Environmental Review Form for Argonne National Laboratory

Click on the blue question marks (?) for instructions, contacts, and additional information on specific line items.

(?)**Project/Activity Title**: **Demolition and Recycling of the SIX Tesla Superconducting Dipole Magnet System**

(?)**ASO NEPA Tracking No.** ASO-CX-271 (?)**Type of Funding**: ____
B&R Code ____

(?)**Identifying number**: ERF-01061 WFO proposal # ____ CRADA proposal # ____
Work Project # ____ ANL accounting # (item 3a in Field Work Proposal) ____
Other (explain) ____

(?)**Project Manager**: Jesse Adams Signature: [signature] Date: 8-25-10

(?)**NEPA Owner**: Phil Rash Signature: [signature] Date: 8/25/10

ANL NEPA Reviewer: *M. A. Kamiya* Signature: [signature] Date: 8/25/2010

I. (?)**Description of Proposed Action:** The project consists of moving the magnet out of building 370 into the parking lot adjacent to buildings 370, 371, and 376. The magnet will then be cut into pieces to meet DOT shipping requirements and sent off-site for metal recycling.

II. (?)**Description of Affected Environment:** General movement and demolition will not impact the environment. Air permitting is not required for cutting operations. However, some safety related issues exist due to cutting plastic that is in the magnet. Water will be available to control burning activities.

III. (?)**Potential Environmental Effects:** (Attach explanation for each "yes" response. **See Instructions for Completing Environmental Review Form**)

A. Complete Section A for all projects.

1. (?)Project evaluated for Pollution Prevention and Waste Minimization opportunities and details provided under items 2, 4, 6, 7, 8, 16, and 20 below, as applicable — Yes X No ____

   The contractor will be paying Argonne a fee based on the recycling the metal from the magnet.

2. (?)Air Pollutant Emissions — Yes X No ____

   The IEPA does not require a construction permit for this activity. There are hazardous air emissions from the cutting of the stainless steel and insulation within the magnet. The contractor will follow the FMS and IH requirements. The contractor will utilize nitrogen and water for preventing combustion.

3. (?)Noise — Yes X No ____

   The plasma torch and fans will create noise. The contractor will follow the FMS and IH requirements.

4. (?)Chemical Storage/Use — Yes ____ No X

5. (?)Pesticide Use — Yes ____ No X

6. (?) Polychlorinated Biphenyls (PCBs) — Yes ____ No X

7. (?) Biohazards — Yes ____ No X

8. (?)Liquid Effluent (wastewater) — Yes X No ____

   Water will be used to cool the plasma torch cutting of the magnet to prevent ignition of the insulation. The drains will be surrounded by absorbent pigs to prevent run-off from reaching the storm drains. The water will be absorbed and disposed of as general waste.

9. (?)Waste Management

   a) Construction or Demolition Waste — Yes X No ____

   The ~400,000 lb. magnet will be recycled for its metal content off-site by the contractor. Daily, the fine metal particles from the cutting of the magnet will be swept up to prevent contamination of the storm drains.

   b) Hazardous Waste — Yes ____ No X
   c) Radioactive Mixed Waste — Yes ____ No X
   d) Radioactive Waste — Yes ____ No X
   e) PCB or Asbestos Waste — Yes ____ No X
   f) Biological Waste — Yes ____ No X
   g) No Path to Disposal Waste — Yes ____ No X
   h) Nano-material Waste — Yes ____ No X

10. (?)Radiation — Yes ____ No X

11. (?)Threatened Violation of ES&H Regulations or Permit Requirements — Yes ____ No X

12. (?)New or Modified Federal or State Permits — Yes ____ No X

13. (?)Siting, Construction, or Major Modification of Facility to Recover, Treat, Store, or Dispose of Waste — Yes ____ No X

14. (?)Public Controversy — Yes ____ No X

15. (?)Historic Structures and Objects — Yes X No ____

    The magnet requires a historical review by the Illinois Historic Preservation Agency (IHPA). The IHPA review and concurrence is required before the magnet can be demolished. Attached is the letter (Attachment #1) ~~issued to the SHPO by DOE~~ by the SHPO approving the project without mitigation. Also attached is the Argonne evaluation report on the historical significance of the magnet. (Attachment #2)

16. (?)Disturbance of Pre-existing Contamination — Yes ____ No X

17. (?)Energy Efficiency, Resource Conserving, and Sustainable Design Features — Yes ____ No X

