Environmental Review Form for Argonne National Laboratory

Form:	ANL-985
Version:	5
Your Form ID:	ANL-985-1803
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Created By:	McGhee, Ian Riley

Creator

Badge:	**272547**	Name:	**McGhee, Ian Riley**
Cost Center:	**331**	Division:	**ESH**
Job Title:	**ESH Multi-Functional 2**	Employee Type:	**Regular Full-Time Exempt**
Building:	**362**	Lab Extension:	**2-2324**

General Information

Project/Activity Title: Fermenter Studies Including Scale-Up Pilot

ASO NEPA Tracking No.: ASO-CX-382 Type of Funding:

B & R Code: Identifying Number: BETO-DOE-EERE-L001-1505

SPP Proposal Number: CRADA Proposal Number: 2022-22113/2022-22114

Work Project Number: ANL Accounting Number: (Item 3a in Field Work Proposal)

Other (explain):

List appropriate NEPA Owners:

Division: AMD NEPA Owner:

Financial Plans

To select a Financial Plan, click the magnifying glass icon to open a search window.

Cost Center: Project: Phase: Task:

Description of Proposed Action

This is a revision of ASO-CX-382 - ERF#ANL-985-1600 - Approved 4-14-2021. This revision adds in mycelium fermentation. This work consists of two similar tasks brewery wastewater and cheese whey digestion in a bioreactor, and mycelium (mushroom) fermentation from nutrient-rich streams from food manufacturing (confectionary, breweries, and other food-production plants) waste streams. In both tasks, several types of bioreactor systems would be used for anaerobic digestion, which can be used to produce organic acids (e.g., acetic, butyric, lactic), and gases (e.g. mainly CO2 and trace levels of CH4, H2, and H2S) from waste streams (e.g. food waste, industrial, municipal wastewater). Additionally, food-grade mycelium would be produced by using nutrient-rich side streams from food manufacturing including water used to brew beer or boil chickpeas. Work is being completed in the hi-bay of building 369, the Materials Engineering Research Facility (MERF 370), and building 362 in third floor laboratory spaces. Bioreactors used would include: -500mL benchtop bioreactors -14L benchtop bioreactors -50L bioreactors -100 gallon bioreactor (378L) Description of procedures: -Cheese whey powder would be mixed with brewery wastewater and continuously fed into a bioreactor. The feedstock would be fermented under anaerobic conditions at elevated temperatures and evaluated for pH, seeking to scale-up anerobic digestion for wastewater treatment applications. -Argonne would characterize, select, and pretreat nutrient-rich side streams from food manufacturing to use as feedstock for fermentation. This includes selecting feedstocks that maximize suitability for fermentation, availability, safety, sustainability impact, and cost effectiveness. Pretreatment may include separation and nutrient supplementation. Argonne would develop a bioprocess for mycelium fermentation, including: drying mycelium to produce a flour with an appealing sensory and nutritional profile, seeking to produce material in Argonne's 50 liter and/or 100-gallon pilot bioreactor, ideally using waste feedstocks. For this work, 13 species of basidiomycete fungi (Lentinus tigrinus., Coriolopsis polyzona., Ganoderma lucidum, Agaricus bisporus, Agaricus subrufescens, Aspergillus oryzae, Cordyceps militaris, Fusarium venenatum, Hericium erinaceus, Lentinus edodes, Pholiota adiposa, Pleurotus ostreatus, Rhizopus oligosporus.) would be evaluated under different environmental conditions and refined through bioreactors and submerged cultivation. Stock cultures would be obtained from either the Kansas State, USDA Peoria or ATCC culture banks and maintained in petri dishes containing a sterile solid potato dextrose agar medium (PDA) and kept at optimal growing conditions. Lastly, chemical analysis of materials may be performed as needed. -In all phases of work, effluent from fermentation would follow instruction from Environmental Compliance, and a log would be kept of all discharges or packaging into containers (amounts and concentrations). All waste would be pH neutral before discharge down a sanitary sink per LMS-PROC-122.

