U.S. Department of Energy (DOE) Building Technologies Office (BTO) 2021 Laboratory Cooperative Research and Development Agreement (CRADA) Call

Timeline

4/15/21: BTO Laboratory CRADA call release date
4/22/21: Informational webinar, 1 p.m. Mountain Daylight Time (MDT).
Register: https://nrel.webex.com/nrel/onstage/g.php?MTID=ee19ee1d49b71893b8f56b8f99f6fad6b
4/30/21: Deadline for notice of intent to apply—email submission must be received by 5 p.m. MDT
5/9/21: Deadline to submit questions by 11:59 p.m. MDT
5/14/21: Deadline for proposal submission by 5 p.m. MDT
July 2021: Selection and announcement of awards (anticipated)

Process Logistics and Key Considerations

INQUIRIES: All communications regarding this call should be directed to bto.crada.call@nrel.gov.

NOTICE OF INTENT: Please inform the National Renewable Energy Laboratory (NREL) that you intend to apply by emailing bto.crada.call@nrel.gov. no later than April 30, 2021 at 5 p.m. MDT. (See details under Notice of Intent section.)

PROPOSAL SUBMISSIONS: To apply to this Lab CRADA call, lab personnel must register (and sign in) with their lab email address and submit application materials through EERE Exchange at https://eere-Exchange.energy.gov by 5 p.m. MDT on May 14, 2021. (See details under Proposal Preparation section.)

QUESTIONS: Frequently asked questions for this Lab CRADA call and the EERE application process can be found at https://eere-exchange.energy.gov/FAQ.aspx. Specific questions about this lab call should be submitted via email to bto.crada.call@nrel.gov. BTO and NREL will provide answers related to this Lab CRADA call on EERE Exchange at https://eere-exchange.energy.gov. Please note that you must first select the specific opportunity number for this Lab CRADA call in order to view the questions and answers specific to this Lab CRADA call. We will attempt to respond to a question within three business days unless a similar question and answer have already been posted on the website. Questions related to the registration process and use of the EERE Exchange website should be submitted to EERE-ExchangeSupport@hq.doe.gov. To ensure fairness for all lab participants, please do not ask individual BTO or NREL staff questions directly.

PARTICIPATING LABS: Applicants should pay close attention to eligibility restrictions listed in each Area of Interest (AOI) as they vary by AOI. Eligible national laboratories are stated in each AOI as "participating labs."

PERIOD OF PERFORMANCE: Projects may be up to three years in length for any AOI but can be shorter.

NOTIFICATION OF SELECTION: When selections are finalized, lab applicants will receive an email from bto.crada.call@nrel.gov.

Objective

Through this request for proposals being issued by NREL, DOE BTO seeks to accelerate the development of emerging building technologies and address barriers to their commercialization and acceptance in the marketplace by cost-sharing collaborative research, development, and demonstration (RD&D) projects. Up to $8.5 million will be made available to national laboratories working on collaborative projects that involve one or more DOE national laboratories and non-lab partners.

Background

Today's homes and buildings account for 39% of annual global energy-related carbon emissions—28% from building operations and 11% from building materials and construction.[1] The current administration's goal of achieving a 100% clean-energy economy and reaching net-zero emissions no later than 2050 cannot be met without advancements that reduce the carbon footprint of the built environment and the buildings industry. DOE plays an essential role in pushing the frontiers of science and engineering and catalyzing the creation of new clean energy jobs through RD&D and deployment. Under the new administration, DOE will leverage the expertise of its national laboratories to pursue innovations with partners and scale up emerging technologies that will place more Americans in construction, skilled trades, and engineering professions.

BTO's mission is to develop and accelerate the adoption of cost-effective technologies, techniques, tools, and services that enable high-performing, energy-efficient, and demand-flexible residential and commercial buildings in both the new and existing buildings markets. In support of this effort, BTO seeks collaborative research and development projects that involve one or more national laboratories and partners to accelerate the development and commercialization of promising low-carbon building materials, processes, and technologies in a range of research areas.

