Muon Collider/Neutrino Factory Targetry R&D 2009-2012

- **Simulations**
  - **Benchmark MERIT beam/jet/magnet results**
    - 0.5 grad student effort $\times$ 3 years
    - 0.2 FTE scientist supervision $\times$ 3 years
  - **Refine models of beam-liquid interaction (cavitation, breakup, …)**
    - 0.5 grad student effort $\times$ 2 years
    - 0.2 FTE scientist supervision $\times$ 2 years
  - **Refine simulations of nozzle performance**
    - 0.2 FTE scientist supervision $\times$ 1 year
  - **Simulate splash in collection pool (beam dump)**
    - 0.4 FTE engineer effort $\times$ 1 year

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- **Hardware R&D**
  - **Nozzle design/fabrication/testing (configuration as per Study 2)**
    - 0.3 engineer effort × 2 years
    - Hardware $50k
    - Testing in 0 T $20k
    - Testing in 15 T $80k
  - **Comparison of injection into nozzle via 0° and 180° bend**
    - Hardware $40k
    - Testing $20k
  - **Hg splash in collection pool**
    - Hardware $50k
    - Testing $20k
  - **Integrate nozzle into Fe plug at upstream end of magnet**
    - 0.3 engineer effort × 1 year
    - Hardware $100k
    - Testing $20k
  - **Collaboration with ESS/Eurisol on Hg handling (Riga, Latvia)**
    - 0.2 scientist effort × 3 years
    - Travel $20k
  - **Use of a Pb-Bi alloy rather than Hg (?)**

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- **Systems Engineering/Costing**
  - Hg loop (including collection pool)
    - 0.3 engineer effort $\times$ 2 years
  - Upstream/downstream beam windows
    - 0.3 engineer effort $\times$ 2 years
  - Remote handling for target component replacement
    - 0.3 engineer effort $\times$ 2 years
  - Water-cooled tungsten carbide shield
    - 0.3 engineer effort $\times$ 2 years
  - Option for high TC solenoid
    - 0.3 engineer effort $\times$ 2 years

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- Summary:
  - Effort:
    - Grad Student   1.5 years $90k
    - Engineering   4.6 years $1012k
    - Scientist   2.5 years $550k
  - Hardware $440k
  - Operations $200k

  - Total program cost: $2300k

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