Description of Affected Environment

Work is done indoors. Waste from experiments would be disposed via appropriate channels as defined in the work control documents and per Argonne procedures and requirements. If applicable, waste discharges would take place via sanitary drains located in the buildings where work would be performed (362, 369, 370). For pilot-scale reactors, Carbon Dioxide (99%) and other trace gases (1%) of methane (CH4), hydrogen(H2), and hydrogen sulfide (H2S) is quantified and vented through the vent system of the building in which work is being performed. See details below.

Potential Environmental Effects

- Attach explanation for each "yes" response near bottom of form.
- **See Instructions for Completing Environmental Review Form.**

Section A (Complete For All Projects)			Yes	No	Explanation
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		◉	○	See responses below. All work will be conducted in compliance with Argonne guidelines and regulations.
2.	Air Pollutant Emissions		◉	○	140 - 1520 L/day of Carbon Dioxide (99%) and other trace gases (1%) of methane (CH4),hydrogen(H2), and hydrogen sulfide (H2S) would be vented through a venting port in building 369 discharging above the roof line. EOF staff attached a tube to a gas tipper to quantify the amount of gas released from the fermenter prior to exiting the building in the Vent Port of the building in which work is being performed. During mycelium work, no hazardous pollutants are anticipated (methane, hydrogen, H2S). Environmental Compliance has evaluated the project in regards to regulated air emissions and has determined that no permitting will be required for this work. During mycelium work, no hazardous pollutants are anticipated (methane, hydrogen, H2S).
3.	Noise		○	◉	
4.	Chemical/Oil Storage/Use		◉	○	Only the minimum amount of chemicals needed for the project would be used and stored in original containers. Secondary containment would be used for all materials during transport and storing. The following would be transported as follows: -NaOH (10 gallons of 10M) would be shipped from distributer to building 369 or transported from building 362 in a government vehicle in 4Lplastic bottles (~1gallon), not to exceed 10 bottles, -HCl (0-1 gal 3M) would be transported from building 362 to building 369 in 5-gallon carboy or original glass container, -Cheese Whey(220lbs) would be transported to building 369 in a 5-gallon drum, -Industrial and municipal wastewater 5500 L (1,450 gal) total for the project would be transported to building 369 in 5-galloncarboys as needed; not to exceed 4-8/day. -2 gallons of 50% glycerol would be used in a chiller and discarded at the end of the project. Peristaltic pumps would be used to add the above to a feed tank that sits inside the berm. Potential spills from the facility would be contained by a berm designed to capture 11,356L (3,000gal). A 302L (80gal) harvest tank would be located outside of the berm containing fermenter effluent. The harvest tank is set on wheels for easy transport to the sanitary drain. This procedure would be walked through with water to find and address any friction in the path that could lead to spillage or injury.
5.	Pesticide Use		○	◉	
6.	**Toxic Substances Control Act (TSCA) Substances**				
	6a.	Polychlorinated Biphenyls (PCBs)	○	◉	
	6b.	Asbestos or Asbestos Containing Materials	○	◉	
		Other TSCA			

