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INSIDE

Mike Becker, of Roads and Grounds, with a Prairie Harvest volunteer. A profile of Becker and Bob Lootens, prairie specialists. **See page 2.**

DOE Reviews Main Injector Project

by Leila Belkora, Office of Public Affairs

With the help of the Main Injector accelerator, due to come on line in 1999, protons and antiprotons will swarm more thickly than ever before into the interaction areas at Fermilab's Tevatron. Top quarks and other rare particles will appear a hundred times more frequently than they did in the 1991-95 run, enabling experimenters to do more physics in less time. Scientists at Fermilab's two collider detectors are scrambling to upgrade their detectors to take advantage of the faster pace. For the moment, however, those quarks are just a gleam in their eyes; first, the Lab must finish building the Main Injector and connect it to the Tevatron.

More than 40 people crowded into the Comitium meeting room on September 17, eager to hear the deliberations as DOE began its twelfth semi-annual review of Fermilab's Main Injector Project. The charge to the DOE committee, headed by DOE engineer Dan Lehman, was to scrutinize the cost estimate and schedule for completing the $230 million project. Fermilab project managers and the director prepared to review progress and to answer tough questions about the schedule and plan for completion.

The Main Injector, the largest civil construction project at the Lab since its inception, will increase the collision rate of protons and antiprotons in the Tevatron by a factor of at least five. The new machine, which will replace the Main Ring as the fourth stage of acceleration, consists of a 2-mile circumference oval ring and another 2000 feet or so of structures connecting with the Booster and Tevatron. The project is now almost 60 percent complete.

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Photo by Reidar Hahn

Steve Holmes, Fermilab project manager for the Main Injector, checks his voluminous stack of viewgraphs one more time before heading into the DOE review meeting.

Main Injector

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In his opening remarks, Fermilab Director John Peoples drew attention to the success of project leaders in meeting the demands of civil construction and operating the existing accelerator complex for the fixed-target run. "We keep balancing ourselves.... One person's disaster is another person's opportunity. We've made good use of accelerator 'down time' to proceed with construction," he said.

Peoples then introduced a proposal, still under discussion, to advance the scheduled shutdown of accelerator operations to allow for construction of the Main Injector-Tevatron connection. The proposal comes in response to a $7 million shortfall in Fiscal Year 1997 operating funds. The original schedule called for a shutdown starting February 1998; the proposed plan (one of several alternatives the Lab is considering) would turn off the accelerator around September 1997. In late 1998 or early 1999, the Lab would either resume fixed-target operations or begin collider commissioning. MI project managers welcome the proposal, which would give them more time to complete critical tasks.

Current Status

Project manager Steve Holmes and members of MI project groups reviewed progress in the last year. They said magnet production is going full blast, following earlier research and development phases and prototype production. The Lab now has approximately 239 (out of 344) dipole magnets, the most numerous of several kinds of magnets required for the Main Injector. Quadrupoles, sextupoles, Lambertsons, trim, and permanent magnets are rolling off the production lines as well, and technicians are busy testing them. "We're awash in data at this point," said Dave Harding, a member of the Accelerator Systems group.

Tom Pawlak, associate project manager for civil construction, reported on the trials and triumphs of construction by the project's seven major contractors. "None of the utility pipes or services were where we thought they were. One of the major advantages of this job is, we now know," he noted, displaying a photograph of a carefully-excavated jungle of pipes near the 8 GeV Booster connection enclosure. Heavy rains in July set one contractor back. Procurement went ahead, however, for such items as circuit breakers, switches, transformers, and transmission towers. Pawlak is now turning his attention to electrical work and construction of the Kautz Road Substation, which will help meet the Lab's increased power requirement.

The agenda also included overviews of accelerator physics issues, vacuum systems, power supplies, RF systems, instrumentation, kickers and slow extraction systems, controls, safety, and utilities. DOE panel members raised questions ranging from broad concerns about project management and funding profiles to probes of magnet test procedures. On a lighter note, Dixon Bogert, head of the Main Injector Department, told how work on pond construction started early: the contractor working on the 8 GeV line needed dirt, so Bogert suggested they dig at the planned excavation sites for MI cooling ponds.