Collaborative Research

National laboratories and qualified partners are sought to participate in collaborative projects in one or more of the research areas described in the AOI section below. Projects must include one or more national laboratories and shall also include partners from one or more of the following: industry; universities; nonprofits; institutes; codes and standards organizations; associations; or other relevant stakeholders. Multiple collaborative research projects are sought under this Lab CRADA call, subject to the availability of funding. Project selections will continue to be made on a rolling basis given the availability of funds. Participants are highly encouraged to utilize DOE's standard CRADA terms. Agreements that are not executed within 60 days of award may be rescinded. Taking exception to the standard CRADA terms may delay the agreement execution schedule beyond an acceptable timeframe.

Areas of Interest

AOIs, participating national laboratories by area, and estimated funding levels are described below.

[1] Cortese, Amy. 2020. "The Embodied Carbon Conundrum: Solving for All Emission Sources from the Built Environment." New Buildings Institute, February 26, 2020, https://newbuildings.org/embodied-carbon-conundrum-solving-for-all-emission-sources-from-the-built-environment/.

AOI 1: Automated and Continual Commissioning of Building Energy Management Systems

Participating Labs: Lawrence Berkeley National Laboratory (LBNL), NREL, Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL)
Estimated DOE Funding Available: Up to $2 million
Estimated Number of Projects: 2

Automated and continual commissioning reduces deployment costs of controls, extends equipment life, reduces the possibility of failures, and saves energy. Systems components must automatically share their identity, status, and availability with advanced building controls and operate successfully as an integrated system when necessary. Some examples of contributing technologies include self-identifying equipment, self-configuring controls, automatic verification of installation, continual monitoring and testing, and self-diagnosis of faults and degradation.

This topic seeks proposals to advance automated and continual commissioning of integrated energy management systems in commercial buildings to reduce control installation and upgrade costs. An area of particular interest is the automation of point mapping processes and standardization of control sequences and verification tests in an open and digital format to streamline the installation and implementation process for building energy management systems in the building design or retrofit phase.

Proposals should describe the current state of the technology of focus, the intended application space (e.g., building type), and targeted metrics.

AOI 2: Advancing Optimization-based Autonomous Building Energy Management

Participating Labs: LBNL, NREL, ORNL, PNNL
Estimated DOE Funding Available: Up to $2 million
Estimated Number of Projects: 4

This topic seeks proposals to advance optimization-based integrated energy management systems in commercial and residential buildings. The technology should be capable of handling multiple objectives (e.g., reduce energy costs, improve occupant comfort, provide resilient operations during extreme weather events, reduce emissions, load shaping) while being robust in light of uncertainties related to weather, occupancy, sensing, etc. Proposals should highlight capabilities not commonly found in legacy systems—economic solutions for small commercial buildings, retrofit solutions for split-incentive buildings, auto-calibration and self-learning, semantic interoperability compliance/capabilities, cybersecurity features, explainable (intelligible) solutions, automated fault detection and diagnostics, and others. Proposals should describe the current state of the technology of focus, the intended application space (e.g., building type), and targeted metrics.

AOI 3: Envelope Technologies

Participating Labs: Argonne National Laboratory, LBNL, NREL, ORNL, PNNL
Estimated DOE Funding Available: Up to $1.5 million
Estimated Number of Projects: 2–6

The opaque envelope affects 25% of building energy use or 10% of total U.S. primary energy use. Improving the energy performance of the opaque envelope is critical to reducing total building energy use. Retrofits are crucial to realizing the energy savings potential of the opaque envelope because nearly 85% of residential buildings and 55% of commercial buildings that exist today will still exist in 2050.

Novel opaque envelope technologies could dramatically reduce building energy use while simultaneously delivering additional benefits—comfort, well-being, and productivity—for building owners and occupants. To maximize impact, these novel envelope technologies and approaches need to be advanced to the market, validated, demonstrated in the field, and ultimately widely adopted and deployed.

The following subtopic areas are of interest to BTO. Higher preference will be given to proposals that focus on facilitating energy retrofits of existing buildings as well as market priming functions to make energy retrofits a more commonplace occurrence, and provide a clear inflection point within one to three years (e.g., demonstration in the field, initiation of concerted commercialization, deployment efforts by an industry partner).

