



DOE Review of FermiLab's Proton Improvement Plan (PIP)

Jan 21-22, 2015

John Kogut

HEP Program Officer of FNAL



Welcome!

The Review Panel

1. Rod Gerig (ANL) rod@aps.anl.gov , rod@gerig.org
2. John Seeman (SLAC) seeman@slac.stanford.edu
3. John Byrd (LBNL) jmbyrd@lbl.gov
4. Mike Spata (JLAB) spata@jlab.org
5. Uli Wienands (SLAC) uli@SLAC.Stanford.EDU
6. Wolfram Fischer (BNL) wolfram.fischer@bnl.gov
7. John Galambos (ORNL) jdg@ornl.gov
8. Sergey A. Belomestnykh (BNL) sbelomestnykh@bnl.gov

Sub- committees of PIP Reviewers

- A. Management (incl. cost, schedule, evolution into PIP-II)
Seeman, Gerig
- B. Linac (incl. operations, reliability, intensity goals)
Galambos, Spata
- C. Booster (incl. RF, losses, operations, reliability, intensity goals)
Fischer, Belomestnykh
- D. Recycler (incl. slip stacking, losses, operations, reliability, intensity goals)
Wienands, Byrd



Content of Today's Executive Session

- Review Procedures
- The Charge to FNAL
- Challenges and Goals of the PIP
- Review Schedule
- Review Assignments
- Current Issues at the lab
- Discussion



Review Procedures

Purpose: Peer review of the lab's Proton Improvement Plan.

- Evaluate PIP's progress toward its goals.
- Identify excellent efforts. Identify underperforming efforts and provide constructive comments.
- **Output: A set of individual letters from the committee members that cover all aspects of the PIP.**
 - All are free to comment on all parts of the program
 - **Each reviewer should also focus on specific areas of your expertise in your letters as well.**
 - Letters are typically 3-4 pages, with technical analyses and evaluations.



Goals of PIP

(reproduced from the Charge Letter to Fermilab)

The PIP is a critical element of the Fermilab program in experimental high energy physics because it will provide one of the world's most intense proton beams. Such a beam is required to produce intense secondary pion and muon beams, and tertiary neutrino beams, that will enable the lab's suite of Intensity Frontier experiments. A particularly critical initial goal of the PIP is to enable delivering up to 700 kW of proton beam to the NOvA target within the next two years. However, because the Accelerator Complex at Fermilab has some aging components, for the long-term success of the PIP (i.e., PIP-II and beyond) it is essential to produce a reliable source of intense beams over the next two decades.



Questions Fermilab Must Address in this Review

- Are the goals, deliverables, budget and schedule of the PIP properly defined, well understood, achievable and self-consistent?
- Are the plans to address the Linac vulnerabilities and reliability adequate?
- Are the plans for the Booster rf cavities sufficient to support the required beam intensity and extend their life at least until 2030?
- Are the plans to minimize Booster losses adequate and sufficiently understood to allow for the required higher beam power levels? Are beam losses in the Recycler understood sufficiently to minimize machine and tunnel activation and avoid any degradation of the magnetic elements?
- Are the Recycler plans to overcome beam instabilities and losses during slip-stacking adequate?
- Are the goals of achieving 460 kW (without the slow-extraction program) in 2015 and 700 kW by mid-2016 technically achievable? Are key risks to both goals identified and mitigation strategies defined?
- How well do the current plans for PIP integrate smoothly into future plans for achieving even higher beam power (PIP-II and beyond)?



