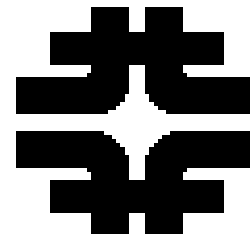


Muon Collider R&D Co-ordination Committee Report



MCTF



Alan Bross, Steve Geer, Harold Kirk, Vladimir Shiltsev, Mike Zisman

In 2007 the Muon Collider Coordinating Committee (MCCC) was set up to coordinate the NFMCC & MCTF activities and plans.

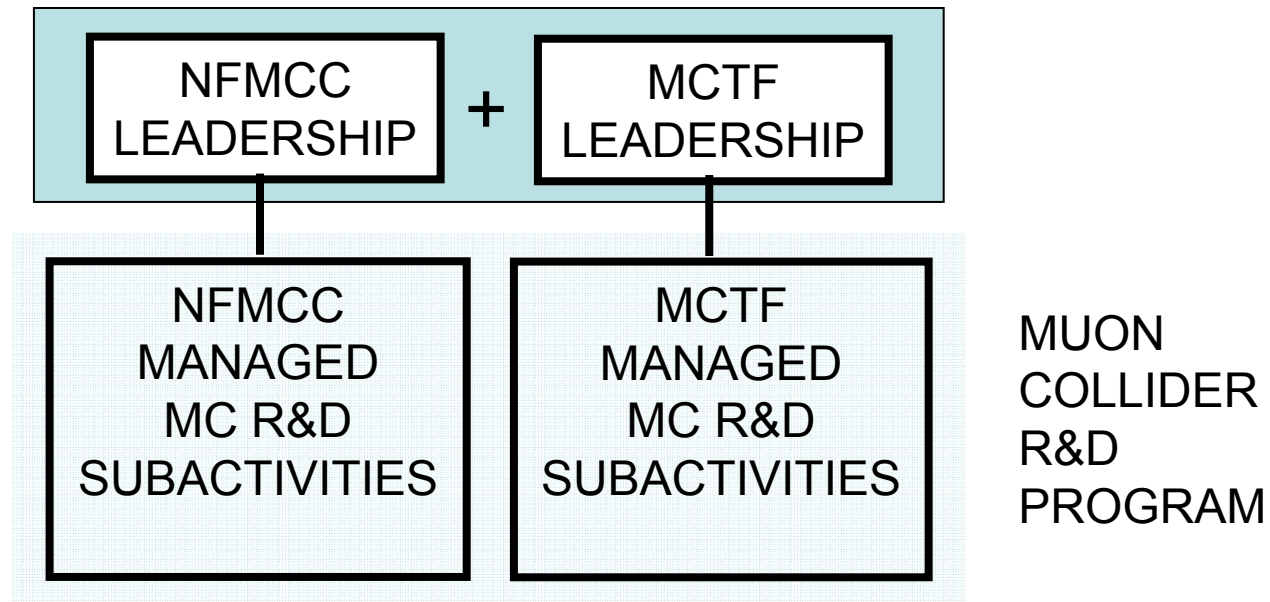
Steve Holmes, March 13th, 2007:

“ ... MCOG ask the NFMCC and MCTF to form a Coordinating Committee composed of the management of each organization. This would include Geer, Shiltsev, Bross, Kirk, and Zisman.

.... The general charge would be to provide effective coordination that maximizes the integrated effort. ... “

PURPOSE: To co-ordinate the NFMCC and MCTF proposed & ongoing R&D activities to maximize their joint effectiveness & facilitate cross-participation in these activities where it makes sense.

MUON COLLIDER R&D CO-ORD COMMITTEE



Over the last year the MCCC has had telephone meetings to discuss issues as the need has arisen → approximately once per 2 months:

Focus of discussions:

- Ongoing program
- MUTAC agenda
- Input for P5
 - NF plan: R&D, timeline, cost estimate
 - MC plan: R&D cost, visionary timeline
 - Staging vision (Project X → NF → MC)

The output from these MCCC discussions you have seen earlier in this meeting (see e.g. Vladimir's talk). Will briefly review this in preparation for some discussion.

