

DRAFTv2

**FINDINGS:
JUNE 22–23, 2021
PLACE-BASED
MULTILAB
WORKSHOP**

**NATIONAL LABORATORY
DIRECTORS' COUNCIL**

SEPTEMBER 2021

Executive Summary

While the DOE national labs began with a mission to help us defend our country and our values, today these world-leading scientific R&D institutions are focused on solving a range of scientific challenges our nation faces. This work takes place at the bench, at national user facilities, in data and policy analysis, and in collaboration with industry, other federal agencies, and academia.

In addition, the labs have a long history of working to transfer technology and knowledge, and integrate science and technology (S&T) solutions, often where they are most needed: in communities, cities, indigenous areas, states, and territories, and often with a special focus on working with underserved groups.

Through partnerships with communities and other on-the-ground stakeholder groups, the labs address energy, economic, climate, and infrastructure challenges in ways that increase the value of our energy system, improve the quality of life in communities and regions, and keep the labs on the cutting edge of use-based research.

In June 2021, the National Laboratory Directors' Council convened the national laboratories to explore the current state of community-engaged research projects, identify current learnings and research opportunities stemming from place-based challenges, and build a multilaboratory network of researchers addressing these challenges. As an internally facing first step to better understanding our collaborative capabilities and experiences, the

workshop was a collective investment of time and effort in being informed and educated when engaging in place-based research.

The guiding principle that emerged is that community-engaged research requires the same care and rigor national laboratories bring to all research. Inclusion of community voices in the early stages of project and program design all the way through implementation is critical—not only to project success but also to developing synergies and knowledge that benefit both labs and communities.

As the impacts of COVID-19 laid bare the great and widening disparities among American demographic groups in 2020, they also pointed to the opportunity and imperative to leverage DOE national lab science and technology to make a difference on the ground—not only in lab host cities from Long Island to Chicago to Golden to the San Francisco Bay Area, but in regions all around the country.

The workshop and subsequent report are the result of exploratory efforts to identify how labs can promote national priorities while providing local support, especially to address challenges arising from changing energy needs, aging infrastructure, cyber and physical security threats, shifting demographics, and international competition to develop innovations.

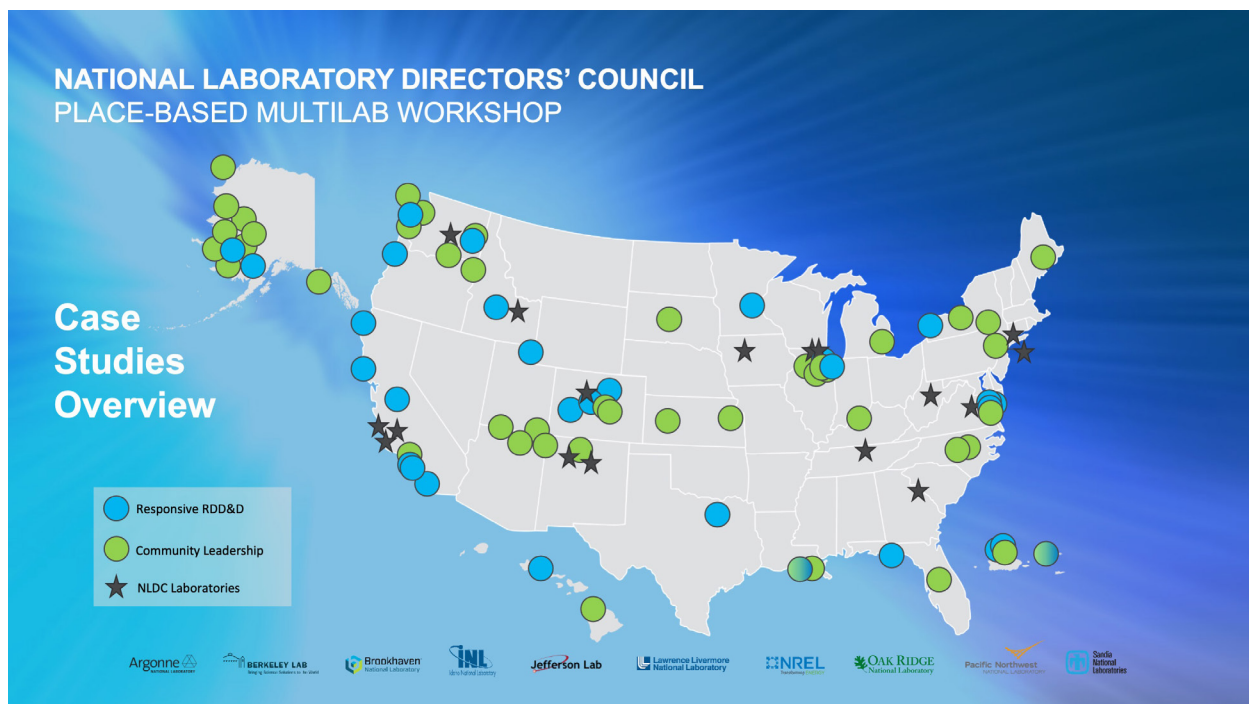


Figure ES-1. Case studies submitted by national labs indicate extensive national impact at the local level and identify opportunities to engage with communities for further benefit.

The 83 case studies (Figure ES-1) collected for this effort illustrate that labs have engaged, primarily on an individual project basis, with communities through a range of disciplines, including technology validation, deployment, testing, technical assistance, environmental remediation, permitting, disaster recovery and resilience planning, and workforce development; as hosts of innovation ecosystem hubs; and as active and valuable participants in local community life. We developed a thought model of change (Figure ES-2) based on typical projects and built the workshop themes around how these types of projects influence laboratory research and deliver impacts on the ground. The projects focus to varying degrees on:

- 1) Leveraging community knowledge and needs to drive research priorities (responsive research, development, demonstration, and deployment)
- 2) Maximizing community benefits of national lab research through enabling community leadership.

The case studies and subsequent workshop find that while individual projects have local and lab impact, there is not a strategic approach to these projects. Lack of strategic laboratory interactions and clearly defined community engagement priorities at the DOE and lab levels limit our ability to scale the federal investment in individual projects to advance national energy transformation goals.



Figure ES-2. Thought model illustrating process and core questions for understanding community-engaged research. Illustration from Bobby Jeffers, SNL.

While individual projects have local and lab impact, there is not a strategic approach to these projects. Lack of strategic laboratory interactions and clearly defined community engagement priorities at the DOE and lab levels limit our ability to scale the federal investment in individual projects to advance national energy transformation goals.

There is much to learn about effective community engagement; taking a strategic approach would lead to successful community-engaged laboratory relationships, address local and national priorities, and identify research gaps and needs for leveraging national lab expertise in community-engaged place-based work.

This report outlines both technical and structural barriers to maximizing community benefits and furthering national laboratory leadership in innovation. It also makes recommendations to support a strategic approach at all levels of the DOE complex. Two core recommendations are to develop:

- 1) A more cohesive and better articulated approach to the role of national laboratories in workforce development (internally, in the local community, and for the broader energy transformation workforce)
- 2) A crosscutting group at the NLDC level supporting a cohesive strategy for leveraging community engaged research to maximize community impact and laboratory innovation as well as identify solutions to technical and structural limitations identified through this effort.

