3.4 National Laboratory Capabilities

All the participating national laboratories have provided the following technology areas and capabilities they are able to support as it relates to this TCF Open Voucher Call. It is possible that the administrator could select a voucher that does not fall within any of the areas of focus below, but vouchers that do fall within these areas are most likely to be selected. The "National Laboratory's Capabilities" column denotes specific areas of interest for each laboratory within the technology area.

Blank sections within the "National Laboratory's Capabilities" column denotes that the national laboratory has not specified a particular area of focus for the technology area, but the technology area remains of interest to the national laboratory.

We request that you do not reach out to laboratory staff regarding your voucher requests. We recommend basing these requests on the National Laboratory's Capabilities listed below. We also recommend researching the laboratory capabilities from the Lab Partnering Service website.

Technology Area	National Laboratory	National Laboratory's Capabilities
Analysis	Argonne National Laboratory	- Energy analysis - Environmental analysis - Economic systems analysis
Analytical Instruments	Pacific Northwest National Laboratory	- Life sciences - Security - Environment - Industrial - Research - Materials characterization - Food and beverage
	Los Alamos National Laboratory	- Life sciences - Security - Environment - Research
Battery	National Renewable Energy Laboratory	- Battery loss - Life modeling
	Oak Ridge National Laboratory	- High-resolution microscopy, microstructural and magnetic characterization, high-resolution chemical mapping, 3-D surface profiling, and mechanical pinch testing capabilities enable in-depth investigation of new battery materials. -Advanced computational modeling to accelerate prototyping of cell designs, to screen new battery materials, to determine the effects of electrode coating defects on cell performance, and to develop accurate lifetime predictions.
Bio-Based Products	National Renewable Energy Laboratory	- Biochemical conversion
	Pacific Northwest National Laboratory	- Biological conversion and thermochemical conversion
Biofuels	National Renewable Energy Laboratory	- Life cycle assessment (greenhouse gas emissions, global warming potential, net energy

		value, water use, fossil fuel requirements, other potentially harmful effluents) - Techno-economic analysis - Thermochemical conversion (gasification, fuels synthesis, pyrolysis, thermochemical process integration, conversion of CO_2 to fuels and chemicals)
	Pacific Northwest National Laboratory	- Thermochemical and electrochemical conversion (hydrothermal liquefaction, oxygenates to fuels and chemicals, syngas to olefins, CO_2, and/or methanol conversion, aqueous organic electrolysis) - Techno-economic analysis
	Los Alamos National Laboratory	-Integrated assessment of algae strains, cultivation conditions, and productivity -Algae strain characterization -Multi-scale, multi-omics systems -Techno-economic analysis -Algae test beds, photobioreactors -Plant growth chambers, greenhouse, test beds -Microbial community and systems analysis -High throughput screening for root phenotype to assess effects of plant growth promoting microorganisms on bioenergy crops -Soil amendment test bed for assessing climate impacts of microbial and other soil amendments
Buildings	Oak Ridge National Laboratory	- Energy-efficient equipment: Developing energy-efficient building equipment technologies, including heat pumps, HVAC, dehumidifiers, appliances, water heaters, and refrigeration systems -Building envelope materials: Developing new low-carbon materials and integrating them into advanced manufacturing techniques to effectively reduce heat, air, and moisture transfer through the building envelope and decrease embodied carbon in buildings -Multifunctional equipment integration: Testing new components, equipment, and systems in realistic environments (e.g., research house, flexible research platforms) before market introduction; using computer modeling, visualization, and analytics to develop integration technologies -Integrated building performance: Pursuing advanced sensor and control technologies, advanced building and system energy modeling, energy efficiency optimization, grid-interactive controls, communication and automation, and energy-optimized solutions for neighborhoods of the future -Energy storage: Advancing the development and integration of materials, building envelopes,

		equipment, sensors, and controls into optimized systems that reduce energy use and peak demand while maintaining occupant comfort
	Pacific Northwest National Laboratory	- Geocoding - Energy efficiencies - Sustainability
	Lawrence Berkeley National Laboratory	- Energy-efficient technologies (e.g., envelope, glazing, HVAC, lighting, plug load controls) -Electrification and decarbonization enabling technologies (e.g.. smart electrical panels, controls platforms, smart breakers) -Building automation systems (controls) -Industrial process efficiency -Combustion technology (e.g., gas appliances and woodstoves)
Concentrating Solar Power	National Renewable Energy Laboratory	
Demand Flexibility and Controls (Includes Demand Response and Other Grid Services)	Lawrence Berkeley National Laboratory	- Distributed energy resources, including, but not limited to, batteries, photovoltaics, water heaters, HVAC, electric vehicles, and lighting and their related controls - Demand flexibility controls systems
	National Renewable Energy Laboratory	- Real-time dispatch and control software for energy storage systems
Direct Air Capture	Los Alamos National Laboratory (LANL)	- Design, development and evaluation of novel materials and technology platforms - Materials and technology platform performance benchmarking under specific meteorological conditions using cooled-loop, and humidity-, CO2 concentration-, and air speed-controlled bench scale and small pilot (ca. 1 metric ton CO2 equivalent) systems - Structured materials development to optimize capture efficiency
Electric Vehicles	Sandia National Laboratory	- Infrastructure Integration - Vehicle integrated photovoltaics
Energy	Pacific Northwest National Laboratory	- Conversion - Renewables - Chemistry - Catalysts
	Los Alamos National Laboratory	- Conversion - Renewables - Chemistry - Catalysts
Energy Storage	National Renewable Energy Laboratory	- Long duration energy storage
	Pacific Northwest National Laboratory	- Stationary storage (zinc-based batteries, flow batteries, sodium-based batteries, high-throughput materials assessment) - Anodes and electrolytes for lithium batteries

