



Department of Energy

Argonne Site Office
9800 South Cass Avenue
Argonne, Illinois 60439

JAN 14 2015

Dr. Peter B. Littlewood
Director, Argonne National Laboratory
President, UChicago Argonne, LLC
9700 South Cass Avenue
Argonne, IL 60439

Dear Dr. Littlewood:

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

The Argonne Site Office (ASO) has approved the following as a categorical exclusion (CX) under Appendix B (to 10 CFR Part 1021, Subpart D, Integrated DOE NEPA Implementing Procedures, December 1996), Category 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 in Building 211, ASO-CX-310

Therefore, no further NEPA review is required. However, if any modification or 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 Kaushik Joshi of my staff at (630) 252-4226.

Sincerely,

A handwritten signature in black ink, appearing to read "Joanna M. Livengood".

Joanna M. Livengood
Manager

Enclosure:
As Stated

cc: J. Stauber, ANL, w/encl.
S. Chemerisov, ANL, w/encl.
N. VanWermeskerken, ANL, w/encl.
K. Joshi, ASO, w/encl.
M. McKown, SC-CH, w/encl.
P. Siebach, SC-CH, w/encl.

Environmental Review Form for Argonne National Laboratory

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

ASO NEPA Tracking No. ASO-CX-310 **Type of Funding:** Operation funds

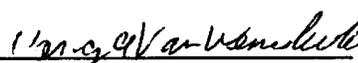
B&R Code _____

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

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

Other (explain) _____

Project Manager: Sergey Chemerisov Signature:  Date: 12.15.2014

NEPA Owner: Nancy VanWermeskerken Signature:  Date: 12/17/2014

ANL NEPA Reviewer: Joel V. Stauber Signature:  Date: 12/22/14

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 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 in 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 planned 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	<u>2e-4</u>
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

4. Chemical/Oil Storage/Use Yes No

Up to thirty 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. 400L of transformer oil is used in the facility in high voltage transformer tanks.

5. Pesticide Use Yes No

6. Polychlorinated Biphenyls (PCBs) Yes No

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

7. Biohazards Yes No

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

9. Waste Management

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

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

10. Radiation Yes 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

12. New or Modified Federal or State Permits Yes No

13. Siting, Construction, or Major Modification of Facility to Recover, Treat, Store, or Dispose of Waste Yes No

14. Public Controversy Yes No

15. Historic Structures and Objects Yes No

16. Disturbance of Pre-existing Contamination Yes No

17. Energy Efficiency, Resource Conserving, and Sustainable Design Features Yes No

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 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. 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.

decommissioning of particle accelerators, including electron beam accelerators, primary beam less than approximately 100 MeV.

ASO NEPA Coordinator Review: Kaushik Joshi

Signature: *K Joshi*

Date: 1-12-2015

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: *Peter R. Siebach*

Date: 1/12/2015

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