Deployment Readiness Framework Subtask 1.2 Outreach Report:

Common Themes Among Clean Energy Transition Technical Assistance Projects

Kerry Strout Grantham,[1] Katie Arkema,[2] Katie Peterson,[1] Aryana Nakhai,[1] and Saurabh Biswas[2]

1 National Renewable Energy Laboratory
2 Pacific Northwest National Laboratory

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15013 Denver West Parkway
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List of Acronyms

C-LEAP	Community Local Energy Action Program
DOE	U.S. Department of Energy
DRF	Deployment Readiness Framework
EERE	Office of Energy Efficiency and Renewable Energy
ES4SE	Energy Storage for Social Equity Initiative
ETIPP	Energy Transitions Initiative Partnership Project
LA100	Los Angeles 100 [Equity Strategies]
NREL	National Renewable Energy Laboratory
PNNL	Pacific Northwest National Laboratory
TRL	technology readiness level
WPTO	Water Power Technologies Office

Executive Summary

Island and remote coastal communities face an uncertain energy future. These communities build, operate, and maintain energy infrastructure in extremely challenging environments and pay the highest prices for electricity and fuels. Moreover, climate change increasingly affects grid reliability, resiliency, and, ultimately, the cost of energy. Marine energy could address many of the challenges faced by island and remote coastal communities, but these communities often have limited resources and capacity to invest in complex energy and coastal resilience issues.

The Deployment Readiness Framework (DRF) is being developed to support community-driven energy transitions in these remote, coastal, and island communities and to better understand the readiness of communities for marine energy demonstration and operation. Led by the National Renewable Energy Laboratory and Pacific Northwest National Laboratory, the DRF builds on the Energy Transitions Initiative Partnership Project (ETIPP) supported in part by the U.S. Department of Energy's (DOE) Water Power Technologies Office.

This report details the results from the stakeholder outreach and engagement effort with clean energy transition technical assistance programs, which is linked to the previously reported literature review (Arkema et al. 2022) and indicates the following three results: First, **there are echoes of the key phases in effective science policy processes for renewable energy projects that show up in technical assistance programs**. This iterative process includes (1) scoping and convening, (2) collecting data and establishing a baseline assessment, (3) developing alternative pathways or scenarios for the future, (4) analyzing these alternatives, (5) identifying financing mechanisms, (6) communicating and sharing a strategic plan, (7) implementing the plan and associated projects, and (8) monitoring and evaluating projects, policies, and action with respect to the plan.

In practice, scoping generally includes defining partnerships and roles, establishing a workplan, developing a rapport between partners, and ensuring the workplan is feasible with the given resources, timeline, and expertise (Rosenthal et al. 2015). Differences are noted in scoping activities between cases in which a community has reasonably well-defined expectations of technology or infrastructure outcomes and more exploratory cases where communities are aiming to address existing challenges through energy infrastructure and are not tied to a specific technology choice or other energy system upgrade/efficiency measures. Technical assistance project arcs appear to struggle to adapt to the emergent needs in the latter situation and will be described in the analysis contained in this report.

Outreach data collected for this report show that many technical assistance projects are linearly structured and could benefit from an adaptive management approach. Adaptive management tests predictions against observations, which allows for iterative recalibration of the management process at predetermined decision points as learning occurs throughout the length of a project (Williams 2011). This approach aligns with the Subtask 1.1 report finding that emphasized the importance of developing participatory processes that allow for iterative collaboration between communities, scientists, and government throughout an energy transition.

Second, while technical assistance programs temporarily added capacity from the national laboratories to communities (particularly with respect to human capacity and technical

expertise), **there is a need for sustained assistance beyond the funding life span of technical assistance projects**. Communities need additional assistance to achieve project objectives in clean energy transitions. Due to structural barriers with funding mechanisms for technical assistance programs, it is difficult for DOE to fund communities directly. Technical assistance projects generally cover the planning, design, and analysis facets of clean energy transitions. Often, projects do not have adequate staff to complete the tasks at hand. Such capacity issues limit access to the expertise needed for technical assistance and may limit how a community proceeds in its clean energy transition.