Main ongoing activities managed by NFMCC:

- Target R&D (MERIT)
 - MUCOOL
 - US-MICE
- } *All of this R&D is common to NF & MC. NFMCC also contributing to NF IDS.*

Main ongoing activities managed by MCTF:

- HPRF Tests (including beam to MTA)
 - HCC Channel studies (including rf integration)
 - HTS Studies ↔ new national collabn (?)
- } *Chosen because this R&D needs to be done, but is beyond present NFMCC resources*

Activities jointly pursued by both NFMCC & MCTF:

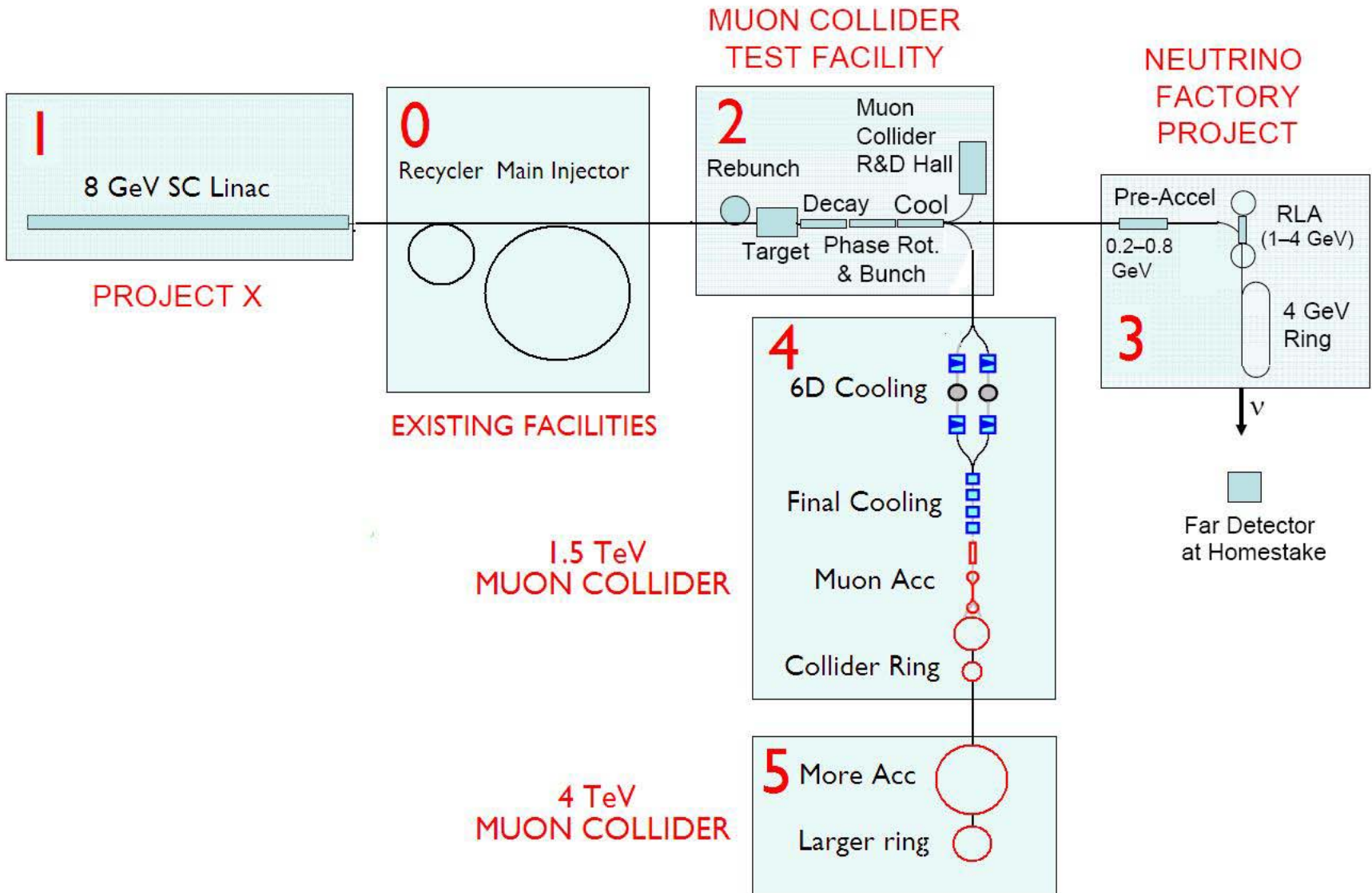
- Simulation studies including bunching & phase rotation cooling, acceleration & collider ring.