While the national laboratories embrace the opportunity to support communities in transforming their future energy economies, we are also cognizant of our history—communities have been harmed by energy projects of the past.

As we continue to expand and strengthen our relationships, we intend to ensure frontline and historically underserved communities can be full partners in the planning, design, and implementation of energy and other projects. As we will demonstrate in this document, inclusivity and representation inside and outside the lab are not only critical to the labs' success, but they are also the baseline condition of place-based research.

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1 Background

The 2021 Place-Based Multilab Workshop was created to support a renewed interest in leveraging national laboratory expertise in working with communities to accomplish local and national goals. Hosted by the National Laboratory Directors' Council (NLDC), the workshop focused on a particular aspect of place-based work: community-driven or -led multitechnology, multiproject efforts that address local goals with associated national goals of energy affordability, clean energy, decarbonization, resilience, prosperity, and security—in keeping with the principles of equity, diversity, and inclusion.

The goal of the workshop was to inform a vision for a renewed commitment to successful laboratory/community relationships, define local and national impacts, and identify research gaps and needs for leveraging national lab expertise in place-based work.

All U.S. Department of Energy (DOE) national laboratories represented in the Directors' Council were invited to serve on the planning committee and contribute to case study identification and development. While some were more active than others in the run-up to the workshop, it is hoped that more will actively participate as their potential roles in community-engaged research become clearer and more deeply connected with their missions.

1.1 Workshop Purpose

This workshop was designed to bring the national laboratories together to articulate common goals and exchange successful strategies for working with communities to achieve national goals. The specific goals of this lab-driven workshop are to:

- Discuss potential shared goals amongst the labs to operationalize a renewed commitment to place-based research
- Identify and catalog community-engaged laboratory projects
- Share approaches and successes to determine pathways for future national laboratory collaborations within communities
- Develop and maintain a network of national laboratory staff to prepare for an increase in community engagement as an important way to leverage the national laboratories' science and technology (S&T).

1.2 Workshop Structure and Themes

The exploratory workshop brought together national labs and DOE leadership to exchange ideas and structures for approaching community-engaged research. DOE leadership set the context with an overview of place-based strategy and planning status.

DOE highlighted three place-based pillars focusing on 1) driving economic development around the national laboratories through technology commercialization, 2) supporting the transition of energy communities and 3) creating opportunities for communities to engage with and benefit from national laboratory research. While much of the research highlighted in the case studies overlaps the first and second pillars, this workshop was designed to address this third pillar.

The workshop was organized around two interconnected themes:

- **Responsive research, development, demonstration, and deployment (RDD&D):** How has integrated work with communities influenced and driven the labs' research portfolio? How have laboratories responded and adjusted to community needs and addressed them while driving American innovation and leadership?
- **Community leadership:** How have laboratories substantively deferred to community leadership in programming? How have laboratories balanced community leadership and input with technological innovation?

The themes were intended to draw out discussion about how community-engaged laboratory research advances the laboratories' missions while also extending the benefits of their research to a broader set of communities to achieve the greatest impact for the American people domestically and for U.S. research leadership globally.

Each workshop session invited participants to identify and explore the following aspects of laboratory-community interaction:

- **Approach:** What approach did laboratories use to identify the challenge faced by the community? How did the labs reach out to stakeholders?
- **Accountability:** How did laboratories interact with local subject matter experts? Did labs incorporate principles of diversity, equity, and inclusion?
- **Tools:** What tools or resources did laboratories apply to improve outcomes?
- **Impact:** How has a community changed because of its engagement with the labs?

The planning committee invited participating laboratories to submit relevant domestic case study examples of community-engaged research that represented the two workshop themes and addressed the subthemes outlined above. Submitted between June 10 and July 7, 2021, the case studies were synthesized (Section 2) following the workshop and used in coordination with workshop outcomes to identify the workshop findings summarized in Section 3.

2 Case Study Synthesis

The planning committee defined “community-engaged research” as an interactive subset of place-based work in the broader U.S. government context, in which projects are community-engaged or community-led, multitechnology, multiproject efforts that address local goals while promoting national goals, including energy affordability, clean energy, decarbonization, prosperity, and security—in keeping with the principles of equity, diversity, and inclusion.

These are collaborative projects in which community stakeholders actively participate in project design, development, execution, and evaluation. The labs were presented with a case study template that included project geographic location, goals, and impact to the laboratory or the community, as well as key takeaways from the project.

A data set compiled from the submitted case studies offers the first DOE complex-wide look at the research areas explicitly engaging communities in the RDD&D process. Along with providing insight into how national labs have approached the opportunity to improve research through increased engagement with intended beneficiaries, this cross-cutting snapshot helps to deepen understanding of the potential reciprocal benefits of active community engagement in research.

To date, laboratories have not focused on the opportunity for community-engaged research. However, technological innovations and advances in interdisciplinary methods bridging fields of sociology, anthropology, engineering, and economics are allowing for more productive interaction with community stakeholders throughout the relationship-building, research design, project execution, and evaluation processes. As national labs better understand how innovation works within stakeholder constructs, their staffs will be better equipped to realize a significant and meaningful return on American taxpayers' investment. That said, the exploratory nature of the data set results in several limitations.

First, the planning committee's definition of “engagement” made room for a variety of interpretations—from engagement with a single stakeholder type to engagement across a range of stakeholder types representing diverse perspectives and capacities. This broad definition, while allowing the workshop to consider several models, precluded the committee's ability to offer a unifying definition and framework for community engagement across the national labs.

Second, case studies submitted after the workshop (Unique Identifiers:67–83) may have been influenced by the discussions during the workshop. Because of the exploratory nature of the data analysis effort and the relatively small number of postworkshop case study submissions relative to the entire data set, they were not included in the analysis.

Third, the differences in scale of reporting make it challenging to evaluate project impacts. For example, one lab may have submitted a case study of a project focused on a single geographic location, whereas another may have submitted one with impacts in 10 jurisdictions. Despite the differences, each would be counted as a single case study. Further analysis could offer more useful insights.

Fourth, the committee organized the case studies by lab submission. In some examples, we found that the labs that submitted the case studies were not able to speak to the projects' impact on the other participant labs.

Finally, the brief period of data collection limited the depth and specificity of highlighted program and project methods and impacts. Varied reporting on the duration of place-based research projects, as well as depth and style of engagements, resulted in inconsistencies across submissions. Although some information could be gleaned from the lessons learned and “takeaways” sections of case studies (e.g., multiple submissions identified the duration of the engagement as a critical factor in community impact), a more refined, in-depth data request focused on a subset of particularly relevant case studies could lead to enhanced understanding of projects and greater insight into opportunities in future iterations.

The final data set includes 83 projects submitted by 10 national laboratories. The committee informally reviewed the 37 submissions cataloged prior to June 22 to guide workshop development and identify initial themes. Postworkshop, the committee cataloged another 29 early submissions, as well as the final 17 case studies that came in after June 23. Following the workshop, the complete, cataloged data set was reviewed and analyzed to better understand and themes, shared practices, and approaches.