Third, outreach to the first cohort of ETIPP communities strongly indicates that **communication between communities and technical assistance providers from national laboratories tends to be slow due to the use of technical jargon**. Communities struggled with understanding technical jargon early in the project, and technical assistance providers likely struggled to communicate without using technical jargon, which created a barrier to constructive conversations and decision-making processes. Deliberate use of community-specific plain language early in project scoping can go a long way in communicating more effectively. Meeting a community "where it is" is an important ingredient in relationship-building for technical assistance projects.

The next step in this work involves combining the results from the engagement phase with the literature review to inform the design, development, and testing of the DRF, with the goal of applying the resulting framework to marine energy demonstration projects.

Table of Contents

List of Figures

1 Introduction

The U.S. Department of Energy's (DOE's) Water Power Technologies Office (WPTO) is spearheading several efforts to understand and leverage the power of the oceans to achieve economic prosperity, social equity, and environmental sustainability. For example, DOE's Powering the Blue Economy™ initiative[1] aims to identify the power requirements of emerging coastal and maritime markets and advance technologies that integrate marine energy to relieve power constraints and enable new opportunities both near shore and offshore. The Resilient Coastal Communities program within the Powering the Blue Economy initiative supports energy innovation for remote, coastal, and island communities with a focus on end-user needs, emergent blue economy markets, technology optimization, and marine energy. While these efforts aim to advance the development of marine energy technologies, there is increasing recognition on the part of scientists, technology providers, industry, DOE, and other federal agencies that designing and deploying effective renewable energy technologies requires iterative exchange of information and meaningful co-production of approaches and tools with communities and stakeholders interested in transitioning to resilient energy systems.

Over the last several years, WPTO has increasingly invested in programs that foster engagement and collaboration among DOE, national laboratories, communities, and stakeholders to support community-driven energy transitions in island and remote areas. For example, DOE, a marine energy developer, and renewable energy researchers built a relationship with tribal leadership in Igiugig, Alaska, over a decade, resulting in the deployment and demonstration of a marine renewable energy device in 2019. In a separate example, WPTO has invested significant resources and capacity in the Energy Transitions Initiative Partnership Project (ETIPP),[2] which is a collaboration among several DOE offices, national laboratories, and regional stakeholders working alongside coastal and island communities to bolster their energy resilience planning. These efforts have highlighted not only the importance of collaboration among scientists, policymakers, and local populations, but also the need for tools and approaches (designed not just for researchers and industry) that can be used by communities to link energy outcomes to community goals and to scale these resilience efforts to other populations.

1.1 Deployment Readiness Framework

To address challenges related to supporting resilient energy transitions for island and remote communities, WPTO funded the development of the Deployment Readiness Framework (DRF). This project is jointly led by the National Renewable Energy Laboratory (NREL) and Pacific Northwest National Laboratory (PNNL). The DRF team will develop a framework that defines marine energy demonstration readiness from both community and programmatic perspectives. At its core, the DRF presents a vision for community-driven, ecologically sustainable design that seeks to balance energy resilience, ecosystem resilience, and community development goals.

The development of the DRF includes three main tasks: Task 1 is a learning phase involving an outreach and engagement campaign to stakeholders and communities and a literature review to

[1] https://www.energy.gov/eere/water/powering-blue-economy
[2] https://www.energy.gov/eere/about-energy-transitions-initiative-partnership-project

synthesize metrics of community readiness to advance through an energy transition. Task 2 is a development phase in which specific approaches and tools in the DRF are defined and developed to help decision-makers at WPTO and researchers at national laboratories better understand a community's readiness for energy transition. Task 3 is an implementation phase to create the tools and interfaces for WPTO and the national laboratories to interact with the DRF. Additional details about DRF tasks are included in Appendix A.

The outreach and engagement effort in Task 1 serves two purposes: (1) engage directly with communities, technical assistance partners, and program leadership associated with ETIPP to identify the process of community-driven energy transitions, and (2) engage directly with DOE sponsors and national laboratory managers of technical assistance programs that support clean energy transitions in communities across a range of technologies to better understand clean energy technical assistance program design and lessons learned.

All three phases include close collaboration with communities and end users of the framework—first, to identify gaps in the science and tools needed to achieve community-driven energy transition goals, and second, to iteratively test and improve the framework. Through technical assistance programs and utilizing the completed DRF to understand the influencing factors that motivate or deter energy transitions, WPTO hopes to engage a number of near-term marine energy demonstration opportunities. The audience for the DRF is DOE and the national laboratories. It eventually may be reorganized and revised for communities that are interested in assessing their own readiness for marine energy demonstration.