B. For projects that will occur outdoors, complete Section B as well as Section A.

18. (?)Threatened or Endangered Species, Critical Habitats, and/or other Protected Species	Yes ____	No X
19. (?)Wetlands	Yes ____	No X
20. (?)Floodplain	Yes ____	No X
21. (?)Landscaping	Yes ____	No X
22. (?)Navigable Air Space	Yes ____	No X
23. (?)Clearing or Excavation	Yes ____	No X
24. (?)Archaeological Resources	Yes ____	No X
25. (?)Underground Injection	Yes ____	No X
26. (?)Underground Storage Tanks	Yes ____	No X
27. (?)Public Utilities or Services	Yes ____	No X
28. (?)Depletion of a Non-Renewable Resource	Yes ____	No X

C. For projects occurring outside of ANL complete Section C as well as Sections A and B. N/A

29. (?)Prime, Unique, or Locally Important Farmland	Yes ____	No ____
30. (?)Special Sources of Groundwater (such as sole source aquifer)	Yes ____	No ____
31. (?)Coastal Zones	Yes ____	No ____
32. (?)Areas with Special National Designations (such as National Forests, Parks, or Trails)	Yes ____	No ____
33. (?)Action of a State Agency in a State with NEPA-type Law	Yes ____	No ____
34. (?)Class I Air Quality Control Region	Yes ____	No ____

IV. (?)Subpart D Determination: (to be completed by DOE/ASO)

Are there any extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal?	Yes ____	No X
Is the project connected to other actions with potentially significant impacts or related to other proposed action with cumulatively significant impacts?	Yes ____	No X
If yes, is a categorical exclusion determination precluded by 40 CFR 1506.1 or 10 CFR 1021.211?	Yes ____	No ____

Can the project or activity be categorically excluded from preparation of an Environment Assessment or Environmental Impact Statement under Subpart D of the DOE NEPA Regulations? Yes X No ____

If yes, indicate the class or classes of action from Appendix A or B of Subpart D under which the project may be excluded. B3.6 Decommissioning of facilities for small-scale R&D projects

If no, indicate the NEPA recommendation and class(es) of action from Appendix C or D to Subpart D to Part 1021 of 10 CFR.

ASO NEPA Coordinator Review: Ken Chiu

Signature: [signature] Date: 8/30/2010

ASO NCO Approval of CX Determination:

The preceding pages are a record of documentation that an action may be categorically excluded from further NEPA review under DOE NEPA Regulation 10 CFR Part 1021.400. I have determined that the proposed action meets the requirements for the Categorical Exclusion identified above.

Signature: [signature] Date: 8/30/2010

Peter R. Siebach
Acting Argonne Site Office NCO

ASO NCO EA or EIS Recommendation: N/A

Class of Action: _____

Signature: _____ Date: _____

Peter R. Siebach
Acting Argonne Site Office NCO

Concurrence with EA or EIS Recommendation:

CH GLD: _____

Signature: _____ Date: _____

ASO-CX-271

ASO Manager Approval of EA or EIS Recommendation: N/A

An ____ EA ____ EIS shall be prepared for the proposed _____ and

_____ shall serve as the document manager.

Signature: _____ Date: _____

Dr. Joanna M. Livengood, Manager

ASO-CX-271 Attachment #1

DL2010-189
5400.2(2.7)

Illinois Historic Preservation Agency

FAX (217) 782-8161

1 Old State Capitol Plaza • Springfield, Illinois 62701-1512 • www.illinois-history.gov

DuPage County
Argonne
Removal of a 6 Tesla Superconducting Dipole Magnet
North of Bluff Rd. in Building 370
IHPA Log #012073010

August 16, 2010

Dr. Joanna M. Livengood
Department of Energy
Argonne Site Office
9800 S. Cass Ave.
Argonne, IL 60439

Dear Dr. Livengood:

We have reviewed the documentation submitted for the referenced project(s) in accordance with 36 CFR Part 800.4. Based upon the information provided, no historic properties are affected. We, therefore, have no objection to the undertaking proceeding as planned.

Please retain this letter in your files as evidence of compliance with section 106 of the National Historic Preservation Act of 1966, as amended. This clearance remains in effect for two years from date of issuance. It does not pertain to any discovery during construction, nor is it a clearance for purposes of the Illinois Human Skeletal Remains Protection Act (20 ILCS 3440).

If you have any further questions, please contact me at 217/785-5027.

