Department of Energy
Fermi Site Office
Post Office Box 2000
Batavia, Illinois 60510

APR 12 2012

Dr. Bruce L. Chrisman
Chief Operating Officer
Fermilab
P.O. Box 500
Batavia, IL 60510

Dear Dr. Chrisman:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DETERMINATION AT FERMI NATIONAL ACCELERATOR LABORATORY (FERMILAB) – 35 TON LIQUID ARGON PROTOTYPE DETECTOR

Reference: Letter, from B. Chrisman to M. Weis, dated April 11, 2012, Subject: National Environmental Policy Act (NEPA) Environmental Evaluation Notification Form (EENF) for the 35 Ton Liquid Argon Prototype Detector

I have reviewed the Fermilab EENF for the 35 Ton Liquid Argon Prototype Detector. Based on the information provided in the EENF, I have approved the following categorical exclusion (CX):

Project Name	Approved	CX
35 Ton Liquid Argon Detector	4/12/2012	B3.6

I am returning a signed copy of the EENF for your records. No further NEPA review is required. This project falls under a categorical exclusion provided in 10 *CFR* 1021, as amended in November 2011.

Sincerely,

Michael J. Weis
Site Manager

Enclosure:
As Stated

cc: P. Oddone, w/o encl.
Y. - K. Kim, w/o encl.
N. Grossman, w/encl.
T. Dykhuis, w/encl.

FERMILAB ENVIRONMENTAL EVALUATION NOTIFICATION FORM

Project/Activity Title: 35 Ton Liquid Argon (LAr) Membrane Cryostat Prototype Detector to be built in the Proton Center (PC)-4 Building
ES&H Tracking Number: 01098
Funding Source: GPP
Fermilab, Project Manager (Owner): Bruce Baller (X2427)
Fermilab, ES&H Manager: Eric McHugh (X3199)

I hereby certify via my signature that every effort would be made throughout this project to comply with the commitments made in this document and to pursue cost-effective pollution prevention opportunities. Pollution prevention (source reduction and other practices that eliminate or reduce the creation of pollutants) is recognized as a good business practice which would enhance site operations thereby enabling Fermilab to accomplish its mission, achieve environmental compliance, reduce risks to health and the environment, and prevent or minimize future DOE legacy wastes.

Fermilab Project Manager: Bruce Baller

Signature Bruce Baller

Date 4/11/2012

Fermilab NEPA Reviewer: Teri L. Dykhuis

Signature Teri L. Dykhuis

Date 4/11/2012

I. Description of the Proposed Action and Need

Purpose and Need:
The **purpose** of this proposed action/project is to build a 35 ton Liquid Argon (LAr) Membrane Cryostat Prototype Detector in the existing Proton Center (PC)-4 Building; this would be a prototype of the envisioned Far Detector for the anticipated future Long Baseline (distance between the detector and the neutrino source) Neutrino Experiment (LBNE). The proposed LBNE would be an experiment comprised of a large far detector illuminated by a distant intense neutrino source and a smaller near detector located close to the source. It is expected that LBNE would increase research capabilities to enable a world-class neutrino physics program that is needed to measure fundamental physical parameters, explore physics beyond the Standard Model, and better elucidate the nature of matter and antimatter and, therefore, the very structure of our universe. The LBNE far detector must be at a long distance (more than 1200 kilometers) from the neutrino source to increase sensitivity to neutrino oscillations and have sufficient sensitivity (through increased size and technological innovation or both) to improve neutrino detection. It is believed that the sensitivity necessary to meet the science requirements for LBNE could be attained via a large LAr Detector; this detector would need to be constructed at a much larger scale than has ever been attempted before and it represents a relatively new technology. Therefore, LBNE depends upon a proposed prototyping program to demonstrate the viability of this scale-up to understand the engineering issues prior to full scale construction.

The **need** for a proposed 35 ton Liquid Argon Membrane Cryostat Prototype Detector, to be built in the PC-4 Building at Fermilab, is to gain understanding of the necessary cryostat technology and to verify purity in the cryostat so that it can be demonstrated that this technology will meet the LBNE science requirements.

