Department of Energy
Argonne Site Office
9800 South Cass Avenue
Argonne, Illinois 60439

DEC 17 2013

Dr. Eric D. Isaacs
Director, Argonne National Laboratory
President, UChicago Argonne, LLC
9700 South Cass Avenue
Argonne, IL 60439

Dear Dr. Isaacs:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DETERMINATION FOR ARGONNE NATIONAL LABORATORY (ANL)

The Argonne Site Office (ASO) has approved the following as a categorical exclusion (CX) under the category of "Appendix B 3.10 Siting/construction/operation/decommissioning of particle accelerators, including electron beam accelerators, primary beam energy less than approximately 100 MeV".

- Operation of the 50 MeV Electron LINAC Accelerator (ASO-CX-300)

Therefore, no further NEPA review is required. However, if any modification or an expansion of the scope is made to the above project, additional NEPA review will be necessary.

Enclosed please find a copy of the approved Environmental Review Form (ERF) for the project. If you have any questions, please contact me or Kaushik Joshi of my staff at extension 2-4226.

Sincerely,

Joanna M. Livengood

Dr. Joanna M. Livengood
Manager

Enclosure:
As Stated

cc: J. Stauber, ANL/FMS, w/encl.
R. Riel, ANL/CSE, w/encl.
S. Chemerisov, ANL/CSE, w/encl.

Argonne NATIONAL LABORATORY

Environmental Review Form for Argonne National Laboratory

Project/Activity Title: Operation of the 50 MeV Electron Linac Accelerator (CSE60)

ASO NEPA Tracking No. ASO- CX- 300 **Type of Funding**: Operation funds

B&R Code _____

Identifying number: _____ WFO proposal # _____ CRADA proposal # _____

Work Project # _____ ANL accounting # (item 3a in Field Work Proposal) _____

Other (explain) _____

Project Manager: Sergey Chemerisov Signature: _____ Date: 10.14.2013

NEPA Owner: Roberta Riel Signature: Roberta Riel Date: 10/14/2013

ANL NEPA Reviewer: Joel Stauber Signature: Joel V. Stauber Date: 10/15/13

I. **Description of Proposed Action:** This review covers the operation and maintenance of the 50-MeV linac electron accelerator as it is currently authorized. The accelerator will be operated within approved and authorized limits as detailed in the governing Safety Assessment Document, Work Planning and Control documentation, Radioactive Work Permit, or other applicable documents.

II. **Description of Affected Environment:** The 50 MeV Linac electron accelerator is an existing facility that is used by CSE division to study radiation induced effects in solid, liquid, and gaseous samples. The Linac accelerator facility is located in Building 211, room D-076, and utilizes a closed loop cooling water system and a one pass air ventilation system. The energy of the generating electrons is high enough to induce radioactivity in accelerator components (beam pipes, magnets, and beam stops) but direct interaction of the high energy electrons with air does not effectively activate the air due to the small cross section. Activation of the air is possible only when high energy electrons strike a specific target and high energy x-rays are produced. Calculations of the radioactivity produced during the activation of air are detailed below.

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 ____

2. Air Pollutant Emissions Yes X No ____

Per B. Micklach (PHY) the activity for conditions that are planned to use for thermal load test of the Mo target.

Table 1. Operational parameters of the accelerator

beam energy (MeV)	35
beam current (uA)	700
accelerator power (kW)	24.5
assumed path length of brems in air (m)	1
target room volume (liters)	300000
run time (hr)	800
wait time (min)	15
occupancy time (min)	5

Release (Table 2)is calculated based on room inventory (concentration) during operation plus exhaust of air after run stops. The run is this case is defined as 800 hrs, the nominal amount of operating time in one year. 35 MEV was used as a limiting case because maximum efficiency for radioactive gasses production is expected at this energy with current configuration of the accelerator

Table 2. Radioactive gases release at the scenario mentioned above. Activities are calculated for nominal amount of operation time in a calendar year. Realistic estimate of experimental (irradiation time) per year is 10 times less. The activity will be proportional to the irradiation time.

nuclide	half life (s)	activity released due to one run (Ci)
He-3	3.89e+08	1.76E-05
Be-7	4.61e+06	3.18E-04
C-11	1223.1	1.11E+01
N-13	597.9	9.84E+02
O-15	122.24	3.33E+02
N-16	7.13	2.321E-1
Cl-38	2234.4	1.26E-01
Cl-39	3336	5.68E-01
Total		1.66E+03

In addition to the air activation Linac will induce radioactivity in the solid Mo targets used in the experiments. Part of the targets will be converted to liquid form (dissolved) in the facility. Table 3 presents planed maximum activities and isotope composition for the targets and released activities.