Contributing laboratories matched one of the two workshop themes to their case studies, and the submissions were evenly split between Community Leadership (42) and Responsive RDD&D (41). It may be that the self-reporting nature of the cases, and the flexibility in interpretation of the themes, led to a majority of the studies highlighting benefits to both the laboratories' research mission and the impact on the participating community (or communities).

The committee’s analysis revealed the presence of a real or perceived bifurcation between the two themes. That is, labs articulated a mutually exclusive relationship between innovation research and community impact. Further exploration of how laboratories could navigate this divide would help to illuminate effective models—and limitations of those models—for designing research and expanding community impacts.

The community-engaged projects were based in 23 individual states or territories, and 12 identified impacts across an additional eight states. Four projects highlighted activities nationwide. While there were projects geographically proximate to national laboratories, the case studies came from many regions within the United States.

Funding support was identified in 59 case studies. In 27 of these, DOE represented all or part of the funding reported. The remaining 32 projects drew funding support from a range of other federal and state funding mechanisms, foundations, and private funders. Notably, two states, New Mexico and Washington, are able to fund national laboratory support of local businesses and communities,

and three case studies highlighted the use of those funds specifically for community-engaged research projects.

The submitting laboratories broadly used the term “engagement” to describe their relationships with project stakeholders (see Table 1 for the number and types involved). Often, projects involved multiple stakeholder types; 54 involved two stakeholder types, and 15 partnered with three or more. We can see that collaboration with two or more stakeholder types tend to be the norm in place-based research—an indication of the diversity of stakeholders and their likely influence on research and outcomes.

Of 83 submitted case studies, 31 reported engagement specifically with community-based stakeholders (nongovernmental organizations [NGOs]/community groups, tribes, community members), indicating the variety of ways laboratories define “community,” even within the context of the definition we provided for community-engaged research. These 31 case studies stemmed from the work of six laboratories (Table 2), indicating the work is happening across a variety of laboratories.

TABLE 1. COUNT OF CASE STUDIES BY STAKEHOLDER TYPE ENGAGED

STAKEHOLDER TYPE ENGAGED	COUNT OF CASE STUDIES
State and/or local government	66
Non-DOE Federal Agencies	31
Private Industry	20
Tribes	14
NGO/Community Groups	13
Community Members	4

TABLE 2. TYPES OF COMMUNITIES ENGAGED BY LABORATORIES

SUBMITTING LAB	COUNT OF CASE STUDIES	NGO/COMMUNITY GROUP	COMMUNITY MEMBERS	TRIBE GOVERNMENT OR REPRESENTATIVE GROUP
ANL	4	1	2	1
INL	1	1		1
NREL	14	6	1	7
PNNL	5	4		2
SNL	1	0	1	1
LANL	1	0		1
unknown	2	2	0	0

Note: Table is not additive because some case studies reported multiple stakeholders.

The data set does not include extensive information related to the quality of or accountability for those engagements. For example, there is no measurement of how many key stakeholders in each project were inadvertently or directly ignored or excluded, or to what extent stakeholders were engaged meaningfully or topically in the research. To begin to address this issue, the narrative in the case studies related to how the stakeholders were engaged was evaluated to determine whether there were emergent patterns ripe for further exploration.

All but one of the case studies identified specific approaches to engagement with stakeholder groups. These were organized into four types of responses, as described in Table 3, and reflect the diversity of approaches to community engagement. For example, the “Informed” category, reflecting cases in which

research questions, methods, and directions framed initial and ongoing engagement activities, sometimes included only limited interaction with the community overall, such as when researchers determined from existing research or journalistic reporting that there was a challenge faced by the community. In the “Regular meetings” category, on the other hand, the most common reported interactions indicated an actively involved stakeholder set that may have had more influence in project direction as it evolved.

Better understanding the quality and nature of these inputs—and the specific methods and strategies used to support authentic and sustained engagement from historically underrepresented stakeholders—could foster identification of practices that optimize community engagement in research and community outcomes.

TABLE 3. TYPES OF ENGAGEMENT BY NUMBER OF CASE STUDIES

TYPE OF ENGAGEMENT	CASE STUDY COUNT
Regular meetings: Stakeholders were engaged throughout the project development, execution, and follow-up stages to varying degrees. Frequency was not always cited; biweekly and monthly were common words used within the narrative descriptions in the case studies.	42
Informed: The work was informed by researchers’ existing or speculated need. Literature review is included among the specific types of engagement in this category.	25
Check-in: Stakeholders were engaged at specific time periods or progress throughout the project duration.	7
Project team: Case study explicitly mentions diversity of disciplinary skills as critical, and project involved members of the paid project team, such as public health researchers.	6
Initial outreach: Stakeholders were engaged in the formation of the project.	2

Of the 83 case studies, 73 provided lessons learned or findings related to lab interactions with communities during place-based research. The committee coded these lessons by themes that emerged organically—based on repeat narratives or explicit mentions—to create five categories. Some cases reported multiple lessons. These summaries and their counts are outlined in Table 4.

The lesson most valuable to projects’ impact on either lab or the community goals was that it was necessary to have meaningful, remunerated participation and partnerships

with stakeholders, whether or not they were community-based. The second most valuable lesson highlighted the need for the application of locally relevant data and tools—or the limitations of locally irrelevant data and tools.

These findings highlight the challenges the labs face in establishing potentially productive partnerships with their place-based stakeholders and matching research-grade data and tools with decision-grade data and tools. Both challenges need more in-depth exploration to increase the effectiveness of the laboratory-community partnerships.

TABLE 4. CASE STUDY LESSONS

LESSON LEARNED	COUNT
Meaningful/substantive, long-term, valued/remunerated partnerships with community stakeholders: These noted the importance of meaningful interactions with communities to have desired research and community impacts.	44
Locally relevant data and tools: These narratives focused on the challenges and importance of local data and locally relevant and accessible tools for use in supporting community impact within the research field.	28
Lab neutrality or expertise: The lesson involved references to the importance of lab expertise, stature, or positioning to result in community impact.	27
Locally driven benefits: These referred to the necessity to provide community benefits as designed and directed by the community (as opposed to assumed).	20
Coordination across agencies or other support systems: The narrative indicated the importance of connections being made across different service providers to result in the most value for the community and the greatest leveraging of research dollars.	18

In summary, the data set of 83 case studies helps us begin to understand how participating labs and DOE researchers are conducting community-engaged research. It reveals several opportunities to better understand how place-based work can positively influence both research results and community outcomes, summarized in the following recommendations:

- **Focus on reciprocity in the lab-community relationships.** Several case studies identified a need for valued participation/remuneration. Further investigation could explore how community members could help meet lab workforce needs.
- **Identify reductions in transaction costs for execution of these projects.** Many of the projects listed have multiple funders over their duration with associated transaction costs that reduce research and engagement opportunities. Identifying streamlined methods for project funding would enable more work to be done.
- **Prioritize systemic incorporation of expectation of broad and continuous stakeholder engagement.** Leadership at the NLDC and DOE levels can influence prioritization and understanding of the importance of broad engagement to continued American leadership in national lab innovation and is critical to staff-level emphasis on this work.