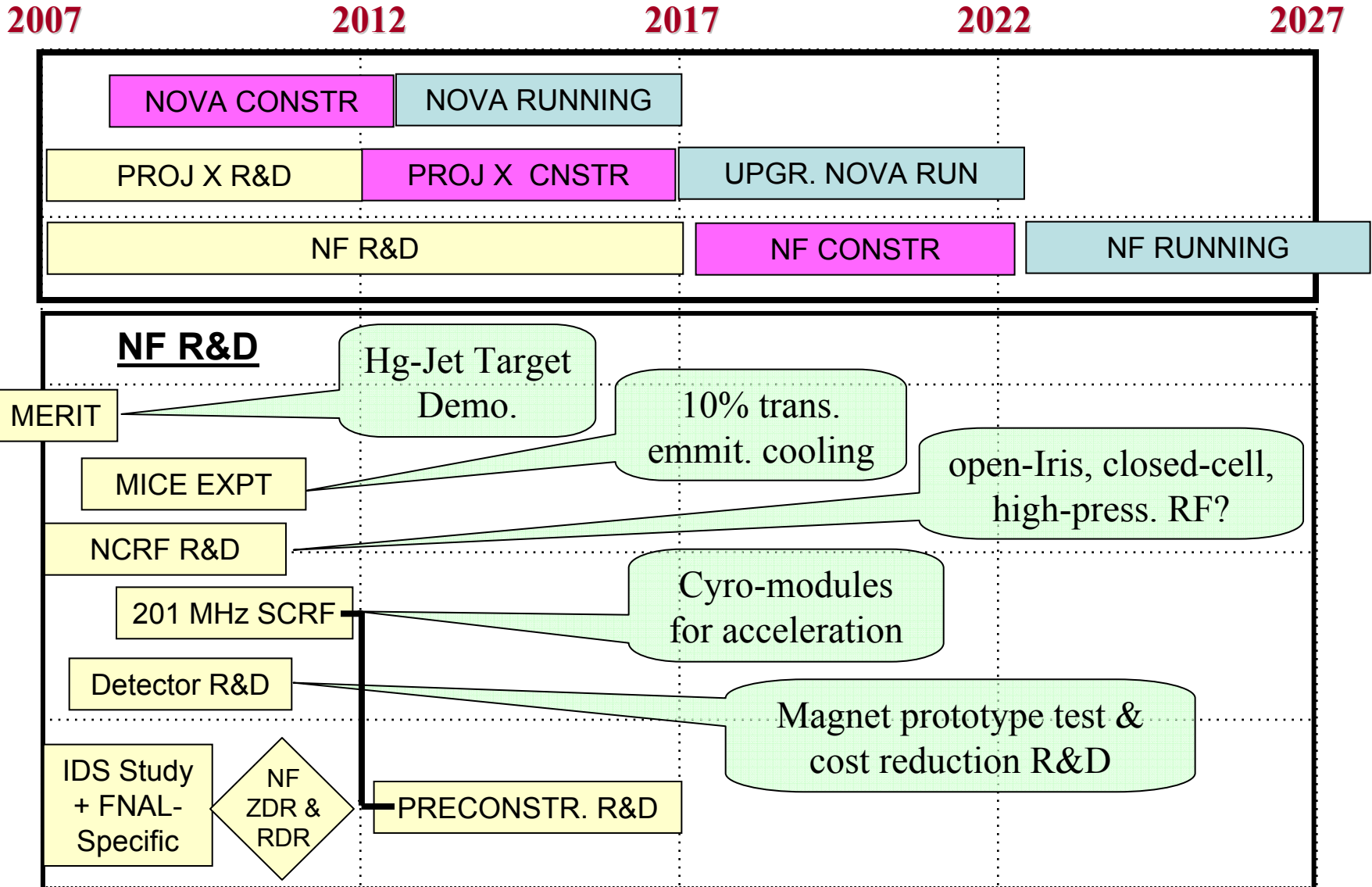
This is all good stuff ... but it is not enough.