	6c.	Regulated Substances	○	◉	
	6d.	Import or Export of Chemical Substances	○	◉	
7.	Biohazards		○	◉	
8.	Effluent/Wastewater (If yes, see question #12 and contact Peter Lynch (HSE) at 2-4582 or lynch@anl.gov)		◉	○	Peter Lynch has reviewed the effluent and any discharge to the sanitary drain would be logged in a logbook kept in the hi-bay. The Harvest tank would be positioned outside a berm on wheels for easy transport to the sanitary drain. The contents would be logged with exact concentrations of each, but below is a daily estimate. Reactants -Sodium Hydroxide 10M 1.5 gal/day-Hydrochloric Acid 3M 0-1 gal/day -Cheese Whey 1 g COD/g 6.3kg/day -Industrial brewery wastewater 32 g COD/L 100L/day Products -Carbon Dioxide 99% 300-400 gal (see AirPollutant emissions in question 2) -Total Organic Acids (Lactic acid+ volatile fatty acids) 45 g/L10-40 gal -Lactic Acid 20g/L 10-40 gal -Acetic Acid 5g/L 10-40 gal -Butyric Acid 23g/L 10-40 gal-COD 85g/L 10-40 gal
9.	**Waste Management**				
	9a.	Construction or Demolition Waste	○	◉	
	9b.	Hazardous Waste	◉	○	For the work conducted at Argonne National Laboratory, all RCRA hazardous waste well be accumulated (in a Satellite Accumulation Area) by personnel qualified by Argonne-specific training. Requisitions for transfer of accumulated hazardous waste to a central on-site facility would be completed by Argonne-certified personnel. The research personnel would conform to the requirements in LMS-PROC-103. All on-site handling, storage, and disposal would be performed in accordance with the RCRA Part B permit issued by the IEPA. The accumulated hazardous waste would be disposed in accordance with Argonne's Part B permit, and in accordance with the requirement in LMS-PROC-103. Hazardous waste are not anticipated to be generated under the normal operation of this project.
	9c.	Radioactive Mixed Waste	○	◉	
	9d.	Radioactive Waste	○	◉	
	9e.	Asbestos Waste	○	◉	
	9f.	Biological Waste	◉	○	This project was determined to be BSL-1 by the Argonne Biosafety Officer (BSO) after a thorough review of the project and the 13 species of basidiomycete fungi (Lentinus tigrinus, Coriolopsis polyzona, Ganoderma lucidum, Agaricus bisporus, Agaricus subrufescens, Aspergillus oryzae, Cordyceps militaris, Fusarium venenatum, Hericium erinaceus, Lentinus edodes, Pholiota adiposa, Pleurotus ostreatus, Rhizopus oligosporus) to be used. The review included searches in the ABSA International¿s risk group database, Pathogen Safety Data Sheets from Canada¿s Health Risk and Safety website and ATCC website¿s safety data sheets.
	9g.	No Path to Disposal Waste	○	◉	
	9h.	Nano-material Waste	○	◉	
10.	Radiation		○	◉	
11.	Threatened Violation of ES&H Regulations or Permit Requirement		○	◉	
12.	New or Modified Federal or State Permits		○	◉	
13.	Siting, Construction, or Major Modification of Facility to Recover,		○	◉	

	Treat, Store, or Dispose of Waste			
14.	Public Controversy	○	◉	
15.	Historic Structures and Objects	○	◉	
16.	Disturbance of Pre-existing Contamination	○	◉	
17.	Energy Efficiency, Resource Conserving, and Sustainable Design Features	○	◉	
Section B (For Projects that Occur Outdoors)		**Yes**	**No**	
18.	Threatened or Endangered Species, Critical Habitats, and/or other Protected Species	○	◉	
19.	Wetlands	○	◉	
20.	Floodplain	○	◉	
21.	Landscaping	○	◉	
22.	Navigable Air Space	○	◉	
23.	Clearing or Excavation	○	◉	
24.	Archaeological Resources	○	◉	
25.	Underground Injection	○	◉	
26.	Underground Storage Tanks	○	◉	
27.	Public Utilities or Services	○	◉	
28.	Depletion of a Non-Renewable Resource	○	◉	
Section C (For Projects Outside of ANL)		**Yes**	**No**	
29.	Prime, Unique, or Locally Important Farmland	○	◉	
30.	Special Sources of Groundwater (such as sole source aquifer)	○	◉	
31.	Coastal Zones	○	◉	
32.	Areas with Special National Designations (such as National Forests, Parks, or Trails)	○	◉	
	Action of a State Agency in a State			

33.	with NEPA-type Law	○	◉	
34.	Class I Air Quality Control Region	○	◉	

Categorical Exclusion

ANL NEPA Reviewer Use Only

○ My approval is the final approval necessary

◉ This form requires additional approval from DOE

To be Completed by DOE/ASO

Section D	Yes	No
Are there any extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal?	○	◉
Is the project connected to other actions with potentially significant impacts or related to other proposed action with cumulatively significant impacts?	○	◉
If yes, is a categorical exclusion determination precluded by 40 CFR 1506.1 or 10 CFR 1021.211?	○	○
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?	◉	○
If yes, indicate the class or classes of action from Appendix A or B of Subpart D under which the project may be excluded: This project can be categorically excluded under the following category of Appendix B of 10 CFR 1021, Subpart D: B 3.6 Small-scale research and development, laboratory operations, and pilot 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.		