The overall data set could be enhanced and refined to improve understanding of geographic diversity in laboratory impact and gaps that could support broader national impact of these federally funded laboratories. The following findings suggest further exploration of the subset of 31 cases that focus on community stakeholders could illuminate best practices and models for improved community outcomes:

- A more comprehensive understanding of where these lab-community partnerships are taking place would inform a discussion about whether the labs are working in the places and with the communities where they are most needed.
- Additional data on stakeholder types and interaction models could improve our understanding of research innovation and community impact, including how and to what extent they are consulted and informed, and how their feedback is incorporated.
- Additional information about the range of research activities that take place during community-engaged activities would also be helpful. Given the short submission timeline for the data set reviewed for this study, these case studies may be skewed toward a specific type of research question or researcher type, and we may not have captured the full range of existing community engagement research approaches. A deeper dive into existing case studies, and an inquiry framed to capture a wider range of research activities, could identify more refined program development best practices and offer key learnings for formalizing the cross-laboratory approach to community-engaged research.

The analysis of this and other data could inform efforts across the laboratories to improve research innovation and community impact within the current models of place-based research—and increase the possibility that there are other models to explore that would be equally or more effective.

3 Workshop Findings

The NLDC 2021 Place-Based Multilab Workshop primarily focused on laboratories' expertise, capabilities, and experience related to effectively engaging communities in laboratory-led and DOE-funded R&D. DOE leadership opened the workshop with an overview of DOE's place-based strategy and planning status. They highlighted three place-based pillars focusing on 1) driving economic development around the national laboratories through technology commercialization, 2) supporting transitioning energy communities, and 3) engaging communities with national laboratory research. While much of the research highlighted in the case studies overlaps the first and second pillars, this workshop was designed to address this third pillar.

The workshop content and discussion identified four areas of findings or observations that should inform the NLDC's as well as the laboratories' approach to community engaged research. Those areas are 1) Workforce Interplay, 2) Technical Capabilities for Engaging Communities, 3) Structural Capabilities for Engaging Communities, and 4) Scaling Community-Engaged Research. Each of these focus areas needs further research and strategy development, as is discussed in the following sections.

3.1 Workforce Interplay

Despite not being an independent focus of the workshop, workforce interplay surfaced as a key element of how laboratories can and do impact the communities in which they are engaged, as well as how they are able to successfully fulfill their current and emerging mission priorities. The gaps and priorities identified during the workshop are summarized below. Note that while the case studies themselves did not feature workforce development as a major theme, this was an important issue raised in the discussion between the planning committee and the NLDC. The committee recommends that the NLDC consider making workforce development the focus of a future workshop.

Although the workshop planning team strove for submissions that included representation from a wide range of demographics and disciplines, achieving that goal proved more difficult than anticipated. The findings presented in this report represent a fair amount of diversity in some areas, such as gender and level of expertise, but less in others, including race and level of seniority.

We acknowledge significant opportunities for greater diversity in the projects presented and experts showcased. All 17 national laboratories are cultivating an increasingly diverse workforce that is more reflective of the American populace. In the case of our community-engaged

work, it is an even greater priority to ensure that we reach out to a wide range of communities, especially those that are underserved.

Three workforce focus areas that roughly align with DOE's three place-based pillars were identified during the workshop and follow-on session with the laboratory directors: 1) Laboratory Workforce, 2) Regional Workforce Near Laboratories, and 3) Energy Transition Workforce. Ongoing efforts to ensure employee recruitment and retention for STEM crafts, trades, and technicians, as well as support for a more diverse and inclusive workforce, overlay each of the three workforce focus areas to varying extents.

3.1.1 Laboratory Workforce

All 17 DOE national laboratories rely on the specialized expertise of their staffs to achieve their respective missions. This includes the STEM workforce at the bachelor's, master's, and doctoral levels, which forms the backbone of the laboratories' R&D capabilities. It also includes significant numbers of staff members serving in professional, craft, trade, and technician roles, who are also essential to mission success. The National Nuclear Security Administration (NNSA) laboratories (SNL, LLNL, and LANL) are also vested in meeting the needs of the production-site workforce, which is critical to achieving the broader NNSA mission and assuring the nuclear deterrent.

Like other workforces across the country, the national laboratory workforce is experiencing a generational shift, resulting in increasing focus on attracting, recruiting, training, and retaining staff at all levels of expertise. The laboratories' mission-driven work requires expertise that must be gained on the job. Developing and maintaining long-term expertise depends upon retaining staff for durations exceeding what is typically found in private industry. The laboratories have programs focused on workforce issues that are unique to each laboratory. These programs are not comprehensively represented in this report.

In executing their primary missions, the laboratories have significant local and regional impact. At a minimum, each laboratory employs a significant number of staff members who reside in neighboring communities. Laboratories also provide educational and training experiences as part of their science education, student internship, and postdoctoral programs, as well as the professional development opportunities they offer through various residences and sabbatical programs. The community impacts associated with these programs are not fully understood. We recommend the NLDC encourage laboratories to evaluate and assess these impacts and more directly engage communities where possible.

When we specifically consider place-based work, it is important to note that the laboratory workforce is often spread out across a wide variety of assignments, many of which do not explicitly require community engagement. To improve the effectiveness of their community-engaged work, the laboratories will need to hire new and train new and existing staff. They will also need to cultivate a community of expertise and appropriately recognize employees' contributions to place-based work in performance review and evaluations.

3.1.2 Regional Workforce

Building and retaining a workforce is a major component of regional economic development. National laboratories can and do play an active role in fostering and retaining a technological and scientific workforce in their local and regional communities, and they can enhance their contributions in the following ways:

Talent retention: Enhance STEM education program offerings. National labs' world-class facilities and programs can inspire and motivate STEM talent throughout the K–12 grades and beyond by, for example:

- Partnering with the public school district(s) and community college(s) to enhance offered STEM programs and build consistent interaction with the laboratory staff and facilities
- Offering internship programs and building awareness of these programs through partnering with local and regional universities, colleges, and organizations through events reaching target communities.

Convening and collaboration: Facilitate collaboration between local and regional science and technology ecosystems and national labs' entrepreneurial and innovation programming, including opportunities sponsored by DOE and other federal agencies, by:

- Actively engaging with local and regional organizations with aligned missions to highlight programs such as Innovation Crossroads, Cyclotron Road, Energy iCorps, and Lab-Embedded Entrepreneurship Programs (LEEP) Chain Reaction Innovations (specifically, seeking out opportunities to connect entrepreneurs and companies engaged in LEEP with regional industries and companies)
- Reviewing opportunities for standing up an entrepreneurially focused program at national labs that may not already have one
- Facilitating more interaction with local and regional entrepreneurially focused organizations or corporate partners to encourage mentorship or business workshops to the participating start-ups, thus further connecting emerging companies to the local and regional area

- Engaging actively with local and regional organizations working with entrepreneurs and emerging companies to highlight DOE-funded programs such as Small Business Innovation Research/Small Business Technology Transfer grants, Technology Commercialization Fund, HPC4 Energy Innovations, American-Made Challenges and Network, and other DOE-funded opportunities requiring industry participation.

National laboratories can effectively partner with other stakeholders in their regional innovation ecosystems, including academic and educational institutions, businesses, incubators and accelerators, economic development organizations, state and local governments, and community-based organizations. It is important for national laboratories to work collaboratively with these partners to drive enhanced outcomes. National labs would benefit from clearly establishing their role in driving workforce outcomes in their local and regional communities, and tracking the outcomes.

