

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:** Operation of the 20 MeV Electron Linac Accelerator, including upgrade to 50 MeV (CSE060)

(?) **ASO NEPA Tracking No.** ASO-CX-257 (?) **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:** George Vandegrift Signature: _____ Date: 12/9/09

(?) **NEPA Owner:** Roberta Riel Signature: Roberta Riel Date: 12/9/09

ANL NEPA Reviewer: M. A. Kamiya Signature: M. A. Kamiya Date: 12/9/2009

I. (?) **Description of Proposed Action:** This review covers the operation and maintenance of the 20-MeV linac electron accelerator as it is currently authorized. In addition, the review will cover a planned upgrade program to increase the power to 50 MeV. The accelerator will be operated within approved and authorized limits as detailed in the governing Safety Assessment Document, ^(SAD) Work Control Permit, Radioactive Work Permit or other applicable documents.

II. (?) **Description of Affected Environment:** The 20 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. An upgrade in energy up to 50 MeV is being planned, and is scheduled for completion during the second quarter of FY10. 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 three cases A: maximum beam energy and beam current per present SAD, B: Conditions that are planned to use for thermal load test of the Mo target and C: for planned upgrade of accelerator that will be completed in one year from now and will be go through NEPA evaluation later.

Table 1. Operational parameters of the accelerator

	case		
	A	B	C
beam energy (MeV)	20	15	35
beam current (uA)	200	2000	700
accelerator power (kW)	4	30	24.5
assumed path length of brems in air (m)	1	1	1
target room volume (liters)	300000	300000	300000
run time (hr)	2000	2000	2000
wait time (min)	15	15	15
occupancy time (min)	5	5	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 2000 hrs, the nominal amount of operating time in one year.

Table 2. Radioactive gases release at three different scenarios mentioned above. We are currently limited per linac Safety Assessment Document to case A. Activities are calculated for nominal amount of operation time in a calendar year. Realistic estimate of experimental (irradiation time) per year is 100 times less. The activity will be proportional to the irradiation time.

nuclide	half life (s)	activity released due to one run (Ci)		
		A	B	C
He-3	3.89e+08			4.40E-05
Be-7	4.61e+06			7.97E-04
C-11	1223.1	7.56E-03		4.63E-02
	1223.1			2.78E+01
N-13	597.9	4.02E+02	3.01E+03	2.46E+03
O-15	122.24	1.36E+02		8.33E+02
N-16	7.13			5.82E-01
Cl-38	2234.4			3.15E-01
Cl-39	3336	2.33E-01	1.74E+00	1.42E+00

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 Storage/Use Yes ☒ No ☐

Small amount of chemicals are used in experiments (< 100 ml). Those samples are usually prepared elsewhere and are returned to the owner after irradiation. Small amount of common solvents are used for cleaning of vacuum equipment and stored on facility in flammable liquid cabinet.

5. (?) Pesticide Use Yes ☐ No ☒

6. (?) Polychlorinated Biphenyls (PCBs) Yes ☐ No ☒

7. (?) Biohazards Yes ☐ No ☒

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

9. (?) Waste Management

- | | | |
|--|----------|-------------|
| a) Construction or Demolition Waste | Yes ____ | No <u>X</u> |
| b) Hazardous Waste | Yes ____ | No <u>X</u> |
| c) Radioactive Mixed Waste | Yes ____ | No <u>X</u> |
| d) Radioactive Waste | Yes ____ | No <u>X</u> |
| e) PCB or Asbestos Waste | Yes ____ | No <u>X</u> |
| f) Biological Waste | Yes ____ | No <u>X</u> |
| g) No Path to Disposal Waste | Yes ____ | No <u>X</u> |
| h) Nano-material Waste (is any waste generated? If yes add text) | Yes ____ | No <u>X</u> |

10. (?) Radiation Yes X No ____

20MeV linac accelerator can produce ionizing radiation (beta, and gamma rays) at the energy up to 20 MeV. ~~(I would put something here on how the radiation is controlled, shielding, limited access etc).~~ Radiation is controlled thru the SAD and other relevant work and radiation control documentation.

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. *B.3.10. Operation/maintenance of particle accelerators w/ primary beam energy $\geq$ less than 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: Ken Chiu

Signature: Ken Chiu

Date: 12/15/09

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
Acting Argonne Site Office NCO

Date: _____

12/16/2009

ASO NCO EA or EIS Recommendation:

N/A

Class of Action: _____

Signature: _____

Peter R. Siebach
Acting Argonne Site Office NCO

Date: _____

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: _____

Ronald J. Lutha
Site Manager

Date: _____