This report is organized into four sections: an overview of what technical assistance is, a description of the methods used in this analysis, key findings of the analysis, and conclusions. Outreach and engagement efforts took place between June 2022 and February 2023 and were conducted in accordance with the NREL institutional review board. Key terms are defined in the glossary at the end of the report.

2 Definition of Technical Assistance

Technical assistance programs funded by DOE combine DOE's energy sector capabilities with the specialized local expertise of community-based partner organizations and aim to advance community energy transitions by working alongside communities to identify and advance strategic, whole-system solutions. Technical assistance programs are typically administered by national laboratories in partnership with local, regional, and national subject matter experts; DOE research institutions; and federal government staff. Types of technical assistance include:

- Data collection and assessment activities to help states, localities, and tribes determine impacts, evaluate policy options, and identify technology and market strategies
- Convenings of public officials and stakeholders to share best practices, tackle key issues, and build consensus for preferred courses of action
- Education and training through workshops and webinars to equip policymakers and decision-makers to address local and regional needs
- Consultations for quick-turnaround analysis in which technical experts advise policymakers and decision-makers on specific matters of interest.[3]

The technical assistance programs included in this report are:

- Office of Indian Energy technical assistance[4]
- Community Local Energy Action Program (C-LEAP)[5]
- Los Angeles 100 (LA100) Equity Strategies[6]
- Energy Storage for Social Equity Initiative (ES4SE)[7]
- SolSmart[8]
- Clean Cities Coalition Network[9]
- ETIPP.

2.1 Energy Transitions Initiative Partnership Project

NREL manages ETIPP, a technical assistance program sponsored by several DOE Office of Energy Efficiency and Renewable Energy (EERE) technology programs, including the Energy Transitions Initiative, Building Technologies Office, Geothermal Technologies Office, Solar Energy Technologies Office, Vehicle Technologies Office, Water Power Technologies Office, and Wind Energy Technologies Office. ETIPP provides technical assistance to help remote and island communities increase their resilience through energy transition planning and analysis. ETIPP program objectives include:

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[3] https://www.energy.gov/ta/technical-assistance-frequently-asked-questions
[4] https://www.energy.gov/indianenergy/technical-assistance
[5] https://www.energy.gov/communitiesLEAP/communities-leap
[6] https://maps.nrel.gov/la100/equity-strategies#data-driven-community-informed-approach
[7] https://www.pnnl.gov/projects/energy-storage-social-equity-initiative
[8] https://solsmart.org/
[9] https://cleancities.energy.gov/

1. Help remote and island communities identify and plan for energy solutions to increase their resilience
2. Analyze both proven and novel clean energy technology options
3. Prepare communities to seek commercial technologies applicable to their goals
4. Connect DOE research priorities with community technology needs.

ETIPP employs a community-driven approach to identify and plan resilient clean energy solutions that address a community's specific challenges. This approach combines the experience and expertise of local community leaders, residents, and organizations within the ETIPP partner network. The ETIPP partner network connects selected communities with regional nonprofit or academic organizations (known as Regional Partners), energy experts at DOE research institutions (Lawrence Berkeley National Laboratory, the National Renewable Energy Laboratory, Pacific Northwest National Laboratory, and Sandia National Laboratories), and DOE clean energy technology offices to navigate options for addressing local energy resilience challenges.

ETIPP communities are competitively selected to participate, with an anticipated 12- to 18-month project per community. In 2021, there were 11 communities selected in the first cohort to receive technical assistance from ETIPP. Since then, 12 communities were selected for the second cohort. Both cohorts represent remote and island communities across the United States.

The DRF outreach and engagement effort described in subsequent sections draws comparisons between nine ETIPP projects in the first cohort and six other technical assistance projects to better understand and articulate key steps in energy transitions and to facilitate discussions around community readiness for marine energy demonstration.

3 Outreach and Engagement Methods

To better understand how technical assistance informs community-driven energy transitions, we conducted both surveys and interviews of key people involved in technical assistance programs sponsored by DOE. Our approach involved four main steps performed over the course of eight months. First, we developed research questions for the surveys and interviews. We then identified, invited, and interviewed participants. Next, we developed a data management system, and lastly, we conducted the thematic analysis and synthesized results. The following subsections provide further details on these steps.