AOI 3a. Building Construction Materials with Lower Embodied Energy/Carbon$_{eq}$: Many typical building materials have relatively high embodied energy and rely primarily on virgin materials—examples include concrete and petroleum-based thermal insulation. Their embodied energy/carbon$_{eq}$ could be decreased with biobased and waste stream materials. Biobased materials sequester carbon; therefore, their end products could have negative carbon emissions. Recycled materials are a way to reuse the energy that was invested in the initial material processing; however, other than post-consumer paper, waste stream materials are minimally used. New building materials are needed that fully or partially replace high-embodied energy/carbon$_{eq}$ virgin materials with biobased and/or recycled materials. These new materials should have lower cradle-to-cradle embodied energy, equal or better performance, and comparable or lower cost to that of readily available building materials.

AOI 3b. High-Performance Insulation Materials that Decrease Overall Retrofit Cost: The cost of envelope retrofits can be significantly influenced by the thermal performance of the selected insulation material. Materials with a low R-value per inch lead to physically thicker retrofit solutions that may not be able to use readily available detailing components, such as window trimmings, and hence require additional customization. Insulation materials with R-values of at least 8 per inch could lessen these additional costs. To expedite their deployment, the proposed new insulation materials, achieving minimum R-values of 8 per inch (or an increase of a commercial insulation material's R-value of at least 2 per inch), should be manufactured with minimal modifications to existing manufacturing processes at attractive manufacturing costs. An additional area of interest is improved reliability and durability of high R-value-per-inch Vacuum Insulated Panels (VIPs) through compartmentalization and/or making them serviceable, while at the same time reducing their manufacturing costs. The development of these new insulation materials should be accompanied by installation and cost analyses so that designers and contractors have a better understanding of the overall cost benefits.

AOI 3c. Non-Destructive/Disruptive Diagnostic Tools for Building Envelopes: As building envelope retrofits become essential to reducing energy use of the building stock, it is imperative to have information on the existing envelope characteristics such as material assembly, moisture content of various materials, mold or mildew occurrence, location of air leaks, and location of structural components. This information is needed to properly select retrofit measures, reduce uncertainties and potential liabilities that lead designers and contractors to increase cost estimates, and decrease high cost estimates that hinder market adoption. Unfortunately, most of the current diagnostic methods require onerous and destructive forensics and/or are quite disruptive to occupants and may require occupants to leave the building. Advanced nondestructive and nondisruptive tools that accelerate diagnosis and decrease uncertainties will make envelope retrofits a more attractive business proposition for building owners, designers, and contractors.

AOI 3d. Fast Onsite Installation, Remediation, or Repair of Continuous Heat, Air, and Moisture Control Layers: Building envelope retrofits that improve thermal and moisture performance can be conducted

by installing heat, air, and moisture barriers onsite. However, this retrofit approach has not been successful because it is labor intensive, costly, and disturbs occupants or neighborhoods for long periods of time. Moreover, this onsite retrofit approach often requires removing existing components such as claddings before installing the water and air barriers, insulation, and the new cladding. Technologies and automation strategies need to be developed that make onsite retrofits faster, easier, and more productive by applying multifunctional solutions (e.g., air, water, and thermal protection) without requiring scaffolding, removal of existing claddings, or significant reconstruction. These new technologies and approaches should reduce labor, cost, and time while providing a robust retrofit solution that is applicable to many types of existing buildings. Another area of interest is the application of improved installation techniques to simplify and reduce the cost of applying continuous exterior insulation in existing buildings.

AOI 3e. Optimized Integration of the Building Envelope, Heating, Ventilating, and Air Conditioning (HVAC), and Electrical Grid: The building envelope has been passively used to store heat and cooling energy and to reduce unwanted heat flow. Dynamic technologies are needed for on-demand use of the envelope's capability to store or redirect heat and cooling energy. These technologies should be integrated with a thermal energy storage system, HVAC system, and advanced controls to optimize shifting of peak energy demand and shedding and tailoring of HVAC loads. In addition to temporal control of thermal loads, increased spatial control based on spatial occupancy within the building (i.e., enhanced thermal zoning) can lead to even greater energy savings, including for moderate improvements to spatial control. Overall, such thermal integration and optimization will enhance energy and financial savings.

