 9 total) – EQ
  - MI RF Upgrade PA's (2 spares out of 20 total) - Plant

- Our plan is to build the spares under the Proton Plan Equipment and Plant tasks to simplify accounting and effort reporting during fabrication activities.

- At the end of the fabrication activities the cost for the spares will be transferred to the appropriate accounts.

- The resource loaded schedule will have a cost transfer task added to each of these subprojects to account for the transferred costs.

- FYI – The cost of spares in the Proton Plan is in the range of $1.6Million ($1Million M&S, $0.6Million Labor) without cont. and indirects.

# Status Summary

- Baseline
  - We recommend having a baseline review in the next month, possibly in place of the next PMG.
- AIP's
  - Booster Correctors
    - $4.4million with 40% Cont. and Indirects. Duration is 38 months.
    - We have drafts of the following:
      - Davis Bacon Justification
      - Project Execution Plan
    - We hope to finalize these documents and get an AIP Directive Authorization in the next 2 months.
  - MI Collimation and MI RF Upgrade
    - We will begin to develop the AIP packages after all upcoming critical project decisions are behind us.