3.1.3 Energy Transition Workforce

The transition to a clean energy economy is underway across the United States, albeit with varying goals, approaches, and momentum. DOE and its 17 national laboratories can have profound impacts on communities during this transition—through RDD&D and other contributions. Workforce development will be a vital component in the coming years and decades.

Workshop discussion uncovered several important questions to guide what we recommend as further inquiry into increasing positive impacts for communities.

How can federal and state governments work together to support the development of the new energy economy?

- How will the federal government support the transition to the new energy economy?
- What technologies will be most appropriate, cost effective, and reliable?
- At what level will decisions to focus on large-scale solar and wind projects requiring significant infrastructure for transmission be made? What's the role of distributed generation with technologies such as residential and community solar with energy storage?

What will be the pace of the transition?

As mentioned above, states are actively advancing their renewable portfolio standards and goals, requiring increased percentages of electricity generated from renewable sources. New York State, for example, is committed to the nation-leading goal of 9,000 megawatts

from offshore wind by 2035.¹ Achieving this may lead to the development of a new domestic industry with supply chains and human capital requirements for energy generation, transmission, storage, and distribution. The deployment of solar and other renewable energy sources will have similar requirements.

With states currently accelerating the transition, companies in the private sector are defining themselves by it. General Motors (GM), for example, has committed to a global line of 30 electric vehicles by 2035.² In January 2021, GM also launched a new logo to illustrate its close affinity for electric vehicles.³

- How broad will consumer and market demands be for energy from renewable sources?
- How quickly will the demand spread throughout major industries?
- How will supply and demand evolve?
- How can we build a “green” manufacturing base in the United States?
- Where will supply chains be based?

Who will design, build, and maintain it all?

Transitioning to the new energy economy will require a STEM-savvy workforce. DOE and its national labs have long been uniquely positioned to assemble multidisciplinary teams of researchers from across the national lab complex, academia, and industry to address complex challenges. In addition to helping students prepare for future STEM careers, including positions that do not yet exist, lab workforce development efforts also support more specific leveled efforts:

- In grades K–12 to learn about the scientific method and problem-solving skills
- High school and upward for:
 - Internships to directly and indirectly contribute to projects that support the energy transition
 - Apprentice-like programs—in partnership with academic and industry partners—to learn skills required for the new energy economy.

In addition to helping prepare the next generation of professionals, lab workforce development efforts also create positive opportunities for community outreach that can build broader support and stronger relationships among laboratories and their communities and regions, as well as the nation they serve.

3.1.4 Workforce Observations and Recommendations

Overall, the case studies and workshop reveal an interest among the national laboratories in supporting internal and external workforce development. The following observations and recommendations highlight the key workforce-related elements identified and discussed during the workshop and the planning sessions that led to it.

- Workforce emerged as a critical issue for successful mission execution at all laboratories. We recommend the NLDC focus on workforce independent from place-based efforts and directly engage the laboratories’ workforce subject matter experts in that process.
- Because workforce is so critical to laboratory success, we recommend the NLDC urge DOE to consider including it as a separate place-based pillar, with elements that extend into each of the other three pillars.
- Increasing diversity within our laboratory RDD&D teams is a priority. In the area of community-engaged research, it is even more imperative that laboratory teams reflect the demographics of our community partners.
- Leadership opportunities, such as planning and participating in workshops such as this one, should be open and accessible to all staff. Ensuring diverse representation should be a priority for future workshops.
- Build, cultivate, and prioritize communities of expertise around place-based work, including recruitment, training, and reward systems. Laboratories should consider identifying existing staff members with relevant expertise and interest who may be focused on unrelated efforts.
- Assess and evaluate laboratory impact on training and supporting the nonlaboratory workforce.
- Laboratories can contribute to the development and retention of talent in technology fields in their local and regional geographies. Identifying skill gaps and partnering with mission-aligned organizations in their areas will be key to success.
- Laboratories can work collaboratively with companies in their geographic regions to design internship programs for graduate students from local and regional universities, especially minority-serving institutions. A coordinated and comprehensive approach to internship and pipeline programs is necessary.

1 <https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Focus-Areas/NY-Offshore-Wind-Projects>.

2 <https://www.gm.com/electric-vehicles.html>.

3 <https://www.forbes.com/sites/samabuelsamid/2021/01/08/general-motors-invites-everybody-in-to-its-new-electric-vehicles/?sh=22498b9a650e>.

- Laboratories can contribute to development and retention of the entrepreneurial workforce by actively engaging with their local and regional innovation ecosystem stakeholders, especially incubators and accelerators targeting emerging companies.

3.2 Technical Capabilities for Engaging Communities

Preparation for the workshop resulted in extensive discussion among the labs about how various capabilities across the complex can enable successful place-based work. Our decomposition of laboratory capabilities is based on a dynamic hypothesis of effective place-based R&D, illustrated in Figure 1. This hypothesis is posed as a feedback loop that governs improving federal programs and policies, enhancing laboratory capabilities and scientific understanding, and developing more effective lab cultures over time. Capabilities for effective place-based R&D can inform one or more of the stages in this feedback chain. Capabilities include technical R&D capabilities such as simulation tools and engineering expertise, as well as planning frameworks, analysis approaches, community survey development, and other approaches that greatly enhance place-based effectiveness.



Figure 1. Laboratory capabilities may be organized by how they augment the virtuous feedback cycle of place-based R&D.

3.2.1 Consciously Beginning Place-Based Work

Referencing the top of Figure 1, all projects and new programs begin with a goal. Place-based work includes an element of community engagement within that goal. The two broad categories for these goals are 1) improving our understanding of our capabilities (a taking relationship

with the communities) and 2) delivering impact for the place-based partner (a giving relationship). Many projects and programs have goals that fall within both categories.

The laboratories tend to focus on developing and deploying technology to meet clearly delineated statements of work (SOWs). However, if an SOW has not adequately considered the dynamic learning that occurs during place-based work, and if it is inflexible over the course of the project, labs are hamstrung even before they begin. Therefore, we recommend consciously focusing on the learning and adaptation that will occur over the life of a project when developing SOWs. This flexibility allows for the feedback mechanism in Figure 1 to succeed.

3.2.2 Developing a Place-Based Project Portfolio

Multiple projects may be developed within a portfolio over time, focused on delivering success to different parts of the feedback loop in Figure 1. We refer to these as the place-based success focus areas:

- **Community impact focus:** These projects target positive impact on the community. Therefore, community stakeholders are often the primary partners or clients.
- **Capability development focus:** These projects develop capabilities that will enhance other parts of the feedback loop. Often, these capabilities focus on delivering future community impact. However, capabilities may also improve engagement, enable flexibility, deliver insight into the link between lab culture and place-based success, or inform our sponsors' programs and policies.
- **Policies and programs focus:** These projects are designed with our federal sponsors as the primary clients. They inform decisions that will ultimately impact communities across the country.
- **Lab staff and culture focus:** These projects have national labs as the primary clients. They seek to understand and improve the linkage between lab staffing/culture and success within place-based RDD&D.
- **Engagement focus:** These projects do not need to show impact or develop new capabilities. Their success is measured by the level of embeddedness and efficiency of community engagement they deliver. Because many benefits accrue after longer periods of engagement/embeddedness, these projects should consciously have long periods of performance.