Attachments

File Description: Original ERF View Attachment

File Description: SOWs for added work View Attachment

Comments

Add Approver

Approver Name	Approver Badge	Reason	Delete
Urgun Demirtas, Meltem	59467	PI	
McGhee, Ian Riley	272547	Preparer	
Willig, Ryne T.	232518	AMD ESH	
Harris, Amy M.	49490	AET NEPA Owner	
Lynch, Peter L.	46304	Wastewater Discharge	
Thompson, Lawrence S.	97495	Waste management	
Pfeiffer, Mark Albert	232188	Air emissions	
Krumdick, Gregory K.	41078	Owning DD	

Notifications

The approval notification email will be copied to the people listed below.

Badge	Name	Division	Delete

ASO-CX Number

ASO-CX- 396

Comments:

This approval is revision of ASO-CX-382, and includes Scale-up Pilot.

Approval

Approver	Action	Date Routed	Action Date	Approval Reason / Comments	Approval Type
McGhee, Ian Riley	APPROVED	2022-09-22	2022-09-22 13:07:00.0	Creator :	PRIMARY
McGhee, Ian Riley	APPROVED	2022-09-22	2022-09-22 13:07:00.0	Project Manager :	PRIMARY
Krumdick, Gregory K.	APPROVED	2022-09-22	2022-09-22 14:23:15.0	Owning DD :	PRIMARY
Lynch, Peter L.	APPROVED	2022-09-22	2022-09-22 13:56:27.0	Wastewater Discharge :	PRIMARY
Harris, Amy M.	APPROVED	2022-09-22	2022-09-22 14:44:22.0	AET NEPA Owner :	PRIMARY
McGhee, Ian Riley	APPROVED	2022-09-22	2022-09-22 13:07:00.0	Preparer :	PRIMARY
Thompson, Lawrence S.	APPROVED	2022-09-22	2022-09-22 14:36:17.0	Waste management :	PRIMARY
Urgun Demirtas, Meltem	APPROVED	2022-09-22	2022-09-23 10:52:16.0	PI :	PRIMARY
Willig, Ryne T.	APPROVED	2022-09-22	2022-09-23 10:35:39.0	AMD ESH :	PRIMARY
Pfeiffer, Mark Albert	APPROVED	2022-09-22	2022-09-23 08:47:41.0	Air emissions :	PRIMARY
Harris, Amy M.	APPROVED	2022-09-22	2022-09-22 14:44:22.0	NEPA Owner Approval for Argonne Environmental Review :	PRIMARY
Ptak, Jill S.	APPROVED	2022-09-23	2022-10-03 09:38:45.0	ANL NEPA Reviewer :	PRIMARY
Hellman, Karen B.	APPROVED	2022-10-03	2022-10-03 14:47:52.0	ANL-985 Review and Approval :	PRIMARY
Dunn, Michael W.	APPROVED	2022-10-03	2022-10-10 13:52:34.0	ANL-985 ANL Deputy COO Review and Approval :	PRIMARY
Joshi, Kaushik N.	APPROVED	2022-10-10	2022-10-14 14:53:00.0	ANL-985 DOE-ASO Review and Approval : **This DOE ERF CX approval is tracked as ASO-CX-396.**	PRIMARY
Siebach, Peter Rudolf	APPROVED	2022-10-14	2022-10-17 10:55:40.0	ANL-985 DOE NEPA Compliance Officer Review and Approval :	PRIMARY
