FSO
Hersemann/mb
3/30/10

FSO
Arnold
3/ 31 /10

FSO
Scott
3/ 31 /10

FSO
Legel
4/ 1 /10

FSO
Bollinger
4/ 2 /10

APR 05 2010

Dr. Bruce 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) – DIGITAL HADRON CALORIMETER

Reference: Letter, B. Chrisman to M. Bollinger, dated March 26, 2010, Subject: National Environmental Policy Act (NEPA) Environmental Evaluation Notification Form (EENF) for the Digital Hadron Calorimeter

I have reviewed the Fermilab Environmental Evaluation Notification Form (EENF) for the Digital Hadron Calorimeter. Based on the information provided in the EENF, I have approved the following categorical exclusion (CX):

Project Name	Approved	CX(s)
Digital Hadron Calorimeter	4/01/2010	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 1997.

Sincerely,

Mark E. Bollinger
Acting 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.

bc: P. Siebach, CH-STS, w/encl.
M. McKown, CH-OCC, w/o encl.
J. Scott, w/o encl.
S. Arnold, w/o encl.
R. Hersemann, w/encl.

File:

ENV - 17. a. 2

FERMILAB ENVIRONMENTAL EVALUATION NOTIFICATION FORM

Project/Activity Title: Digital Hadron Calorimeter
ES&H Tracking Number: 01081
Funding Source: Operating
Fermilab Environmental Officer (submitted PIF): Rob Bushek (X2399)
Fermilab Project Lead: Aria Meyhoefer (X4463)

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 Lead: Aria Meyhoefer

Signature _____

Date 3/24/10

Fermilab NEPA Reviewer: Teri L. Dykhuis

Signature Teri L. Dykhuis

Date 3/24/10

I. Description of the Proposed Action and Need

Purpose and Need:
The purpose of the proposed Digital Hadron Calorimeter (DHC) is to test a novel approach to hadron calorimetry (subatomic particle detector to measure the energy of hadronic particles, such as pions and protons) using a binary or digital readout. It is part of the overall program of the CALICE collaboration which has been carrying out R&D efforts on calorimetry for the International Linear Collider Detector. The major focus of this research has been the development of particle-flow calorimetry for achieving the unprecedented jet energy resolutions required to fully exploit the physics potential of a lepton collider. As such, the prototyping efforts have concentrated on the development of calorimeter technologies with a high degree of longitudinal and transverse segmentation. The collaboration is studying various options for electromagnetic (Si-W and Scint-W) and hadronic (Scint-Steel, RPC-Steel and GEM/Micromegas-Steel) calorimeters with the aim of comparing their performance with respect to the ILC physics requirements.

Proposed Action:
For the proposed DHC, Argonne would provide up to 50 cassettes with a weight of approximately 40 pounds each that contain Resistive Plate Chambers (RPCs) as the active element and include a front-end electronic readout. These cassettes would be inserted into the existing hadron calorimeter structure of the CALICE collaboration which is currently located in the Meson Test Beam area.

RPCs are subatomic particle detectors that require a specific gas mixture for optimal operation. The gas mixture has been fine tuned over the past several decades and contains R134a (1,1,1,2 Tetrafluoroethane), Isobutane and SF6. Despite considerable effort worldwide, no substitute gas with similar performance characteristics has been identified. Other than what has been described, no additional physical action would be undertaken.

An alternate approach to hadron calorimetry within the paradigm of Particle Flow Algorithms is based on the use of scintillator (material which exhibits the property of luninescence when excited by ionizing radiation) tiles as the active element and this is being pursued by another group based in Europe.

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

II. Description of the Affected Environment

The prototype DHC would utilize a gas mixture, containing approximately 94.5% 1,1,1,2 Tetrafluoroethane [Global Warming Potential (GWP) over 100 year time horizon=1320], 5.0% Isobutane, and 0.5% Sulfur Hexafluoride (SF6) [GWP=22,500], which is not flammable; however, isobutane is a regulated air pollutant (volatile organic material), 1,1,1,2 Tetrafluoroethane and SF6 are greenhouse gases (GHGs); and SF6 has the highest GWP of any chemical. The chambers would be continually flushed with fresh gas and the exhaust gas would be vented to the atmosphere. The entire gas volume would be on the order of 40 liters with at least 8 volume changes per day resulting in 400 liters of gas per day. Data would be collected during three separate time periods, lasting about four weeks.

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.

V. DOE/CH-FAO NEPA Coordinator Review

Concurrence with the recommendation for determination:

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

Signature Rick Hersemann

Date 3/30/10

Acting Fermi Site Office Manager: Mark Bollinger

Signature M Eh

Date 4/2/10

VI. Comments on checked items in section III.

Air Emissions
Isobutane is the only regulated air pollutant of the proposed gases, although the other gases (1,1,1,2 Tetrafluoroethane and SF6) are under consideration by the USEPA for regulation. The potential-to-emit (maximum capacity of a stationary source to emit any air pollutant under its physical and operational design) of isobutane would be 4.4 pounds per day (or 0.0064 per hour) and would, therefore, be exempt from the need to obtain an air construction permit from the Illinois Environmental Protection Agency (IEPA) due to the citation below found in Title 35 of the Illinois Administrative Code, Part 201, Section 201.146, Exemptions from State Permit Requirements, which states the following.

> **35 IAC Section 201.146 Exemption from State Permit Requirements**
> Construction permits or operating permits…are not required for the classes of equipment and activities listed below in this Section. The permitting exemptions in this Section do not relieve the owner or operator of any source from any obligation to comply with any other applicable requirements…
>
> jjj Replacement, addition, or modification of emission units at permitted sources that are not major sources subject to Section 39.5 and that do not have a federally enforceable state operating permit limiting their potential to emit, in circumstances where:
>
> 1) The potential to emit of any regulated air pollutant in the absence of air pollution control equipment from the new emission unit, or the increase in the potential to emit resulting from the modification of any existing emission unit is either:
>
> A) Less than 0.1 pound per hour or 0.44 tons per year; or…

As stated previously, 1,1,1,2 Tetrafluoroethane and SF6 are greenhouse gases and the recently passed Sustainability Executive Order 13514 calls for a Federal Agency-wide reduction in emissions of these gases. Considerable effort worldwide has been conducted but no substitute gas with similar performance characteristics has been identified. In addition, environmentally friendly ways to manage the gas, such as recycling, were explored; however, the purity and quality standard necessary for the experiment could not be met through recycling. In addition, the supplier is not able or willing to receive the recaptured gases, if this could be done, due to it being a mixture for which there is no market (if there was only one chemical this might be possible). Therefore, these very minute volumes would be vented to the atmosphere during operation which is estimated at four weeks.

Demolition or Decommissioning

After completing the tests, the CALICE structure would be dismantled and shipped back to the DESY laboratory in Hamburg, Germany and the cassettes containing the RPCs and the electronics would be returned to Argonne National Laboratory