Sincerely,

Anne E. Haaker

Anne E. Haaker
Deputy State Historic
Preservation Officer

ASO-OX-171 Attachment #2

National Register Eligibility Evaluation of a 6 Tesla Superconducting Dipole Magnet Located in Building 370 Argonne National Laboratory DuPage County, Illinois

Prepared by:
Daniel J. O'Rourke
Environment Science Division
Argonne National Laboratory
Argonne, Illinois

Prepared for:
Environmental Quality Oversight
Argonne National Laboratory
and
U.S. Department of Energy
Argonne Site Office
Argonne, Illinois

July 2010

National Register Eligibility Evaluation of a
6 Tesla Superconducting Dipole Magnet Located in Building 370
Argonne National Laboratory
DuPage County, Illinois

Introduction

Argonne National Laboratory (Argonne) intends to dismantle and remove a 6 Tesla superconducting dipole magnet that was designed for use in magnetohydrodynamic energy conversion research, here after referred to as the superconducting magnet system (SCMS-2). The SCMS-2 is located in the high bay of Building 370 on the Argonne main campus. The magnet was built in the early 1980s for research to develop a MHD power plant in the U.S. The magnet was built at Argonne by Argonne personnel. While the magnet was tested to prove its functionality, the overall project was ultimately cancelled without any research being conducted with the magnet. After several years of sitting idle, the magnet was eventually used in development research on a propulsion system for naval vessels. This report contains the National Register evaluation required by Section 106 of the National Historic Preservation Act of 1966, as amended.

Location

Argonne is a federally funded research and development facility owned by Department of Energy (DOE) and operated by UChicago Argonne LLC. Argonne is located in DuPage County, Illinois, approximately 25 miles southwest of Chicago, and occupies roughly 1,500 acres, predominately in Sections 3, 4, 8, 9, and 10 of Township 37 North and Range 11 East of the Third Principal Meridian (Figure 1). The Waterfall Glen Forest Preserve surrounds the facility. The SCMS-2 is located in Building 370 in the southeastern portion of the laboratory.

History

Argonne National Laboratory (Argonne) was established in 1946 with passage of the Atomic Energy Act. In 1947 Argonne was named the National Reactor Center for the Atomic Energy Commission (AEC). A major focus of the laboratory from the beginning was the development of peaceful uses of nuclear energy. This was formalized in 1954 with the Atoms for Peace initiatives. Renewed focus on the development of new energy sources and more efficient conversion technologies came during the U.S. energy crisis in the early 1970s. Among the technologies being considered was the generation of electricity by using magnetohydrodynamic (MHD) conversion technologies. The concept of MHD was first demonstrated in the mid 1800s by Michael Faraday when he attempted to demonstrate an electrical potential. "When a conductor passes through a magnetic field it creates an electrical current in the conductor. A fluid conductor flowing through a magnetic field creates a voltage gradient that converts the energy of motion directly into electricity, eliminating both the turbine and generator normally used to produce electricity" (Holl 1996). A power plant creating MHD power would require a conventional heat source (gas or coal) to heat the conducting material. The heated material would then be run through a magnetic field to generate the electricity. A benefit of operating