Proposed Action:
To fulfill the above mentioned purpose and need, the following activities are proposed for this action/project. A 35 ton LAr Membrane Cryostat Detector Prototype (see Figure 1) would be built and located in the existing Fermilab

PC-4 building (see Figure 2). The building already houses a cryogenic experiment, the Liquid Argon Purity Demonstrator (LAPD), with an existing associated cryogenic system that includes Liquid Argon (LAr) and Liquid Nitrogen (LN2) supply and dedicated vent lines and a large exhaust fan. Piping, which would be temporary and not buried, would be run to connect the LBNE 35 ton prototype tank to the existing cryogenic infrastructure. A concrete envelope to support and contain the tank would be constructed as well as the vessel which would be housed inside the concrete envelope. Additions to the cryogenic system (piping, condenser, etc.) would also be constructed.

Alternatives:
There are no technology alternatives because it is imperative that the prototype mimic the same technology as that proposed for the future LBNE far detector. Additionally, design alternatives (such as a vessel that can be evacuated) were considered but found to be cost prohibitive for the scale of this project. The Fermilab PC-4 Building was chosen due to the existing cryogenic system for the Liquid Argon Purity Demonstrator that currently resides there. An alternative to the PC-4 location would not capitalize on the DOE investment already made in the cryogenic systems there and since the LBNE project team is located at Fermilab, an alternative site would involve travel for personnel that would add to the environmental impact (for example carbon footprint from travel, etc.) and be less than ideal logistically for meeting the purpose and need.

The 'No Action' alternative would not meet the above stated purpose and need.

II. Description of the Affected Environment

The LBNE 35 ton prototype would be located in the existing PC-4 building and would not include any new building construction or major building modifications. No liquid effluents are expected with this project and the potential for accidental LAr or LN2 release would be minimal due to operational and safety procedures and protocols. In the case of a release, these liquids would quickly convert to the gas phase and diffuse into the atmosphere; both gases are inert and natural components of the atmosphere. The amount of new cryogenic piping to be installed inside the building would be about 200 feet; it would be temporary and installed for easy removal once it is no longer needed.

The actual volume of the LAr tank is approximately 38.6 tons (27.7 m^3, 7,320 gallons) with a fiducial volume of approximately 35 tons (In low-background physics experiments where a detecting medium exhibits self shielding properties a fiducial volume is defined as an interior volume of the detecting medium that excludes the most external portion of the detection medium where most background events will occur.). A LN2 tanker truck would be staged outside the PC-4 building and would follow all Fermilab operational and safety procedures and protocols for chemical transfer.

III. Potential Environmental Effects (Provide comments for each checked item and where clarification is necessary.)

A. Sensitive Resources: Would the proposed action result in changes and/or disturbances to any of the following resources?

- ☐ Threatened or endangered species
- ☐ Other protected species
- ☐ Wetland/Floodplains
- ☐ Archaeological or historical resources
- ☐ Non-attainment areas

B. Regulated Substances/Activities: Would the proposed action involve any of the following regulated substances or activities?

- ☐ Clearing or Excavation
- ☐ Demolition or decommissioning
- ☐ Asbestos removal
- ☐ PCBs

- ☐ Chemical use or storage
- ☐ Pesticides
- ☒ Air emissions
- ☐ Liquid effluents
- ☐ Underground storage tanks
- ☐ Hazardous or other regulated waste (including radioactive or mixed)
- ☐ Radioactive exposures or radioactive emissions
- ☐ Radioactivation of soil or groundwater

C. Other relevant Disclosures

- ☐ Threatened violation of ES&H permit requirements
- ☐ Siting/construction/major modification of waste recovery or TSD facilities
- ☐ Disturbance of pre-existing contamination
- ☐ New or modified permits
- ☐ Public controversy
- ☐ Action/involvement of another federal agency
- ☐ Public utilities/services
- ☐ Depletion of a non-renewable resource

IV. NEPA Recommendation

Fermilab staff have reviewed this proposed action and concluded that the appropriate level of NEPA determination is a Categorical Exclusion. The conclusion is based on the proposed action meeting the applicable requirements in DOE's NEPA Implementation Procedures, 10 CFR 1021, Subpart D, Appendix B3.6 which states: "Siting, construction, (or modification), operation and decommissioning of facilities for indoor bench-scale research projects and conventional laboratory operations (for example, preparation of chemical standards and sample analysis); small-scale research and development projects; and small-scale pilot projects (generally less than two years) conducted to verify a concept before demonstration actions. Construction (or modification) will be within or contiguous to an already developed area (where active utilities and currently used roads are readily accessible). See also C12."