At the outset of place-based work, many program managers and principal investigators try to accomplish many or all of these activities within a single project. This may be possible for specific classes of community impact, such as supporting recovery for a particular community

from a particular disaster. However, for large challenges such as a nationwide sustainable and equitable energy transition, we may be better served by developing specialties within each of these focus areas.

Each of these focus areas can have different natural timescales to success. For instance, the focus on engagement and embeddedness can require years to decades of trust building and development of common understanding to succeed. Separate from the relatively short R&D project life cycles, long-term commitments to engagement could greatly improve community embeddedness and therefore impact.

In the short term, success in some focus areas may detract from success in others. However, in the long term, we hypothesize that the reinforcing (positive) feedback loop in Figure 1 should become a dominant behavior mode for the laboratories. For instance, a focus on diversity and inclusion for laboratory staff can exhibit dynamic “worse-before-better” behavior when judged primarily by technical impact and R&D efficiency. A commonly cited reason for this is difficulty in overcoming internal negative cultural stereotypes after a workforce has become more diverse. However in the long term, once internal lab culture adapts to appropriately value-diverse viewpoints, diversity should greatly increase the efficiency of adaptive place-based R&D. This points to the actual model of how place-based RDD&D evolves through time being much more complex than that shown in Figure 1. Improved understanding of the various dynamic drivers at play is recommended as an important capability of its own.

3.2.3 Capabilities Enabling Place-Based Success

Through feedback and multilab discussion leading up to and during the place-based workshop, the laboratories collected a wide variety of technical and procedural capabilities that support the place-based focus areas, along with potential capability gaps, outlined below. Note that some capabilities may have significant overlap, benefiting multiple focus areas.

- **Decision support:** Refining tools for decision support better equips community leaders and decision makers to understand trade-offs, risks, and uncertainties. Care must be taken to develop decision support tools that both integrate separate dimensions of an issue and allow decision makers to probe separate dimensions so that they can examine—and, if necessary, challenge—underlying assumptions in the tool.
- **Infrastructure/technology modeling and simulation:** Allowing stakeholders to experiment with a model—not the actual system itself—is a highly valuable tool for community engagement. It also provides the opportunity

for the model developers to assess and refine their models based on feedback from the users. Models need to be complex enough to reflect reality and simple enough for a wide variety of stakeholders to engage with in a collaborative way.

- **Valid community-level data:** A common issue limiting model effectiveness is the currency and completeness of data. Frequently, time-consuming nondisclosure agreements must be put in place to access data, which is something that could be done at a multilab or DOE level to reduce overhead and administrative costs.
- **Community-relevant climate projections:** Downscaling of climate projections has not yet revolutionized local decision-making. Decision support tools and other data-driven resources should be made available with the decision makers' level of expertise and budget in mind.
- **Social system modeling and simulation:** Deepening and broadening capabilities to incorporate social as well as physical sciences and engineering capabilities through partnering with academic institutions—and, where justified, developing internal capabilities—helps community and lab partners develop complete solutions that consider community needs in the human, economic, political, and social dimensions. While partnering with academic institutions local to a community may be the most effective approach, such partnerships can take time to develop and should be planned and developed in advance of a community engagement.
- **Surveying and social system data collection:** We need to better understand the needs, desires, and behaviors of the communities we seek to engage with. To do this, accepted social science practices, such as survey-based methodologies, may be warranted. This represents an opportunity for partnership with practitioners such as academic institutions, nonprofits, and other agencies.
- **Community engagement mechanisms:** Deep, meaningful engagement with communities can be hindered by the “ivory tower” structure of lab research. One option that has been attempted with limited success is a “convene the conveners” approach in which laboratories maintain hyperregular interaction with community conveners, advocacy groups, and other community representatives across a broad set of demographics.
- **Technology transfer:** When technology solutions have been developed or are ready for deployment, the laboratories need expedient tech transfer processes to move the technology to a private or public stakeholder. Working in advance to streamline mechanisms would assist laboratories and communities through cost efficiencies and clear understanding of expectations.

3.3 Structural Capabilities for Engaging Communities

The NLDC workshop uncovered numerous examples of ways in which national laboratories engage with communities to respond to community needs by contributing expertise and facilities resident at the national laboratories. The core question remains: How do we create structures that encourage and enable community-engaged research at our national laboratories?

In this section we will crystallize structural approaches that underlie examples shared during the NLDC workshop and additional case studies submitted by participants. The goals are to understand approaches that have worked in the past, identify opportunities to enhance these approaches, and highlight gaps that need to be addressed.

Through the case studies and workshop discussion, we identified three main structures through which national laboratories engage in work with communities:

- 1) DOE-driven multilab consortia
- 2) Individual national laboratory partnerships with businesses and organizations in their geographic regions
- 3) Externally driven collaborations in which national laboratories play a key role, which can be driven by events or crises, or by state or local government.

For each of these three structures, we will provide example case studies, review mechanisms by which laboratory work was funded, highlight the importance of the long-term nature of engagement, and outline community involvement, as well as resulting outcomes and challenges.

3.3.1 DOE-Driven Multilab Consortia

As the workshop was developed and executed, the planning committee emphasized multilaboratory efforts that aligned with this place-based definition and identified the DOE/national laboratory response to the energy crisis in Puerto Rico following hurricanes Maria and Irma as the primary example of responsive RDD&D. Section 2 of this report identifies a set of lessons learned synthesized from the 83 case studies submitted by the laboratories, including those associated with the Puerto Rico response. Those lessons learned are identified in Table 4 above. They comprise:

- 1) Lab neutrality and expertise
- 2) Coordination across agencies and support systems
- 3) Meaningful and substantive long-term valued partnerships with community stakeholders
- 4) Locally driven benefits
- 5) Locally driven data and tools.

DOE has many mechanisms to engage the laboratories in topically focused RDD&D activities; however, the primary focus of these initiatives is typically on the cutting-edge science conducted rather than how that science impacts communities outside the laboratory walls.

Maximizing the effectiveness of place-based work involves integrating place-based focus across our primary, science- and engineering-driven mission objectives. In this section we highlight two examples of DOE multilab, multitechnology structures used to focus R&D efforts on major challenges and discuss how they might be leveraged to enhance place-based work across the laboratory complex.