We need more support because we need to go faster.

- **We have been doing good stuff !**
- We believe that *Project X* → *Neutrino Factory* → *Muon Collider* offers a possible staged approach to a multi-TeV lepton collider at Fermilab.
- The IDS is aiming for a *NF RDR by 2012*, after which we think we will be ready for pre-construction R&D.
- *We have a cost estimate* for the NF R&D that needs to be done by ~2012, and a rough cost estimate for the NF (to be refined by the RDR).
- We also have a *visionary timeline for Muon Collider R&D*, and an estimate for the level of support required in the coming years. We will need (in a few years) to execute “*Muon Collider Feasibility Study 1*” to arrive at a first estimate of cost.
- We believe that the NF+MC R&D support needs to be *ramped up to ~25M\$/year within the next ~5 years* to make progress on any sort of reasonable timescale. What happens beyond that will depend upon the HEP roadmap (e.g. NF pre-construction R&D ?)

PHASED APPROACH





- **FY07/08 annual U.S. funding level for NF+Muon Collider R&D:**
5.5M\$ (SWF) + 2.4M\$ (M&S)=7.9M\$ (of this 2M\$ is Muon Collider specific)

R&D estimates corresponding illustrative timeline									
	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17
MICE M&S	0.8	1.3	0.2	0.2					
NCRF M&S	1.0	1.0	1.0	2.0					
SCRF M&S	1.0	1.0	2.0	3.0					
DET M&S	0.1	0.2	1.0	1.0					
OTHER M&S	0.8	0.8	0.8	1.5					
M&S TOTAL	3.7	4.3	5.0	7.7					
SWF+Indir.	8.5	10.4	12.1	13.8					
TOTAL	12.2	14.7	17.1	21.5					