AOI 4: Advanced Water Heating Technologies and Energy-Efficient Appliances

Participating Labs: LBNL, NREL, ORNL, PNNL
Estimated DOE Funding Available: $400,000–$1 million
Estimated Number of Projects: 1–4

Water heating accounts for approximately 19% of residential energy usage. Novel research and development opportunities along with market adoption of advanced water heating technologies that reduce energy consumption and greenhouse gas emissions, including heat pump water heaters, are a priority to reduce total building energy use.

The following subtopic areas are of interest to BTO:

AOI 4a. Advanced Water Heating Technologies for Residential Building Energy Efficiency: BTO seeks innovative technologies that can significantly improve the utilization energy factor of conventional residential electric water heaters by 30% while maintaining existing amenities such as recovery rates and first hour ratings. The goal of this topic is to commercialize drop-in solutions at a price difference that would result in a payback of one year or less and that would reduce electric energy consumption and greenhouse gas emissions.

AOE 4b. Lower-Emission Heat Pump Water Heater: The goal of this subtopic area is to develop a residential heat pump water heater that uses a lower-emission refrigerant (less than 500 GWP[2]) with a utilization energy factor greater than 3.30 at a cost equivalent to that of existing units. A successful

[2] Global Warming Potential (GWP) is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO_2). https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.

proposal would enable a more rapid market entry of a unit that has the potential to achieve significant reductions in greenhouse gas emissions by lowering indirect effects from energy consumption and/or lowering the direct effects from the refrigerant.

AOI 4c. Energy-Efficient Appliances: BTO seeks proposals that would commercialize appliances that can improve the best available efficiency by 10% or greater through the use of advanced systems designs or innovative technologies. Although there have been significant reductions in appliance energy consumption, cost-effective improvements can still be achieved to reduce energy use of appliances, which account for 15% of residential energy use.

AOI 5: Building Electric Appliances, Devices, and Systems (BEADS)

Participating Labs: All DOE national labs are eligible to participate
Estimated DOE Funding Available: Up to $1 million
Estimated Number of Projects: 1–2

AOI 5a. The New Standby: Addressing Rising Energy Consumption from Always-on Connected Devices
In the last decade, the nature of standby loads has skewed away from devices that consume power well in excess of one watt through voltage conversion, digital displays, status lights, and battery charging toward increasingly numerous devices reliant on remote connectivity. The Internet of Things (IoT) has increased convenience, functionality, and energy consumption for a great variety of miscellaneous electric loads (MELs). Novel devices like smart speakers and lighting-control hubs have grown the number of always-on MELs, while other MELs that traditionally powered down entirely must now remain in standby mode awaiting commands or events. While modern devices consume less energy in standby on average than past technologies, and while IoT purports to enable efficiency as a feature, the collective trend among connected MELs is toward substantially increased baseline loads.

This topic is intended to demonstrate that the rise in standby consumption by IoT devices is not an inevitable consequence of their increased functionality. Manufacturers have generally not adopted low-power-operation wireless sensing systems nor low-power hardware, demonstrated in research settings, into commercially available IoT devices. Control strategies do not adequately incorporate connected MELs despite their intrinsic addressability, and predictive algorithms fail to delineate operational patterns between traditional MELs and IoT-MELs. Despite a host of communication and control features available to users of IoT devices, it remains uncommon for devices to report their own energy use.

Successful proposals will demonstrate one or more of the following: (1) the ability to reduce standby load for an IoT device at scale through the use of low-power hardware, current and current-leakage reduction, microcontroller optimization, or wake-up radio advances; (2) self-reporting capabilities that allow users, control systems, or load disaggregation devices to easily obtain power consumption data; (3) enabling features for improved controls and predictive algorithms targeted at IoT-MELs.