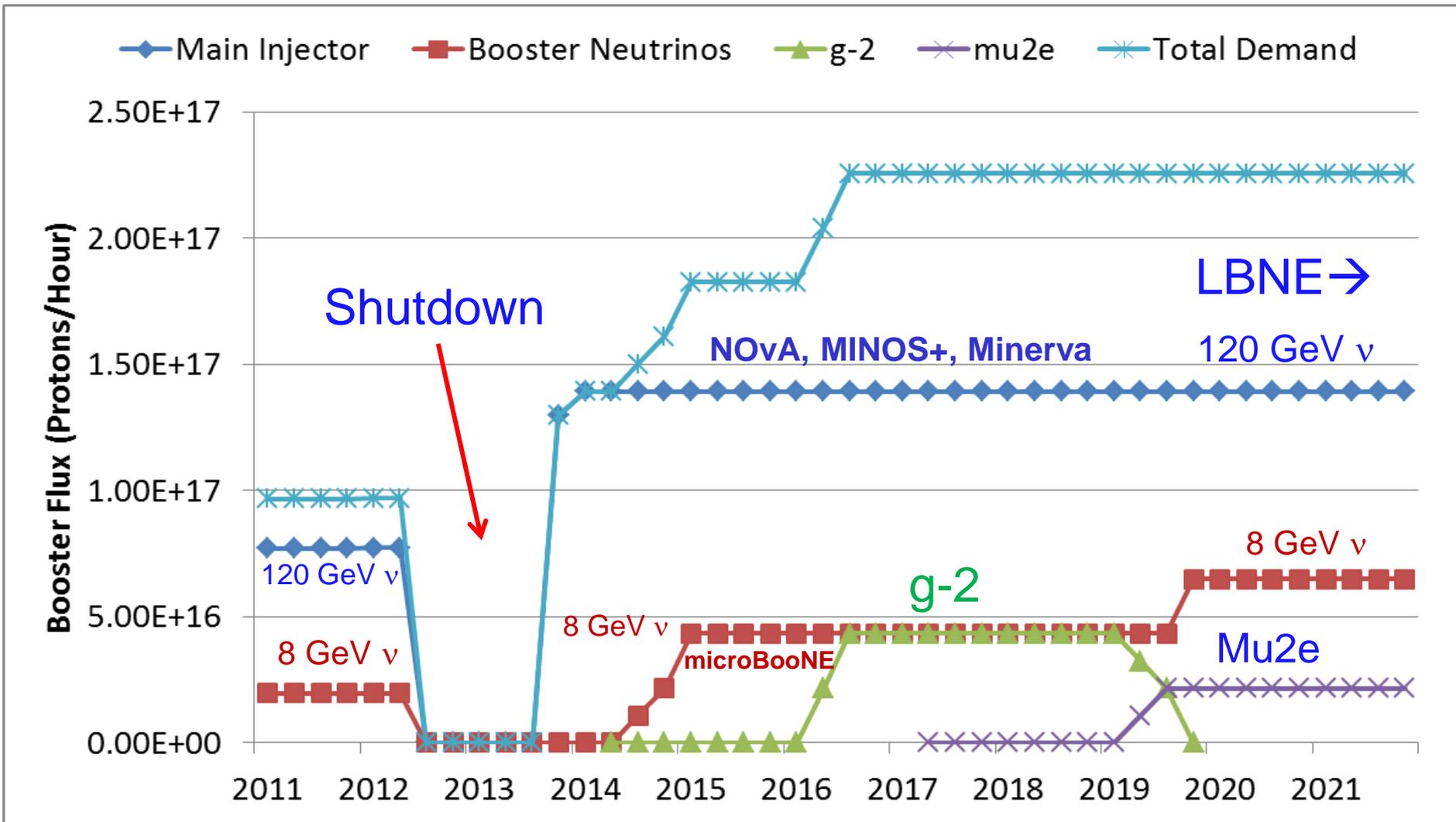
Proton Improvement Plan (PIP)

- To address aging accelerator infrastructure, improve the reliability and provide beams and higher luminosities for the next five years of overlapping experiments, all relevant components of the Accelerator Complex are being upgraded in a multi-year Proton Improvement Plan headed by Sergei Nagaitsev. Financial constraints and changing plans (the rise of PIP-II, revised scope details) have resulted in a modified profile.
- The original and revised financial profiles are:

	PIP Design Handbook	Revision Oct 2013	Present Plan, January 2015
FY12	\$ 17,346,668	\$ 13,956,000	FY12: \$13,956,000
FY13	\$ 14,779,844	\$ 8,612,000	FY13: \$8,612,000
FY14	\$ 19,437,625	\$ 11,000,000	FY14: \$11,432,000
FY15	\$ 19,873,626	\$ 15,000,000	FY15: \$10,000,000
FY16	\$ 14,188,092	\$ 16,000,000	FY16: \$10,000,000
FY17	\$ 1,113,348	\$ 16,000,000	FY17: \$9,000,000
FY18	\$ -	\$ 9,000,000	FY18: \$8,000,000
Total	\$ 86,739,204	\$ 89,568,000	FY19: \$7,000,000
			Total: \$78,000,000