$\Sigma = \sim 10\%$ of project cost

4 GeV NF Cost Estimate (excluding 2 MW proton source)

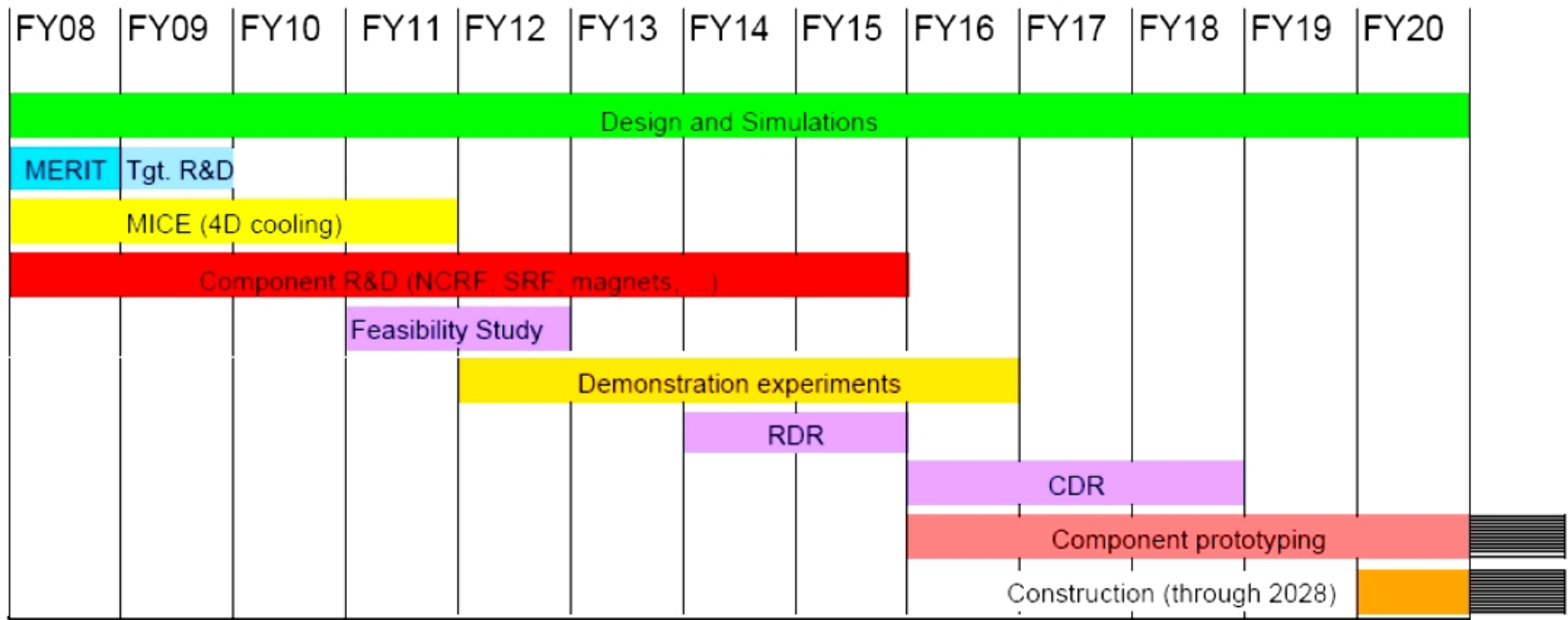
Start from Study 2 cost estimate scaled to account for post-study 2 improvements (ranges reflect uncertainties in scaling) →

ILC analysis suggest loading coeff = 2.07 for accelerator systems and 1.32 for CFS. Labor assumed $1.2 \times$ M&S →

Loaded estimate = 2120 - 2670 (FY08 M\$)

Unloaded estimate (M\$)

Target Systems	110
Decay Channel	6
Drift, Ph. Rot, Bunch	112-186
Cooling Channel	234
Pre-Acceleration	114-180
Acceleration	108-150
Storage Ring	132
Site Utilities	66-156
TOTAL (FY08 M\$)	881-1151



▲ CD-0

▲ Choice of staged or direct path

8	11	13	20	25	25	25	35	40	40	R&D Funds M\$/year
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- Funding request includes that for Neutrino Factory R&D
- Funding increase ($\approx 3\times$) needed if Muon Collider is to be credible option by 2012

We should tell MUTAC that we are doing great stuff ... and should also tell them as much as we can about the R&D program that we would plan to execute as support is ramped up to an assumed 25M\$/yr.

We have made a good start, but it would be good to further clarify our thinking by:

- Fleshing out a little more the part of our R&D plan (including milestones) that gets us to “Muon Collider Study 1” and define more explicitly the goals for “Muon Collider Study 1”.
- Spelling out more explicitly our SWF needs (presently capped) ... for example, how many additional FTE’s on design/simulation studies should our MC R&D plan include ? etc etc
- Developing a list of things we consider should be done in the NF preconstruction R&D phase - where do we draw the line between our R&D program and what we would expect a host laboratory to take in hand.

The NFMCC meetings provide us with an opportunity to discuss our needs and priorities:

1. NF R&D needs (in addition to the R&D in hand):
 - Detector (magnet) R&D ? (Alan)
 - Scope of US-IDS activities (Mike)
 - SCRF needs ? (Nikolay)

2. MC preparation for “MC Study 1”:
 - FTEs needed for design/simulation studies ? (Bob)
 - R&D milestones that need to be accomplished ? (Mike)

3. Cooling Channel hardware R&D:
 - HCC, Guggenheim, HTS, other needs ? (Andreas)
 - 6D cooling experiment: When (after MC-Study 1 ?) (Vladimir)
Where ? Scope ?

4. Muon Collider Test Facility:
 - Scope (what is really needed if no NF) ? (SG)