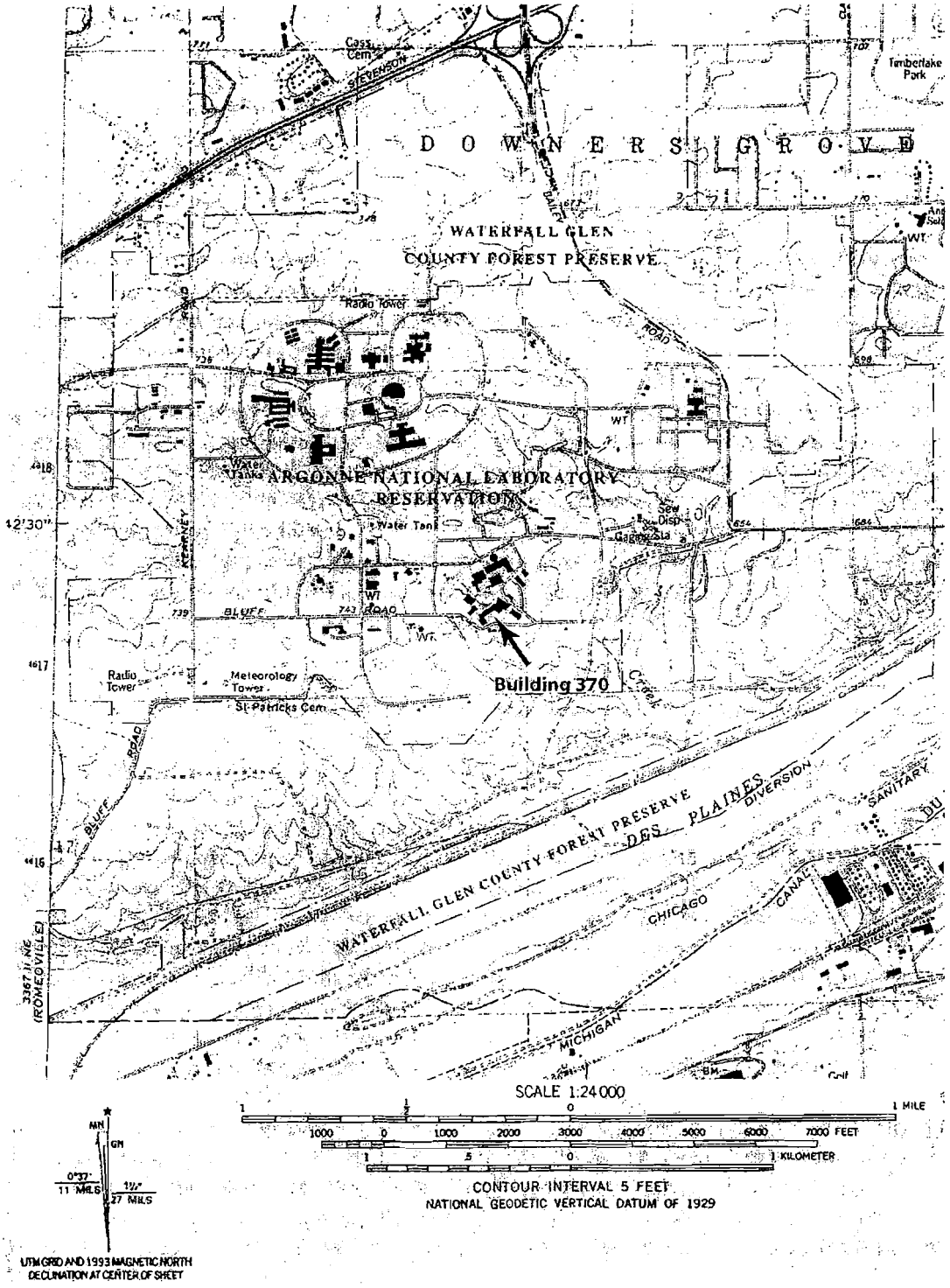

Figure 1 Location of Building 370, Argonne National Laboratory

a MHD plant is that there are no moving parts to maintain (Petrick and Shumyatsky 1978). The efficiency of a MHD plant is also higher than conventional sources of electricity.

Argonne researchers first became involved in MHD studies in the early 1970s when several conferences and committees began looking at MHD as an energy conversion technology in earnest due to the growing energy crisis. Several breakthroughs in the technology during the late 1950s and early 1960s made use of the technology possible as a commercial power system.

During the early 1970s the U.S. and the Soviet Union had begun discussions on cooperative research. This was formalized in 1972 when the two countries signed an Agreement on Scientific and Technical Cooperation (Petrick and Shumyatsky 1978). As part of the agreement a US/Soviet Joint Committee on Energy was established. The efforts of the committee culminated in the construction of a MHD pilot plant located in the Soviet Union (the U-25B). The Soviets had previously constructed the U-25 plant that included MHD technologies but the plant was experiencing technical difficulties. The U-25B pilot plant was to utilize conventional heat sources (such as natural gas and coal) and a large superconducting magnet system (SCMS-1) which was designed and constructed at Argonne. The U-25B was to help resolve the technical issues occurring at the U-25 plant. The SCMS-1 was flown from the Chicago to Russia for installation in the new plant. The U-25B plant began operating in 1977. In parallel with establishing the U-25B plant there was discussion of developing a MHD test facility in the U.S. The joint U.S./Soviet Union research was cancelled due to the Soviet invasion of Afghanistan at the end of 1979.