AOI 5b. Advancing Behind-the-Meter Hardware to Utilize Direct Current (DC) Power in Buildings
Buildings capable of supporting native DC devices can provide substantial energy savings with additional nonenergy benefits (e.g., data, communication, safety, device size, touch temperature). Internal and external power supplies, inverters for solar photovoltaic panels and batteries, electronics chargers, light-emitting diode (LED) drivers, and other converters comprise a significant and growing class of hardware existing chiefly to modify voltage and current, with some amount of inefficiency in each case. Insofar as this hardware is unnecessary in DC-ready buildings, there is significant opportunity to reduce end-of-life electronic waste. Digital power electronics have been modernized to such an extent with precision

circuitry, including high-speed switching and fault management, that reliability, maintenance, and safety concerns for building electricity are largely relegated to incumbent alternating current (AC) systems and AC/DC converters. From a value-engineering standpoint, the complexity of adding "smart" components to an AC-powered building (e.g., digital relays, monitors) is often prohibitive, whereas protocols for DC are inherently compatible with connectivity, addressability, and controls. The advantages of DC-ready buildings are numerous, yet conventional wiring and devices reliant on edge-power conversion remain the norm.

This topic aims to commercialize technologies that advance viability of DC power in buildings at the device or system level. A "chicken-egg" conundrum inhibits development and adoption of both native DC devices and infrastructure capable of supporting such devices. Appliance manufacturers do not typically engineer hardware capable of accepting DC voltage directly because buildings are generally not designed to provide it. On the other hand, building designers and specifiers do not plan for native DC devices that are not commercially available. Successful proposals will feature work with industry partners to develop hardware that works against this cycle, providing solutions with compelling value propositions beyond inherent efficiency improvements. Enabling hardware at the circuit-breaker level should be easily integrated with existing buildings, including DIN rail mounting and general familiarity to electrical installers. Outlet-level solutions and native DC devices should support the Universal Serial Bus (USB) 3.0 standard (or greater) and utilize USB-C connectors.

AOI 6: Scale-Up and Manufacturing of Emerging Building Technologies

Participating Labs: All DOE national labs are eligible to participate
Estimated DOE Funding Available: Up to $1 million
Estimated Number of Projects: 1–5

BTO is seeking proposals that aim to advance technologies beyond early-stage RD&D through proof-of-application, prototyping, pilot production, scale-up and/or manufacturing to successfully cross what is commonly called the "Commercialization Valley of Death." The goal of the collaboration under this topic is to move early-stage RD&D concepts to commercially viable and market-available products.

Within this topic, BTO seeks proposals that pertain to BTO's mission and that are not specifically identified elsewhere in this CRADA call. Technologies currently in the technology readiness level 5 to 8 range are generally sought under this topic. Activities may include but are not limited to technical assistance for prototyping, technology validation (in a lab or field setting), techno-economic analysis, and support for pilot production through scale-up and full-scale, cost-effective manufacturing.

Eligibility

Only DOE national laboratories are eligible to submit a proposal to this Lab CRADA call. Only DOE national laboratories that are listed as "participating labs" under a specific AOI are eligible to apply to that AOI. Each application must include at least one non-national laboratory participant that will collaborate with one or more DOE national laboratories to perform the proposed work. Participant eligibility is limited to: (1) for-profit entities, educational institutions, and non-profits that are incorporated (or otherwise formed) under the laws of a particular state or territory of the United States and have a physical location for business operations in the United States and (2) U.S. state, local, and tribal government entities. Participation by foreign entities may be allowed if approved by DOE. The approval process may extend the award selection and approval timeframes for projects with foreign

involvement. The applicant must identify how the non-lab partner meets the eligibility requirements of the CRADA call in its application.

Funding Requirements

DOE funds provided for each project are to be used for activities undertaken within the participating national laboratories for services, staff time, and facilities necessary to support each selected project; **DOE funds provided to national labs for projects may not be costed outside of the national laboratories**. BTO will provide funding directly to the national laboratory (or laboratories) in support of their work under this CRADA call. **There is no DOE funding available for non-lab partners under this call.** If all funds are not allocated, subsequent requests for proposals may occur.