In summarizing the status of the MI project, Holmes recalled major achievements over the past year, including completion of the tunnel. He pointed out that service building construction is behind schedule and that the project would need about a dozen more people to handle the advanced shutdown scenario. However, he said, whether one lives with the project every day or steps back to take a look at it, the Main Injector is coming along well. "We are starting to see a glimmer of light at the end of the tunnel...and I know the story about trains, so don't tell me," he said.

Critical Work Remains

When the DOE review committee returns in March 1997, Holmes said, Fermilab will have checked several major items off the to-do list. Magnets for the

Photo by Reidar Hahn

8 GeV line leading from the Booster to the Main Injector should be complete. All service buildings around the MI ring, housing power supplies, will be finished. A new contractor will be at work on the ponds, and another on the Kautz Road Substation and transmission lines.

One of the Lab's main concerns is the so-called North Addition to the FZero building. The original FZero building, which dates to the early 1970s, houses RF equipment for the Main Ring. There is also a later component to FZero, for Tevatron RF equipment. During the long shutdown this later component of FZero will come down; the Lab must build the North Addition to shelter the equipment that currently resides there.

Deputy Head of Accelerator Systems Phil Martin says the four "big packages" of civil construction that remain are the construction of the FZero North Addition and Kicker buildings, the Kautz Road Substation, the 13.8 keV feeder system to carry high-current AC power to the Service Buildings, and the cooling ponds.

A key question raised by the review panel is the project's estimated cost at completion, based on current obligations and trends in use of contingency funds. Through July 1996, the MI project had obligated $143.150 million of its $229.6 million allocation.

Holmes reported that magnets are coming in under budget, as are a number of technical and civil components. On the other hand, the Lab had unforeseen expenses, such as installing magnets with conventional rigging techniques when the first magnet installer device failed.

" The end is in sight, and the physics community is looking forward to it."

~ Project Manager Steve Holmes

Holmes' presentation stimulated a discussion of the definition of "completion." "Complete means the Tevatron runs; it doesn't include, for example, NuMI," said DOE panelist Pat Rapp. The NuMI Project involves using a beam extracted from the Tevatron to study neutrino oscillations with a near detector at Fermilab and a far detector in Minnesota. Although the definition of the basic MI Project does not call for construction related specifically to NuMI or any other project, Fermilab physicists pointed out that current plans do not prohibit future extensions to the MI Project.

Getting There From Here

Martin presented the Commissioning Plan, to which Fermilab project leaders have already given detailed thought. In early 1999 Fermilab will link all the parts of the Main Injector into a whole. Martin described the kind of tests needed; for example, someone in the accelerator tunnel, linked to the control room by cell phone, will have to check that vacuum valve positions match those displayed on the consoles.

Holmes concluded Fermilab's presentation by saying he was generally happy with progress on the project, and that an advanced shutdown period would not pose a problem. "We can get there from here. Resources, not money, is the issue," he said. He added, "The end is in sight, and the physics community is looking forward to it."

In the DOE closeout session, Lehman praised the MI Project as "well-managed." He said the panel does have questions about the installation schedule, and asked for a revised schedule and contingency analysis by November 4. He said he would ask Fermilab to hold an additional $2 million in contingency.

Just before Holmes bade the panel goodbye and wished them a safe trip home, DOE panelist Ron Lutha, DOE's representative for the Main Injector, thanked members and the chairman for their work during the exceptionally long review. Lehman quipped, "It's been an interesting three days. You notice I didn't say fun! We've seen a lot of progress. Things seem to be going well. We have a long way to go." ■

At left: A pre-meeting briefing: Fermilab Director John Peoples, left, consults with Deputy Head of Accelerator Systems Phil Martin; Linc Read, MI administrator; and Project Manager Steve Holmes.

At right: A September, 1996 view of civil construction on the 8 GeV line connecting the Booster to the Main Injector. The 8 GeV line is one of the largest remaining pieces of civil construction to be completed; civil construction of the Main Injector ring itself is complete.

Photo by Al Johnson