Table 3. Radionuclides produced in irradiations of the metal Mo-100 targets. Calculation for radionuclide releases are assuming maximum target activity 200 Ci combined Mo-99 and Tc-99m. Calculation do not take into account decay of the Mo-99 (66 hours half life) and Tc-99m (6 hours half life). Target will be handled inside glove box with HEPA filtered exhaust.

Radionuclide	Maximum quantity, Ci	Physical Form	Release Factor	Control	Emission Control Factor	Annual Release, Ci
Mo-99	100	solid	1e-06	HEPA	0.01	1e-6
Mo-99	20	liquid	0.001	HEPA	0.01	2e-4
Tc-99m	100	solid	1e-06	HEPA	0.01	1e-6
Tc-99m	20	liquid	0.001	HEPA	0.01	2e-4
Total						4.02e-4

Radiological air emissions require annual submission of data to the Environmental Protection Manager for submission to the US EPA for their annual NESHAP report.

3. Noise — Yes ____ No X

4. Chemical/Oil Storage/Use — Yes X No ____

Up to several liters of diluted acids and bases will be used in experiments. Small amounts (100s of mL) of concentrated acids and bases can be used in experiments. Small amounts of common solvents are used for cleaning of vacuum equipment and stored in the facility in a flammable liquid cabinet.

5. Pesticide Use — Yes ____ No X

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

   Old capacitors in Linac pulse forming network and HV power supplies contain PCB.

7. Biohazards — Yes ____ No X

8. Effluent/Wastewater (If yes, see question #12 and contact Gregg Kulma (FMS-SEP) at 2-9147 or gkulma@anl.gov — Yes ____ No X

9. Waste Management

   a) Construction or Demolition Waste — Yes ____ No X

   b) Hazardous Waste — Yes X No ____

   c) Radioactive Mixed Waste — Yes X No ____

   d) Radioactive Waste — Yes X No ____

   e) PCB or Asbestos Waste — Yes X No ____

   f) Biological Waste — Yes ____ No X

g) No Path to Disposal Waste Yes ____ No X

h) Nano-material Waste Yes ____ No X

Generated wastes will be managed and disposed of according to LMS-PROC-103.

10. Radiation Yes X No ____

50MeV Linac accelerator can produce ionizing radiation (beta, and gamma rays) at the energy up to 50 MeV.

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 ____ No X

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. N/A

18. Threatened or Endangered Species, Critical Habitats, and/or other Protected Species Yes ____ No ____

19. Wetlands Yes ____ No ____

20. Floodplain Yes ____ No ____

21. Landscaping Yes ____ No ____

22. Navigable Air Space Yes ____ No ____

23. Clearing or Excavation Yes ____ No ____

24. Archaeological Resources Yes ____ No ____

25. Underground Injection Yes ____ No ____

26. Underground Storage Tanks Yes ____ No ____

27. Public Utilities or Services Yes ____ No ____

28. Depletion of a Non-Renewable Resource Yes ____ No ____

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. Appendix B, B.3.10 "Siting/construction/operation/ decommissioning of particle accelerators, including electron beam accelerators, primary beam energy less than approximately 100 MeV."

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: Kaushik Joshi

Signature: KNJoshi Date: 12-12-2013

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: _____ Date: 12/12/2013

Peter R. Siebach
Acting Argonne Site Office NCO

ASO NCO EA or EIS Recommendation:

Class of Action: _____

Signature: _____ Date: _____

Peter R. Siebach
Acting Argonne Site Office NCO

Concurrence with EA or EIS Recommendation:

CH GLD: _____

Signature: _____ Date: _____

ASO Manager Approval of EA or EIS Recommendation:

An ☐ EA ☐ EIS shall be prepared for the proposed _____ and _____ shall serve as the document manager.

Signature: _____ Date: _____

Dr. Joanna M. Livengood
Manager