Cost Share

All projects must include cost share at the following levels:

- 50% - For-profit large business
- 20% - Small businesses[3]
- 10% - Domestic institutions of higher education, domestic non-profit entities, U.S. state, local, or tribal government entities, or small businesses that are also certified as a veteran-owned; women-owned; lesbian, gay, bisexual, transgender (LGBT)-owned; or otherwise disadvantaged businesses by the U.S. Small Business Administration,[4] members of the National LGBT Chamber of Commerce,[5] or verified Veteran-Owned by the Veterans Administration.[6]

Cost share is calculated based on the total project cost. Cost share may be in-kind or cash, but cash cost share is strongly encouraged. Cost share from other DOE offices or federal agencies is not permitted. Proposals submitted with a higher degree of funds-in cost share will have a greater likelihood of being considered for an award.

Contracting Requirements

For each project, the participant and each national laboratory conducting work for the project may enter into an agreement based on the DOE standard CRADA terms. Only changes to incorporate optional or alternate language approved in the DOE CRADA Order (DOE O 483.1B) and changes considered non-substantive can be made to the CRADA. No changes are allowed to the U.S. competitiveness provision. If the participant fails to agree to the terms of the agreement with the national laboratories within sixty (60) days from selection, DOE may rescind the selection. Each applicant should review the standard CRADA template carefully to understand the general terms, including intellectual property rights and requirements and the U.S. competitiveness provision, that will apply to its CRADA project. Each laboratory will execute contracting agreements with its partners using their own forms.

[3] U.S. Small Business Administration, "Size Standards." https://www.sba.gov/federal-contracting/contracting-guide/size-standards

[4] U.S. Small Business Administration, "Welcome to certify.sba.gov." https://certify.sba.gov/

[5] National LGBT Chamber of Commerce, "LGBT-Owned Business Enterprise Certification." https://www.nglcc.org/get-certified

[6] U.S. Department of Veterans Affairs, "Vets First Verification Program." https://www.va.gov/osdbu/verification/

Proprietary Data in Proposal

An applicant should not include proprietary information in the proposal unless such information is necessary to understand and evaluate the proposed project. If proprietary information is required to be included in the proposal, the proprietary information should be marked as such on the specific pages that contain this information. DOE, the national laboratories, and the external reviewers will treat properly marked proprietary information as confidential to the extent allowable under U.S. law.

Notice of Intent to Apply

Please send an email that includes a proposal title, AOI being applied for, principal investigator(s) name, brief project description to bto.crada.call@nrel.gov no later than 5 p.m. MDT on April 30, 2021.

The sole purpose of this notice is to aid in planning for the merit review. The notice will not be evaluated, and applicants will not receive any feedback regarding the submission. The notice should be no more than 500 words and can be sent in the body of an email.

Proposal Preparation

Proposals should be no more than 15 single-spaced pages total using 11-point font (Times New Roman preferred), should be in a single PDF file format, and must include the following components under headings corresponding to the bullets below:

- **Title Page:** The title page is not counted in the page limit and should include the proposal title, AOI being applied for, principal investigator(s), brief partner description, and non-proprietary summary. Include name, address, phone number, and email address of the lead applicant (organization) for both contract issues and for scientific issues.
- **1.0 Abstract**: Describe the specific product, component, analysis, or process being developed, refined, or validated. Include how the national laboratory's unique capability is essential to executing the work.
- **2.0 Project Description**: Describe the project in enough detail that it may be evaluated for its feasibility, impact, and relevance to AOI objectives. Indicate whether the project is related to other current or recently completed BTO-funded projects. Identify any next-stage manufacturing, intellectual property, or resource factors, if appropriate.
- **3.0 Potential Technology Advances**: Identify RD&D challenges that, if addressed, will result in significant technological advances.
- **4.0 Commercialization and Market Adoption**: Describe a reasonable path for the proposed technology toward commercial viability and success, including the anticipated timeline for market entry or increased market adoption. Identify known issues, key pathways, and any barriers to full market adoption of the developed technology. Describe the target market, potential impact on the market, any customer discovery completed to date, desired pathways to market, and key partnerships for market success.
- **5.0 Required Resources and Budget**: Describe the expected DOE and national laboratory member resources, including proposed work areas, staff time, and any facility/equipment needs. Include a summary of the research to be done and the goals this research is expected to achieve, including specific locations and laboratories to be used. This should include a budget of all project expenses by each national lab and project partner.