Meanwhile, the U.S. proceeded in establishing the Coal Fired Flow Facility (CFFF) at the University of Tennessee Space Institute (UTSI) and the Component Development and Integration Facility (CDIF) at the Montana Energy and MHD Research and Development Institute for the study of open cycle MHD energy conversion. Argonne personnel constructed the SCMS-2 which could be used at either test facility. Construction of the new magnet was completed by 1984. The completed magnet weighed 172.8 metric tons and was 4 meters wide and 4.9 meters tall (Figures 2 and 3). The magnet created a magnetic field of 6 Tesla (1 Tesla between 100,000-1,000,000 times the magnetic field of the average household appliance). The SCMS-2 achieved its two primary research objectives: a design that would be operable at either the CFFF or CDIF and a design that was scalable to the larger future MHD magnets that would be required for full size, commercial base load MHD electrical power generating systems. The experience gained in designing and fabricating the SCMS-2 advanced the "state of the art" substantially and generated a technological database for future magnet designs.

Once completed the SCMS was tested to ensure proper functional capabilities. After testing, the SCMS-2 was housed at Argonne awaiting shipment to the test facility. DOE was unable to come to a decision on whether to install the SCMS-2 at the CDIF or the CDFF because of programmatic, budgetary and political issues (Petrick 2010). The decision was made to mothball and store the SCMS-2 at Argonne for potential future use.

With the end of the MHD power test facility program discussions began concerning alternate uses for the SCMS-2. Eventually the SCMS-2 was used to support a project attempting to develop a new propulsion system for naval vessels. The system involved putting a current

through seawater which is passed through a channel that is positioned in a strong magnetic field. This results in the Lorentz effect which in turn results in propulsion. The result was a propulsion system that was very quiet because it did not require a propeller and shaft. The concept was dramatized in the 1990 motion picture The Hunt for Red October. The objective of the experiments was to determine the specifications for the thruster. The studies conducted with the SCMS-2 generated a database of information on the design characteristics of a MHD propulsion system (Petrick 2010).

The SCMS-2 has not been used since the conclusion of the sea water propulsion experiments in 1992. The SCMS-2 has been stored in Building 370 between 1992 and 2010. Currently in the U.S. there is no commercial application of the MHD electrical power technology.

Recommendations

Based on the review conducted of the SCMS-2 it is recommended not eligible for listing on the National Register of Historic Places. While the experiments conducted with the SCMS-2 provided useful scientific and engineering information, the SCMS-2 does not appear to meet any of the National Register Eligibility criteria. Information on the design and operation of the SCMS-2 is available in scientific literature and the databases created as part of the above described projects. The SCMS-2 also fails to meet Criteria Consideration G which addresses objects that are less than 50 years old. The information contained within this report appears adequate to document the SCMS-2. It is recommended that the project to dismantle the magnet be allowed to proceed.

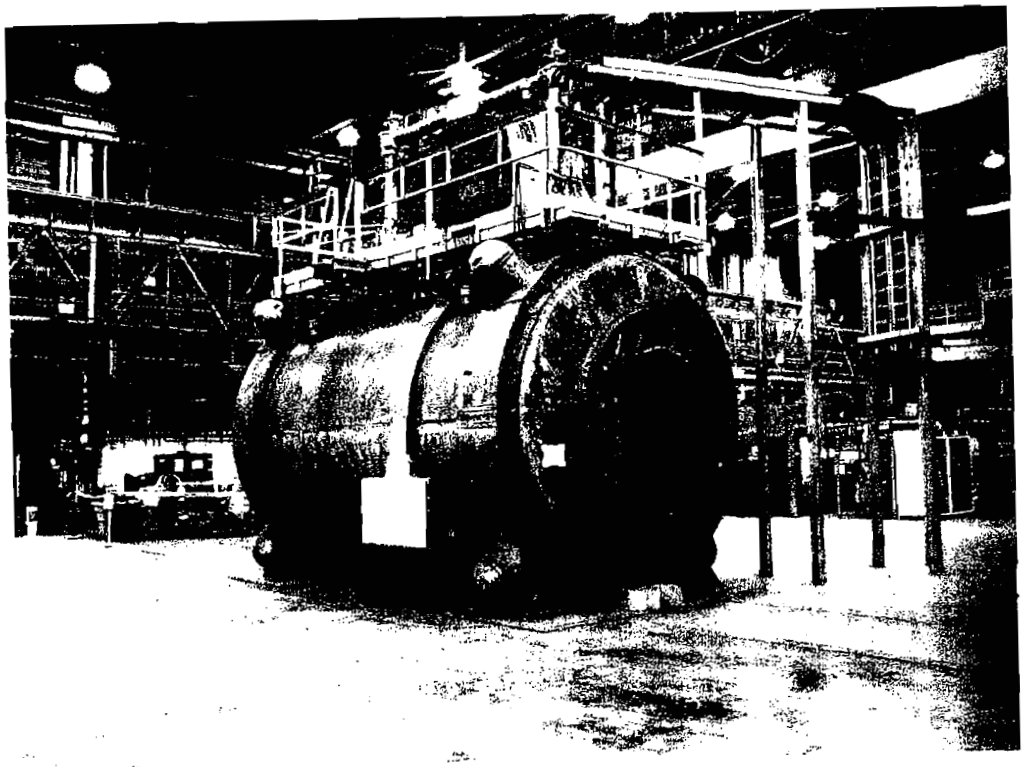

Figure 2. 6 Tesla MHD Magnet.