- **Laboratory Consortia** focus and coordinate the activities of multiple laboratories working toward a common set of goals associated with one or more key DOE priorities. Consolidating a wide range of projects under a single umbrella enables efficient program management and effective use of federal R&D funding while minimizing duplication. Two examples of DOE laboratory consortia are the Grid Modernization Laboratory Consortium and the Agile BioFoundry. While different in scope and structure, both examples have several elements in common, including:
 - Identification of key R&D areas that are critical to accelerating scientific advancement and national-scale impacts in their respective fields
 - Multiyear program plans supported by consistent and reliable funding at levels sufficient to drive meaningful results
 - Emphasis on and prioritization of external partnerships with entities such as technology developers and vendors; nonlaboratory research communities and standards organizations; private industry; community and advocacy groups; electric utilities; power producers; and grid planning, operating, and reliability organizations
 - Consolidated impact tracking, including development of various levels of metrics to assess success.
- **Energy Earthshots** seek to accelerate scientific and technological breakthroughs supporting achievement of aggressive climate and clean energy goals. The program is modeled on DOE's SunShot initiative, which was launched in 2011 and sought to drive down solar energy installation and generation costs to levels that are competitive with the bulk energy markets without subsidies. Energy Earthshots expands that structure to additional technologies and economic goals. DOE recently announced two new Earthshots: the Hydrogen Shot seeks to reduce the cost of clean hydrogen

by 80% to \$1 per kilogram in 10 years. Over the same time frame, the Long Duration Storage Shot seeks to reduce the cost of grid-scale energy storage by 90% for systems delivering over 10 hours of duration. Some commonalities among Earthshot programs include:

- Coordination among multiple program lines and funding streams within DOE
- Simply communicated goals that are based on market parameters necessary for widespread community impact of the technological advancement
- Clear justification for increases in DOE's budgets supporting the articulated goals.

The Earthshot and DOE Laboratory Consortia examples both demonstrate existing multilaboratory, multitechnology structures that target specific achievements in high-value disciplines or application areas. These programs and associated funding streams are consistent and prolonged, targeting a decade or more of support. They prioritize R&D innovation as well as demonstrating and deploying those achievements beyond the confines of the laboratory. These are all factors that support effective place-based work.

Integrating an intentional place-based component into these programs, and funding it appropriately, could enhance DOE and the laboratories' community impact and engagement. As such, we recommend the creation of an NLDC Place-Based Working Group to work in conjunction with DOE to:

- Prioritize identifying, articulating, and promulgating best practices for effective community engagement, including budget formulation and execution
- Develop community engagement metrics and impact targets that mirror the parallel S&T metrics and targets.

3.3.2 Individual Laboratory Partnerships in Their Geographic Regions

National laboratories engage in a broad range of research with partners, including sponsored and collaborative research with large and small businesses, collaborations with academic research institutions, and work for and with local and state governments. Scientific mission drives many collaborations at the national laboratories, resulting in partnerships with entities throughout the United States and internationally.

However, national laboratories are also an integral part of their geographic communities, where they continue to engage with partners. In some instances these engagements take the form of a one-off or ongoing research collaboration with a single entity. In other cases, national labs engage with stakeholders in their surrounding communities to address specific community challenges.

It is important to recognize that to address community challenges and drive meaningful impact, national laboratories need to build long-term relationships with a broad range of community stakeholders.

As discussed in Section 2, 42 of the 83 submitted case studies were classified as Community Leadership work. Many of the case studies identified multiple stakeholder types engaged throughout the project, with an overwhelming majority reporting two or more stakeholder types. This is indicative of the importance of developing a deep understanding of the local and regional ecosystems to effectively engage in community-relevant work.

Of the Community Leadership case studies submitted, about a third (11 case studies) were geographically proximal to the national lab. While the case studies collected as part of this NLDC workshop may present an incomplete picture of laboratories' engagement in their geographic regions, the data highlights the opportunity for the labs to deepen their understanding of community needs and goals and extend their involvement.

Of the 11 case studies, over half of the projects were either entirely or partially funded by state or municipal sources, two were DOE-funded, two received private funding, and one was laboratory-funded. This underscores the importance of state and municipal organizations as sources of funding for Community Leadership work and suggests that labs should be mindful of developing and maintaining productive relationships with government organizations in their geographic regions. Additionally, it points to the opportunity to identify funding mechanisms for DOE funds to be used alongside local and regional government funds for Community Leadership work.

While not explicitly stated in all cases, Community Leadership projects spanned multiple years. For instance, one project involving local rivers was conducted over seven years. This is not surprising, since establishing relationships with multiple local and regional stakeholders, building trust, obtaining funding, and conducting impactful studies often require several years. Labs should plan for the long term when striving to deliver impact in their regional communities.

We recommend that the NLDC Place-based Working Group, in conjunction with DOE:

- Create incentives for labs to increase their involvement in Community Leadership projects that are focused in geographic regions proximal to the labs
- Develop a playbook or guide for labs to understand breadth of community stakeholders, community needs and resources, and prioritize projects
- More closely analyze the funding sources and structures involved in delivering Community Leadership work to date, and identify gaps and opportunities for improved funding approaches.

3.3.3 Externally Driven Collaborations

At times, externally driven collaborations originate with state and/or local government initiatives. Of the 83 case studies submitted, 60 identified state or local governments as stakeholders. A selection of examples is highlighted below:

- **Energy Transitions Initiative (ETI) and its Partnership Project (ETIPP)** leverage DOE funding and laboratory resources to support community-driven solutions to energy and infrastructure challenges in island and remote communities. Participating communities are identified through competitive requests for proposals, and funding is provided by DOE.
- **Technical assistance partnerships** between DOE/ national laboratories and state or local entities, such as the New York State Energy Research and Development Authority, the Ports of Portland and Seattle, the State of Hawaii through the Hawaii Clean Energy Initiative, and State of New Mexico Laboratory Partnership with Small Business Tax Credit through the New Mexico Small Business Assistance program. The scope of these partnerships may vary, but they all focus on DOE laboratories providing technical assistance, analysis, and decision support to state and local entities in meeting their clean energy goals.

Less than half of the case studies that directly included state or local government entities as stakeholders also identified state and/or local funding sources. While this may certainly be an undercount, it does suggest that there is room to increase engagement from state and local governments.

Significant logistical challenges, such as burdensome contractual and financial oversight requirements, as well as laboratory rate structures that can appear excessive to external partners, were cited as hurdles to expanding DOE laboratory and state or local collaborations. While there is no single solution to enhancing state, local, and laboratory collaborations, NREL's streamlined [Technical Support Services](#) program offers an example of how the barriers to initial engagement with a wide range of partners can be systematically reduced.

3.3.4 Observations and Recommendations Regarding Structural Community Engagement Capabilities

- The primary DOE/DOE laboratory mission and focus is on cutting-edge science and engineering. However, many DOE programs include design features identified in the workshop as critical components of place-based work. These programs could be leveraged to

enhance DOE and laboratory community-engaged work by incorporating place-based priorities into the broader program scope and financially supporting its implementation.

- The NLDC Place-Based Working Group, in conjunction with DOE, should prioritize identifying, articulating, and promulgating best practices for effective community engagement, including budget formulation and execution.
- The NLDC Place-Based Working Group, in conjunction with DOE, should develop community engagement metrics and impact targets that mirror the parallel science and technology metrics and targets.
- The NLDC Place-Based Working Group, in conjunction with DOE, should create incentives for labs to increase their involvement in Community Leadership projects that are focused in geographic regions proximal to the labs.
- The NLDC Place-Based Working Group, in conjunction with DOE, should develop a playbook or guide for labs to understand breadth of community stakeholders, community needs and resources, and prioritize projects. This could be built on the DOE Energy Transitions Initiative playbook efforts.
- The NLDC Place-Based Working Group, in conjunction with DOE, should analyze more closely the funding sources and structures involved in delivering Community Leadership work to date and identify gaps and opportunities for improved funding approaches.
- State and local governments are significant stakeholders in much of the laboratories' community-engaged work. These partnerships should be assessed for best practices and lessons learned that can be promulgated across the laboratory community.
- The state/local and laboratory partnerships should be expanded and enhanced to include reducing barriers of entry for initial engagement with laboratory experts and exploring opportunities for additional cofunded projects that leverage local and federal support to achieve shared goals.