V. DOE/CH-FAO NEPA Coordinator Review

Concurrence with the recommendation for determination:

Fermi Site Office (FSO) Manager: Michael J. Weis

Signature _____

Date 4/12/2012

NEPA Coordinator Reviewer, U.S. DOE FSO: Rick Hersemann

Signature Rick Hersemann

Date 4/12/12

VI. Comments on checked items in section III.

Air Emissions

The release of LAr or LN2, inert gases, would not necessitate any changes to the Lab's existing IEPA issued air permit. PC-4 is already qualified as an Oxygen Deficiency Hazard (ODH) Class 1 area; workers would be required to have a health physical and confined space entry training for cryostat installation.

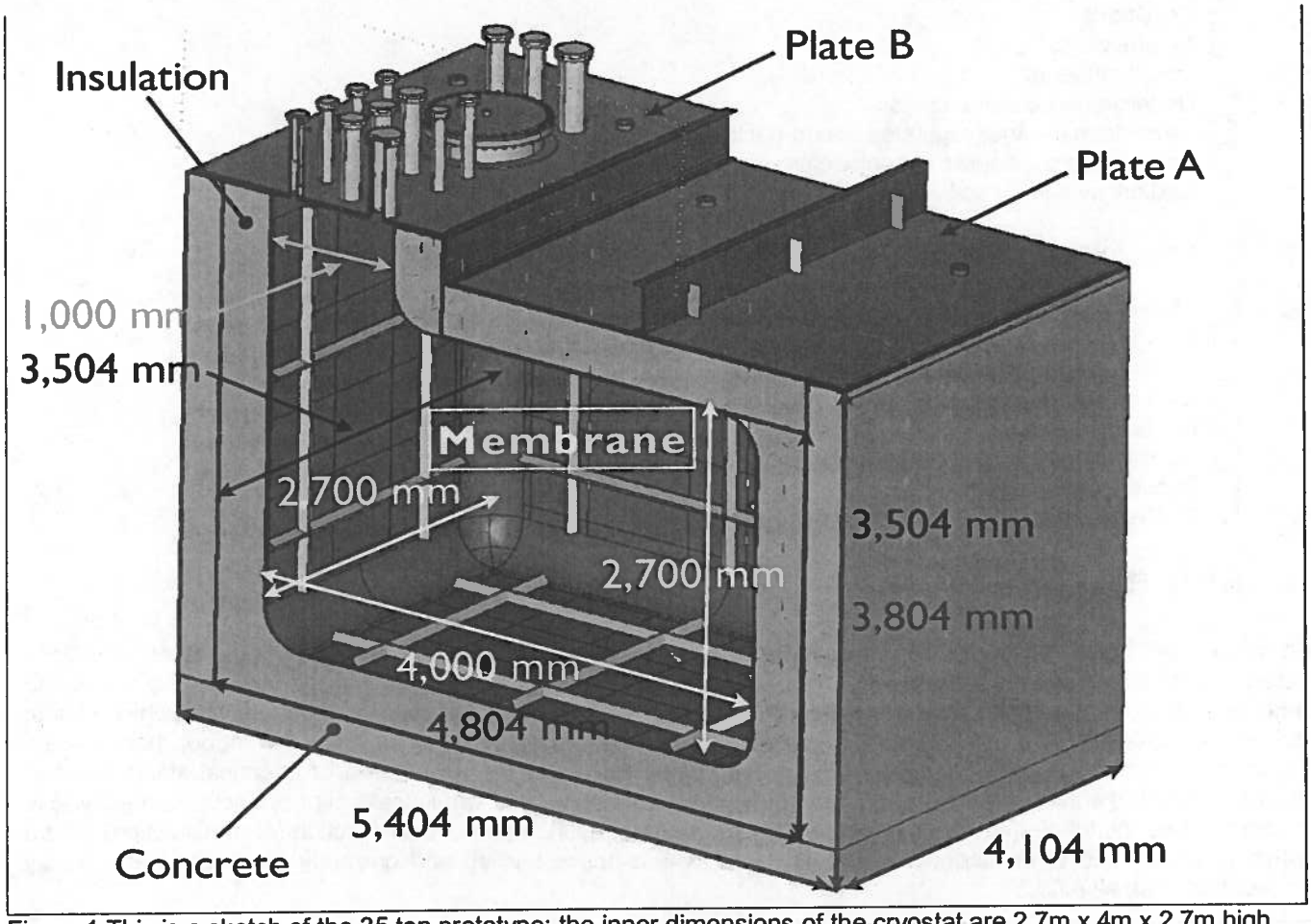

Figure 1 This is a sketch of the 35 ton prototype; the inner dimensions of the cryostat are 2.7m x 4m x 2.7m high.

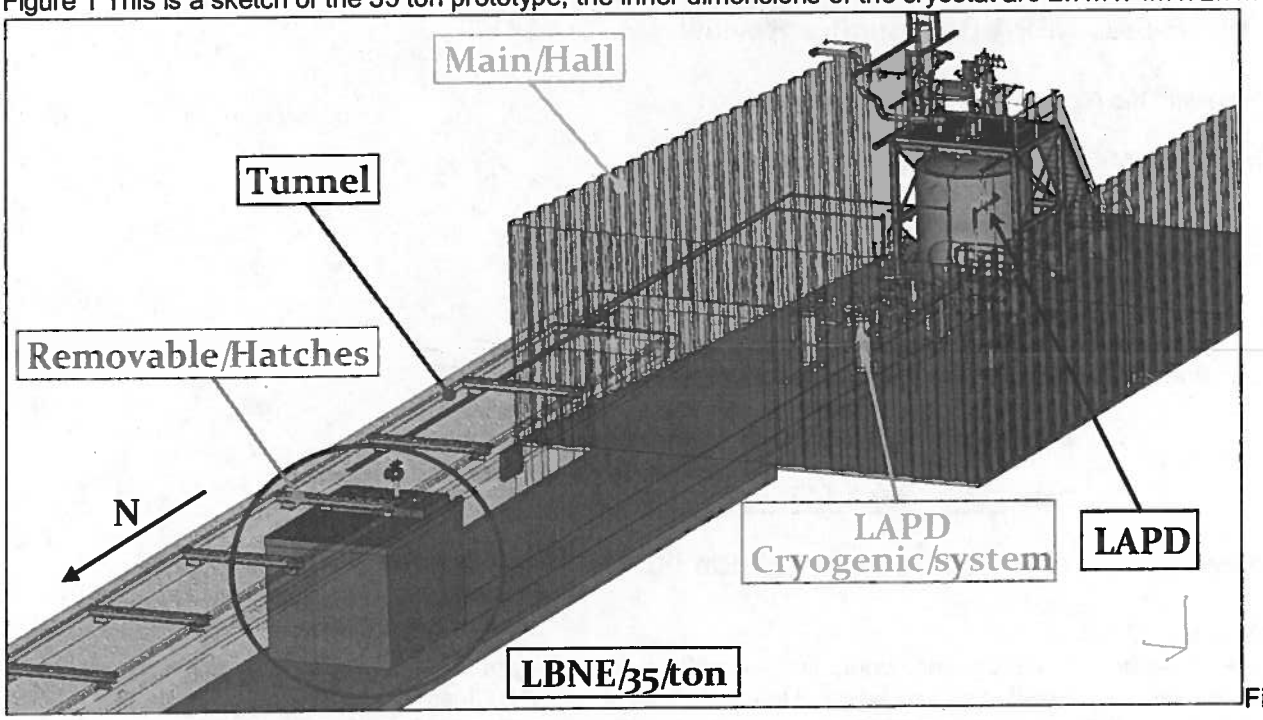

Figure 2 This Drawing shows the position of the 35 ton prototype inside PC-4.