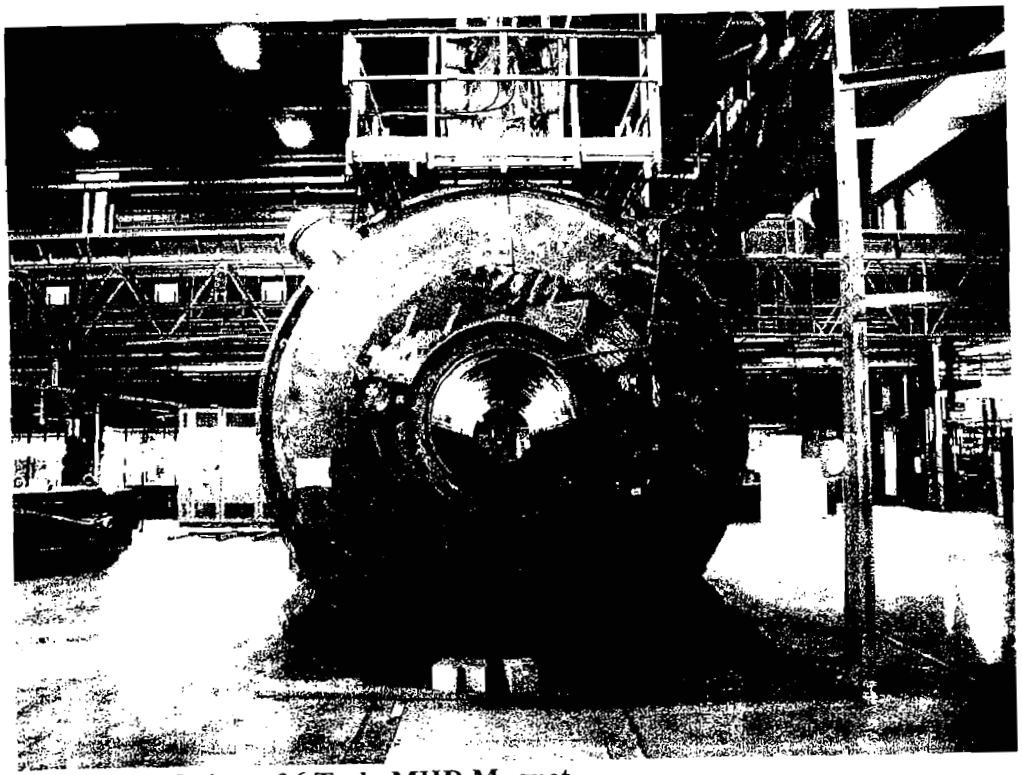

Figure 3 End view of 6 Tesla MHD Magnet.

References

Holl, J.M., 1997, *Argonne National Laboratory, 1946-96*, University of Illinois Press, Chicago, Ill.

Libera, J. 2010, Personal communication with D. O'Rourke, April 15, 2010. (Mr. Joseph Libera is the current manager of the MHD magnet).

Petrick, M., 2010, Personal communication with D. O'Rourke July 7, 2010. (Mr. Mike Petrick was the project manager for construction and operation of the MHD Magnet).

Petrick, M. and B. YA. Shumyatsky (Eds.), 1978, Open-Cycle Magnetohydrodynamic Electrical Power Generation, A Joint U.S.A./U.S.S.R. Publication, Published by United States Department of Energy, Argonne National Laboratory and Academy of Sciences of the U.S.S.R. Institute of High Temperatures.

Petrick, M, A. Thomas, L Genens, J. Libera, R. Nierert, J. Bouillard, E. Pierson, D. Hill, B. Picologlou, O. Ohlsson, T. Kasprzyk, and G. Berry, 1992, *Magnetohydrodynamic Sea Water Propulsion*, ANL/CP—75283 DE92 007396, Argonne National Laboratory, Feb. 14.