

PNNL-33198

Agile Research and Technology Transitions (ARTT)

July 2022

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Abstract

The Energy and Environment Directorate (EED) supports an extensive portfolio of strategic Laboratory Directed Research and Development (LDRD) research through its SEED, strategic, Agile and Initiative programs. Of paramount importance is the relevance of these investments to the long-term objectives of our various Department of Energy (DOE) programmatic sponsors. This LDRD project seeks to maximize impact to our sponsors by providing an agile funding approach to develop/enhance DOE relevant technologies in an accelerated and responsive manner to emerging and adjacent technical challenges. Staff will propose small development activities to be carried out under the overall Agile Research and Technology Transitions project.

Background

The Energy and Environment Directorate (EED) is challenged by our DOE sponsors to accelerate innovation through the fostering of creativity and the stimulation of exploration targeted to address their current and future programmatic needs. The LDRD program is designed to accomplish these and continues to do it well in multiple areas. However, as we consider how to accelerate innovation and be more responsive to the applied energy and environmental programs, we believe that there is an important element in the LDRD domain that needs enhancement.

It often occurs in ongoing research activities that opportunities can arise to implement the developing technology for a previously unplanned or unforeseen application, or the original project has ended, and the technology has yet to be accepted into one of the target applications. In addition, small, time sensitive follow-on tasks involving publishing, technology marketing, staff development or minor R&D tasks may arise. In such situations, there is an opportunity to provide early demonstrations of technologies, enhance research outcomes or modify designs of experiments to both motivate future applications and to seed new ideas. Agile Research and Technology Transitions (ARTT) (ARTT) has effectively allowed our scientists and engineers to do rapid implementations in support of accelerating innovation.

This program has had significant impact by challenging research staff to make rapid technology developments or augmentations, in which the quality and breadth of technology are enhanced.

Methodology

This project provided small amounts of funding (notionally, up to \$40K) to facilitate the development of technologies for emerging applications in Energy and Environment missions.

Staff at PNNL proposed technical opportunities that were evaluated by the EED Chief Science and Technology Office (CSTO) (utilizing appropriate finance, sector and SMEs). This team determined if the advance meets LDRD program, technical quality, and innovation acceleration goals.

For example, proposed efforts included:

- Small technical tasks.
- Small modeling and simulation tasks.
- Analysis and technical reporting.

Selection criteria used:

- Clarity of proposed work and the opportunity to advance the technology through this rapid development.
- Technical merit of the activity and the clear description of the proposed effort and how the work can be successful and the valuable lessons from the implementation.
- Enduring impact to PNNL's foundational Science & Technology (S&T) – likelihood of future sponsor work to further advance the S&T plus the impact to DOE missions.

Once specific concepts / tasks were identified, scope change was submitted to seek PNSO concurrence that the concepts selected are relevant to DOE missions and fall within acceptable scope.

For smaller tasks, e.g. finishing a journal article, an abbreviated submission process was employed. In these situations, we only requested an email submission with a brief scope statement, a description of the outcomes or product and the amount requested. Once authorization was given by the CSTO and with the Pacific Northwest Site Office (PNSO) approval of scope, a work package was provided at the authorized budget level.

For more substantive activities, e.g. follow-on activity related to a previous LDRD project, a more formal submission was requested. Each of these tasks completed its own Electronic Prep and Risk (EPR) to ensure proper risk management.