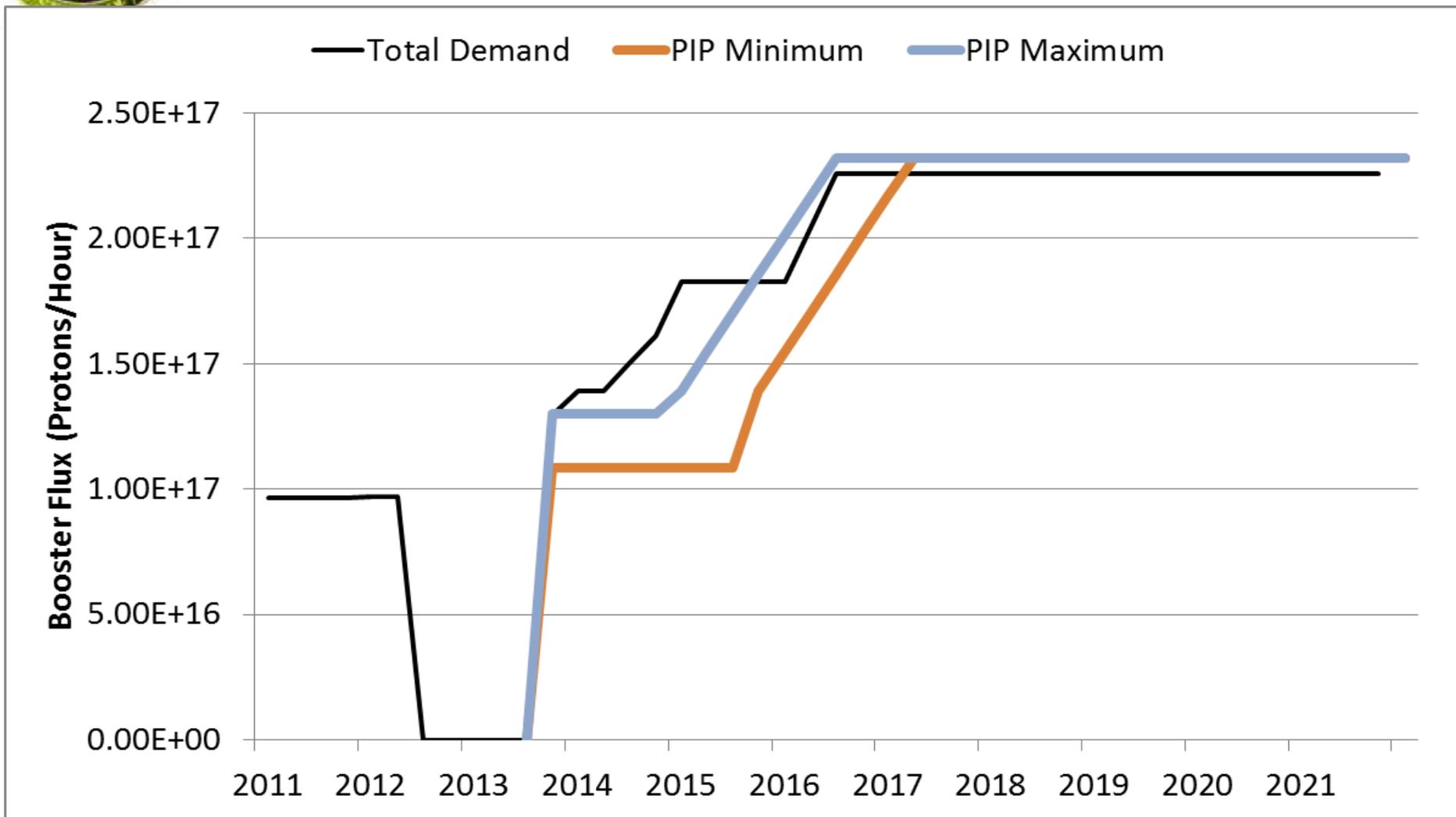


Proton Demand



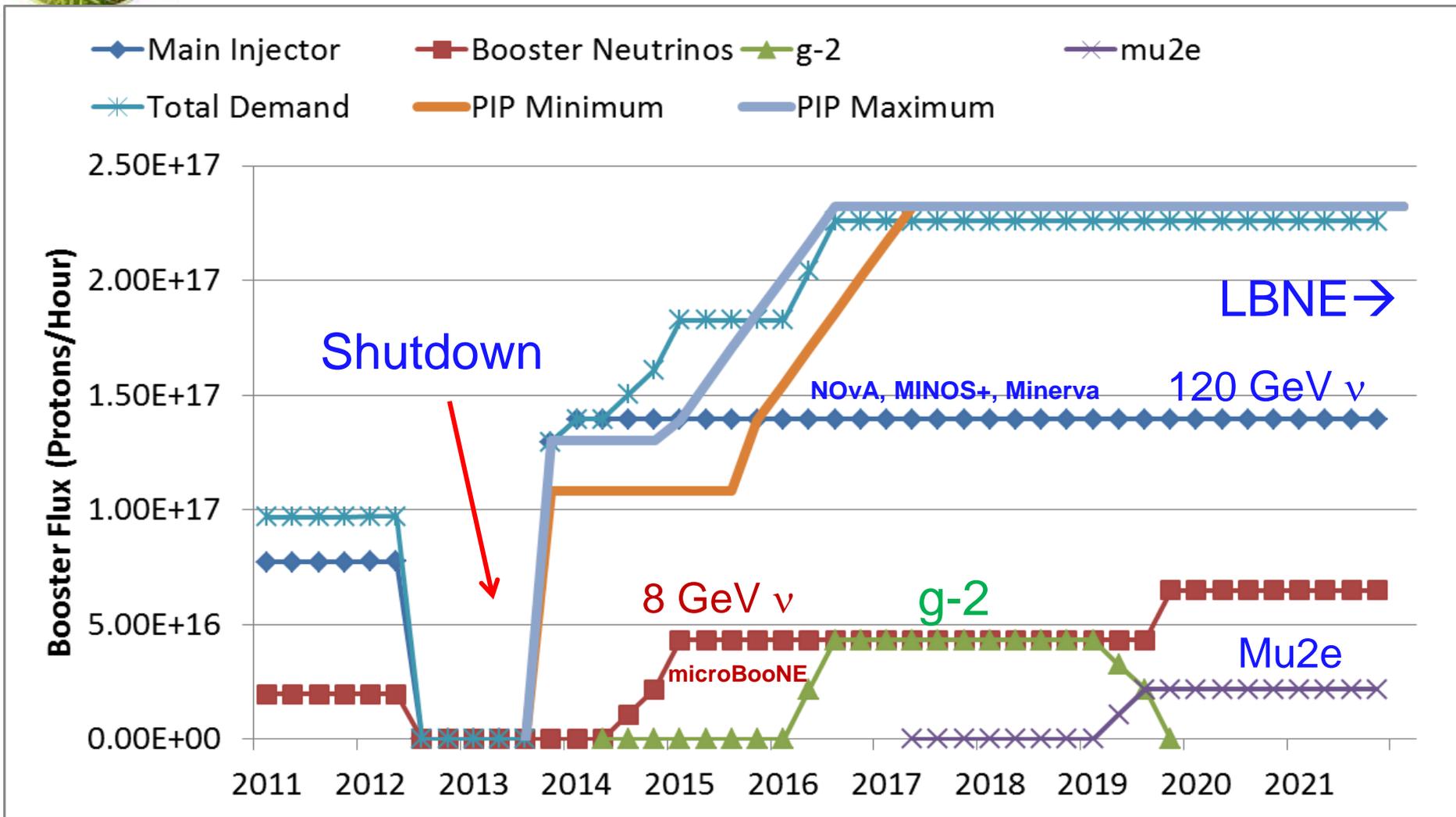


Protons needed by Experimental Program vs. PIP Goals





Proton Improvement Plan Projection





AAC Review, Oct 14-16, 2014

- The Oct 14-16 meeting of the Fermilab Accelerator Advisory Committee reviewed:
 1. PIP & 700 kW Plans
 2. LCLS-II
 3. PIP-II
 4. PIP-III
- Topic 1. coincides with this focused review. Several of this team are members of the AAC .
- All members of this team have had access to the AAC review's documents.
- The results and responses of Fermilab to that review's recommendations will be presented in the Plenary session of this review. Our review will assess Fermilab's responses and plans that resulted from the Oct 14-16 review.



Review Schedule

Plenary talks first half of Day 1

- Give the committee an overview of PIP through Plenary talks.
- Web site:
- http://www.fnal.gov/directorate/OPMO/Projects/PIP%20II/DOE_Rev/20150121/review.html
- **The last ~10 minutes of each talk is for questions and discussion.**

Five Breakout sessions this afternoon.

- Specific reviewers assigned to each.

Executive sessions after Day 1.

- Discussion of issues raised during the first two days.
- Identify additional material to be requested or questions to lab management.

Day 2.

Responses to questions