3.4 Strategic Approach Is Required for Scaling of Research and Community Impacts

The workshop and case study submissions identified several priorities for place-based community-engaged research, as well as technical and structural challenges involved in achieving those priorities at a scale that will result in the level of national impact required to realize current national goals for energy transformation and economic development.

The case studies revealed that while there are project-level successes in supporting both improved RDD&D and community outputs through community-engaged research, a strategic approach is required to scale both the research and the community impact. To date, resources have been dedicated to individual locations (e.g., Puerto Rico) or technologies of interest. While these may inform technology development or the energy goals of a specific location, they are often resource- and priority-limited in terms of contributing lessons learned and research learning to benefit other communities or broaden technology application.

A strategic approach is necessary, in coordination with DOE and other federal partners, to discover how place-based RDD&D can be leveraged more effectively to advance toward national goals while benefiting the communities with which the labs engage. The learning, capability development, informing of policy, and evolution of lab cultures that derive from place-based work can be strategically targeted. Labs can work together to share features of case studies and engagements, generating a portfolio that is significantly greater than the sum of its parts. However, a deeper understanding of how place-based work can achieve a balance of local and national impact—and thereby enrich the labs and DOE—is necessary. This systems-focused approach could be instantiated through interactive and leader-engaged modeling, thereby improving lab leaders' mental models of how portfolios of place-based work can be developed to best achieve goals.

The location-based approaches evaluated here, even at a high level, reveal extensive learnings that could be applied to a strategic program. Among them are the importance of developing long-term relationships, prioritizing meaningful engagement throughout the project process, and valuing local and contextual expertise along with technical expertise. These can be translated to a strategic approach with increasing benefit to the research and community through a coordinated, multilab approach that prioritizes collaboration with on-the-ground stakeholders throughout the process.

4 Conclusion and Next Steps

The NLDC Place-Based Activities Workshop successfully identified and cataloged extensive DOE laboratory experience and expertise in place-based work. Discussion leading up to, during, and following the workshop demonstrated immense commitment and excitement among laboratory staff and leadership to grow the national laboratories' community engagement and impact.

The following observations and recommendations highlight options for next steps to move community-engaged research forward at the laboratory and NLDC levels:

- Laboratories should build, cultivate, and prioritize communities of expertise around place-based work, including recruitment, training, and reward systems for staff specializing in this area.
- There is a need to further refine and prioritize the definition of community-engaged research such that innovations in this space can be more clearly identified and lessons gleaned to improve overall outcomes for laboratories and communities.
- The goals of place-based R&D are bidirectional. Project and program planning should include intentional inquiry into what contributions and education from and by community partners will be necessary to achieve project goals, as well as intentional reflection on what impacts the project aims to have on a given community and how that will contribute to achieving national and local goals.
- While a virtuous feedback cycle of place-based R&D may exist, targeted systems thinking, and modeling, is necessary to elucidate how portfolios of place-based R&D can be crafted with this feedback cycle in mind to best take advantage of synergies among projects to avoid significant overlap and wasted effort.

In response to the above observations, **we more specifically recommend NLDC create a Place-Based Working Group to define and develop a common understanding of and approach to scaling community-engaged research and impact because:**

- Increasing diversity within our laboratory teams is a priority; in the area of community-engaged research, it is even more imperative that laboratory teams reflect the demographics of our community partners.
- Laboratories have significant programs in STEM workforce development but do not have a consistent approach for assessing and evaluating laboratory impact on the nonlaboratory workforce and broader community.
- Laboratories can contribute to the development and retention of talent in technology fields in their local and regional geographies by working collaboratively with public and private community members in their geographic regions to coordinate STEM education and pipeline programs that meet multiple needs.
- Laboratories can contribute to development and retention of the entrepreneurial workforce by actively engaging with their local and regional innovation ecosystem stakeholders, especially incubators and accelerators targeting emerging companies.

Workforce emerged as a critical issue for successful mission execution at all laboratories. **We recommend the NLDC focus on workforce independent from place-based efforts and directly engage the laboratories' workforce subject matter experts in that process.**

At the DOE level, we observe and advocate for the following:

Place-based R&D is an existing field of work that, like other national laboratory capabilities, continues to develop and evolve in real time. Review of the case studies submitted for this workshop revealed the following needs specific to place-based research:

- A deeper dive into existing case studies, and an inquiry framed to capture a wider range of research activities, could identify more refined program development best practices and offer key learnings for formalizing the cross-laboratory approach to community-engaged research.
- A more comprehensive understanding of where these lab-community partnerships are taking place would inform a discussion about whether the labs are working in the places and with the communities where they are most needed.
- Additional data on stakeholder types and interaction models could improve our understanding of laboratory research innovation and community impact, including how and to what extent communities are consulted and informed, and how their feedback is incorporated.
- Additional information about the range of research activities that take place during community-engaged activities would also be helpful.

Advancing the discipline of place-based R&D requires independent focus on the discipline and capability development. **We recommend the NLDC continue to stay connected to DOE and support place-based R&D and specifically community-engaged research at the national laboratories. DOE national laboratories already do significant place-based work within our DOE work and with our external partners.**

Scaling community-engaged R&D will be necessary to achieve the aggressive economic, energy, and climate goals articulated by DOE.

- Impacts could be scaled by incorporating place-based R&D into existing DOE and laboratory programs and by reducing barriers to collaboration with community based partners.
- Long-term relationship development and maintenance is critical for successful place-based work but is inherently unique and locally driven.
- We recommend the NLDC work with DOE to actively pursue and support incorporating place-based priorities into existing programs and support regional and local implementation efforts that reflect community specific needs and strengths.

Perhaps the starkest observation to arise from this workshop was that significant gaps exist between where we are today and where we will need to be to affect the change at the scale we seek. Taking the steps recommended above will go a long way toward closing those gaps.

Acknowledgments

Elizabeth Doris at the National Renewable Energy Laboratory led this effort on behalf of the National Laboratory Directors' Council (NLDC). NLDC Secretariat Julie Wulf-Knoerzer of Argonne National Laboratory and John Louis Sarrao of Los Alamos National Laboratory provided critical topical input and guidance to support the development and execution of the workshop and the report.

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The workshop benefited extensively from DOE input, especially that of Vanessa Chan, Tanya Das, Susannah Howieson, and George Roe.

Technical workshop execution was led by Elizabeth Doris, Bobby Jeffers, Kyle Pfeiffer, and Robin Wong.

Following the workshop, a subset of the above team, including Bobby Jeffers, Robin Wong, Joe Gettler, Paulina Rychenkova, Elizabeth Doris, and Margaret Dick, compiled the Workshop Findings document. The write-up also benefited from NREL Graduate Intern Laura Supple's case study organization and data set development.

The workshop, materials, and report would not have been possible without the extensive support of Anna Garcia, Beth Clark, and Erica Rychwalski of the National Renewable Energy Laboratory, and Amy Engel and Liz Flynn of Brookhaven National Laboratory.