Tasks executed

task number	Principle Investigator	project title	authorized funds
1	Pete McGrail	Quantify Efficiency Gains for a New Heat Exchanger	2,000
2	Olga Marina	Characterization of tested Solid Oxide Cells	8,000
3	Dave Blanchard	U Metal Conversion Analysis	6,000
4	Indrasis Chakraborty	Book Chapter: Data Driven Virtual Battery Modeling	7,000
5	Nick Ward	Tree Gas Exchange	30,000
6	Wei Wang	Preliminary investigation into machine learning-based solubility predictions for organic redox flow battery electrolytes	6,068
	"	Digital Twin	4,860
	"	Analytic Model	32,364
	"	Solubility Prediction	8,000
	"	DFT and Gaussian Model	8,817
7	Amy Borde	Climate Change Effects on Eelgrass	5,000
8	Somani Abishek	Framework to Quantify Cybersecurity Risks and Consequences for Critical Infrastructure	9,000
9	Yan Chen	Optimal Control by Transfer-Learning	3,000
10	Ron McConn	Reactor Photons	10,000
11	Leonard Pease	Mesofluidic Separations Design	1,170
12	Dev Chatterjee	Redox Behavior of Np in Room Temperature Ionic Liquid	15,000
13	Michael Minette	Novel Efficient Silica Removal from Geothermal Fluids	10,000
14	Sam Harding	Water Velocity Measurement Using Acoustic Scanning	5,100
15	Kyle Larson	Deep Learning Classification of Cheatgrass Invasion	4,500
16	Dave Heldebrant	CO2 Utilization and integrated upgrading lignin for building composite materials	5,000
17	Carolyn Pearce	Microplastics in Soils	5,000
18	Michael Kintner-Meyer	Energy storage and renewables requirements for electrifying on-road transportation	30,000
19	Nik Qafoku	Preliminary investigations on the enhanced weathering of silicate rocks as a pathway for atmospheric inorganic carbon removal	7,149
20	John Hardy	Preliminary investigations into sinterability of a new family of proton conductors.	7,000
21	Saumyadeep Jana	Solid phase additive manufacturing (SPAM) scoping study.	20,000
22	Amra Peles	Deep Learning Microstructural Characterization in Friction Stir Welded Al7175	5,000
23	Shane Addleman	Inexpensive Combustible Sorbent Materials for the recovery of critical Materials and removal of Environmental Contaminants.	25,000
24	Sarah Saslow	Carbonate Phase Transformations in Nanopores	25,000
25	Radha Motkuri	Invited article to the "Accounts of chemical Research" journal on adsorption cooling.	5,113
26	Lelia Cosimbescu	Dehydrochlorination of PVC	7,500
27	Uriah Kilgore	Formate upgrading to C2 products	6,227
28	Sarah Newman	Measuring equity.	4,891
29	Sarah Barrows	Understanding Greenhouse Gas Emissions from Agriculture: Impact of Climate Change and Soil Management Practices on CO2, N2O, CH4 fluxes.	20,000
30		Nuclear Sciences publication auction FY21	
	Campbell	A new isotherm model was developed to better predict Cs distribution to CST from tank waste.	3,000
	Jin	Impacts of Melt Temperature on Sulfate Solubility in Low-Activity Waste Glasses	3,500
	Bamberger	Radial Wall Jets over Sigmoidal Sand Beds	3,065
	Westesen	Behavior of Hanford High Level Waste in Crossflow Filtration	4,000
	Colburn	On-line monitoring of cellulosic biomass degradation under gamma irradiation with Raman spectroscopy	2,500
	Asmusen	The Effect of Dopants on UO2 Dissolution	3,000
	Parruzot	Effect of zeolite type, temperature, and pH on Stage III glass dissolution onset and rates for two ILAW glasses	3,000
	Gervasio	Optical Basicity: an easy tool to predict Cr behavior in HLW glasses?	2,500
	Lines	Integrated In Situ Raman and Turbidity Sensor for High Level Waste Tanks	2,500
	Allred	Transition from pore fouling to cake filtration in high level waste dead end filtration	1,770
	Lu	Property and structure of vanadium-containing multi-component borosilicate glasses from experiments and molecular dynamics simulations	3,000
	Colburn	A system for studying chemical reactions under gamma radiation	3,000
	Prabhakaran	Mechanical characterization of neutron irradiated HT-9 at LWR and fast reactor relevant temperatures	4,000
	Branch	Impact of bench scale treatments on mercury content and speciation in Hanford tank waste supernatant	3,500
	Bogliainko	Decontamination of steel surfaces: Comparative analysis of removal efficiencies for different radionuclides	3,000
	Marcial	Effect of oxidation state of Fe on leaching and melting behavior of synthetic Broborg Hillfort glasses	3,000
31		Energy and Environment publication auction FY21	
	Praad	Assessing Environmental Impacts in the Context of Dynamic Baselines: Beneficiary- Benefits and Environmental Impacts Approach to Multi-Stakeholder Tradeoffs	3,000
	Li	Development of a Self-powered Acoustic Transmitter Powered by Fish's Swimming Motion	3,000
	Nims	Temperature dependent fractionation of delta18O and delta13C in juvenile Chinook salmon otoliths	3,000
	Smith	Advancing environmental decision-making through improved social equity analysis	12,000

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