- **6.0 Cost Sharing**: Provide a detailed table describing the proposed cost sharing, clearly articulating cash versus in-kind.
- **7.0 References**: References are not counted in the 15-page limit.
- **8.0 Team**: Include single-page resumes of key project participants (not counted in the 15-page limit).

Proposal Evaluation

Selection of winning proposals will be determined based on available funding and input from DOE and external reviewers. The categories and relative ranking criteria used to evaluate submissions will be as follows:

Technical Merit (30%)

- Relevance of proposed work to each AOI
- Overall technical merit
- Potential impact of the collaboration on the technical challenge being addressed (e.g., national lab and industry leveraged effort)
- Impact of collaboration on other interested and impacted stakeholders (e.g., through sharing of data or experimental results with other stakeholders)
- Degree to which the current state of the technology and the proposed advancement are clearly described.

Commercialization and Market Potential (40%)

- Extent to which the collaboration specifically and convincingly demonstrates how the applicant will move the state of the art through the proposed advancement, validation, demonstration, etc. towards commercialization and market adoption
- Potential impact of the collaboration on the commercialization and market adoption challenges being addressed (e.g., national lab and industry leveraged effort)
- Potential impact of collaboration on the market
- Importance of technology development/demonstration/analyses to general market acceptance.

Plan, Team and Resources (30%)

- Adequacy and feasibility of the proposed work plan to meet clearly articulated goals of the project
- Appropriate use of national lab capabilities, resources, and expertise
- Clear estimated level of effort from national laboratories and strong justification, including table of cash and/or in-kind cost share to be provided by the non-lab partner(s)
- Qualifications and expertise of the key technical personnel who are active participants in the proposed project

- Teams that include representation from diverse entities such as, but not limited to: Minority Serving Institutions,[7] including Historically Black Colleges and Universities (HBCUs)/Other Minority Institutions (OMIs), or through linkages with Opportunity Zones,[8] are encouraged
- Ability of the industrial partner to support proposed activities, commitment of individuals, other partners, available facilities, equipment, etc.

Submission

NOTICE OF INTENT: Please let NREL know that you intend to apply by emailing your topic area and short description of the project to bto.crada.call@nrel.gov no later than April 30, 2021 at 5 p.m. MDT.

PROPOSAL SUBMISSIONS: To apply to this Lab CRADA call, lab personnel must register (and sign in) with their lab email address and submit application materials through EERE Exchange by 5 p.m. MDT on May 14, 2021. Application materials must be submitted through EERE Exchange at https://eere-Exchange.energy.gov, EERE's online application portal.

Questions

Frequently asked questions for this Lab CRADA call and the EERE application process can be found at https://eere-exchange.energy.gov/FAQ.aspx. Specific questions about this lab call should be submitted via email to bto.crada.call@nrel.gov. BTO and NREL will provide answers related to this Lab CRADA call on EERE Exchange at https://eere-exchange.energy.gov. Please note that you must first select the specific opportunity number for this Lab CRADA call in order to view the questions and answers specific to this Lab CRADA call. We will attempt to respond to a question within three business days unless a similar question and answer have already been posted on the website. Questions related to the registration process and use of the EERE Exchange website should be submitted to EERE-ExchangeSupport@hq.doe.gov. To ensure fairness for all lab participants, please do not ask individual BTO or NREL staff questions directly.

Questions will not be accepted after May 9, 2021.

[7] Minority Serving Institutions, including HBCUs/OMIs as educational entities recognized by the Office of Civil Rights (OCR), U.S. Department of Education, and identified on the OCR's Department of Education U.S. accredited postsecondary minorities' institution list. See https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html.

[8] Opportunity Zones were added to the Internal Revenue Code by section 13823 of the Tax Cuts and Jobs Act of 2017, codified at 26 U.S.C. 1400Z-1. The list of designated Qualified Opportunity Zones can be found in IRS Notices 2018-48 and 2019-42. Further, a visual map of the census tracts designated as Qualified Opportunity Zones may also be found under "Opportunity Zones Resources." Also see "Frequently Asked Questions about Qualified Opportunity Zones."