- Writing session and Dry Run in preparation for Closeout with lab management.

Closeout

- Immediate feedback to management.
- This is NOT your final evaluation.
- **Hardcopy Letter is your final evaluation.**



Your Report

- Your individual hardcopy review letter is due February 10*.
 - Address to Jim Siegrist with a copy to me.
 - **A typical report is 3-4 pages, with useful technical analyses and evaluations.**
 - Serves as the basis for DOE evaluation of the lab.
 - Will be kept confidential.
 - Official report from DOE to lab management is issued.
 - Drafted by me based on your letters
 - Not a public document
 - _____
- * Email an electronic version to Jim, cc me. **I will send you a gentle reminder with address information.**



Assignments

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Assignments (cont)

Organize your closeout and review reports in 'Lehman' style:

1. Findings

bullets

2. Comments

bullets

3. Recommendations

bullets

Do this for each of the 7 Topics in the Charge Letter.



The Site's Layout

Fermilab Accelerator Complex 2012



Fermilab Accelerator Complex 2015



ASTA
Advanced Superconducting
Test Accelerator

Test-Beam
Fixed-Target Beamlines

MTA
Muon
Test Area

Muon
Campus

Linac and
Booster

Tevatron
(decommissioned)

MINOS - NOvA
To Minnesota

Booster
Neutrino Beam

- Protons
- Neutrinos
- Muons
- Electrons
- Target