	Sandia National Laboratory	- Security - Interoperability - Grid support functionality - Reliability - Real-time simulation - Microgrids
	Oak Ridge National Laboratory	- Long duration energy storage - Thermal runaway characterization -Colloid and dispersion design and characterization - Mixing and coating technologies and processes - Advanced drying and solvent removal technologies - Solventless processing
Hydrogen	National Renewable Energy Laboratory	- Safety and sensor evaluation - Systems analysis - Technology validation and demonstration - Techno-economic analysis - Electrolysis component development and testing
	Los Alamos National Laboratory	- Hydrogen safety sensor development - Hydrogen production: hydrocarbon reforming - Electrolysis component development and testing - Fuel cell component development and testing - Efficient and accurate modeling of high-fidelity reservoir simulations for underground H2 storage - Identifying optimal locations of H2 refueling stations and optimal technologies for H2 co-located production - Predictive modeling for production, storage & distribution - Quality assurance in hydrogen production, storage, and delivery
	Pacific Northwest National Laboratory	- Safety - Material compatibility - Storage - High-temperature electrolysis
Hydropower	National Renewable Energy Laboratory	- Advanced modeling and simulation - Large-scale computation - Optimization - Cybersecurity - Techno-economic analysis - Grid integration - Regulatory and Policy Analysis
Integrated Water Systems	National Renewable Energy Laboratory	- Advanced modeling and analysis - Multiscale System Co-Optimization - Desalination
Manufacturing	Oak Ridge National Laboratory	- Advanced machining - Additive manufacturing - Digital manufacturing
	Pacific Northwest National Laboratory	- Advanced manufacturing for transportation, energy conversion, aerospace, infrastructure, medical

	Los Alamos National Laboratory	- Advanced machining - Additive manufacturing - Digital manufacturing
Marine Energy	National Renewable Energy Laboratory	- Advanced modeling and simulation - Large-scale computation - System and Component Testing and Validation - Techno-economic analysis - Resource Characterization
Materials	AMES National Laboratory	- High-temperature alloys - Lightweight structural alloys - Magnetic materials
	Argonne National Laboratory	- Material characterization and functionality in devices
	Oak Ridge National Laboratory	- Advanced composites
Microgrid	Los Alamos National Laboratory	- Evaluating the resilience benefits of potential microgrid sites and providing analysis for informed decision making on microgrid siting - Planning and design
	Oak Ridge National Laboratory	- Sensors and controls - Data analytics and controls - Modeling and simulation
Nuclear	Sandia National Laboratory	- Spent fuel - Waste science and technology - Integrated waste management systems
Photovoltaics	Sandia National Laboratory	- Climate optimization - System and component reliability - Module and cell characterization - Field performance/performance modeling - New applications (e.g., vehicle and building integrated photovoltaics)
Power Grid	Pacific Northwest National Laboratory	- Analytics - Optimization - Transactive control - Cybersecurity
	Los Alamos National Laboratory	- Advanced modeling and simulation - Large-scale computation - Optimization - Machine learning/artificial intelligence techniques - Analytics
Security	Pacific Northwest National Laboratory	- Sensors - Data analytics - Cybersecurity - Research computing

	Los Alamos National Laboratory	- Sensors - Data analytics - Cybersecurity - Research computing
Thermal hydraulics modeling and simulation	Oak Ridge National Laboratory	- Direct numerical simulation (DNS) capabilities that provide fully resolved numerical solutions of the Navier-Stokes equations - Large eddy simulation (LES) capabilities that fully resolve large scale turbulence structures and use engineering models to describe structures smaller than the computational mesh elements - Reynolds-averaged Navier–Stokes (RANS) simulation capabilities that rely on engineering models to describe all turbulence - Advanced mesoscopic lattice Boltzmann method (LBM) for simulating turbulent flows - Multiphase CFD using the level set and volume of fluid methods - Subchannel models which provide reduced order lumped parameter representations of thermal hydraulic phenomena - Lumped thermal-hydraulics component models to simulate an entire nuclear system including the balance of plant
Solar Photovoltaic Module Mounting	Lawrence Berkeley National Laboratory	- Solar photovoltaic module mounting fastener stacks, clamps, through bolting, and module frame lip systems -Strength testing under dynamic loading of module mounting fasteners
Technical Energy Assistance	Sandia National Laboratory	- Community microgrids
	Los Alamos National Laboratory	- Community microgrids -Efficiently treat non-traditional water sources, including produced water from oil and gas extraction
Water Treatment	Los Alamos National Laboratory	- Membrane-based water treatment technology evaluation and demonstration including thin film composite and hollow fiber membrane fabrication and evaluation in pervaporation and membrane distillation configurations - Supercritical water desalination and oxidation process evaluation - Technology development & demonstration
Wind Energy	Los Alamos National Laboratory	- Predicting the effects of buildings and stress on wind power resources for small wind turbines for informed decision making on wind project siting - Predictive modeling for small-scale wind projects

Transportation Technologies	Oak Ridge National Laboratory	- Electrification - Emissions reduction - Connected and autonomous vehicles - Materials, and data and decision science