3.1 Questions

To guide the outreach and engagement process, four categories of research questions were developed by the DRF team for ETIPP communities and teams and other clean energy technical assistance program managers:

1. Design and effectiveness of technical assistance programs
2. Perception of community readiness by technical assistance provider
3. Information exchange in technical assistance projects
4. Technical and programmatic needs.

For the community-focused outreach and engagement, three categories of research questions were developed by the DRF team for the first cohort of the ETIPP program:

1. Motivation to participate in the ETIPP technical assistance program
2. Community experience with the technical assistance received in ETIPP
3. Outcomes of the technical assistance received in ETIPP.

The outreach and engagement effort sought input through a combination of semi-structured interviews and surveys with respondents chosen to represent different roles and experiences within technical assistance projects. The aim of this elicitation was to provide a rigorous foundation for a structured approach to future community engagements. From the interview responses, comparisons and similarities were noted between ETIPP projects and technical assistance projects.

3.2 Participant Inclusion/Exclusion Criteria

For this study, participants were required to:

- Be at least 18 years of age
- Be a participant in DOE-funded community-driven energy transition technical assistance projects
- Be able to give written consent.

The outreach and engagement effort engaged 52 participants over 43 semi-structured interviews, occasionally grouped by awardee team (Figure 1). Different geographical regions across the United States were represented among the groups.

3.2.1 ETIPP Participants

The participants targeted for outreach (surveys and interviews) include all technical assistance leads, regional leads, regional partners, and representatives from a select number of communities associated with the first cohort of the ETIPP.

- **Technical Leads:** Lead and conduct the technical assistance effort scoped for any one community, including production and delivery of deliverables.
- **Regional Leads:** Coordinate regional partners, technical leads, and community leads to manage ETIPP projects, address challenges, and identify trends and opportunities.
- **Regional Partners:** Provide local contexts, and work to ensure ETIPP projects are bespoke given these contexts. Regional partners advise communities during the application process and subsequently interface with communities during onboarding and throughout the project.
- **Community Representative:** Those that applied for ETIPP assistance; often the project champion or key personnel within the community that co-lead the ETIPP technical assistance from the community perspective. Please see the glossary for a working definition of "community" defined by the Community-Led Innovation Center.

3.2.2 DOE Sponsors and Technical Assistance Program Leads

The DRF team identified program leads from NREL and PNNL as well as DOE program sponsors working on community-driven clean energy technical assistance projects across DOE's EERE portfolio (C-LEAP, Office of Indian Energy technical assistance, SolSmart, Clean Cities, ES4SE, and LA100 Equity Strategies).

- **DOE Sponsors:** Representatives from DOE offices that manage technical assistance programs; these respondents provided high-level objectives and strategies for technical assistance programs.
- **Technical Assistance Program Leads:** Representatives from national laboratories that execute the vision of technical assistance programs developed by DOE. These respondents provided insight into what makes technical assistance programs effective in clean energy transitions regardless of the technology and resource type.

13 ETIPP Technical Leads	04 ETIPP Regional Leads	07 ETIPP Regional Partners	06 ETIPP Cohort 1 Communities	07 Technical Assistance Program Leads	15 DOE Technical Assistance Sponsors
National Renewable Energy Laboratory Pacific Northwest National Laboratory Sandia National Laboratory Lawrence Berkeley National Laboratory	Northeast Southeast Pacific Alaska	Island Institute Renewable Energy Alaska Project Hawaii Natural Energy Institute Coastal Studies Institute	Eastport, ME Sitka, AK Wainwright, AK Alaska Longline Fishermen's Association Dillingham, AK Ocracoke, NC Islesboro, ME Kauai, HI Nags Head, NC	Indian Energy Technical Assistance Communities Local Energy Action Program LA100 Equity Strategies Energy Storage for Social Equity Initiative SolSmart Clean Cities	Water Power Technologies Office Office of Energy Efficiency & Renewable Energy Office of Policy Office of Electricity Wind Energy Technologies Office Geothermal Technologies Office

Figure 1. Number of interview participants by group and organizations/regions represented in each group.

Graphic by Tara Smith, NREL

3.3 Interviews

Semi-structured interviews (hereafter, "interviews") are a way to glean detailed, nuanced information from participants through open-ended questions and enable interviewers to follow up or clarify questions during the interview (Adams 2015). This method allows the interpretation of larger themes across groups through qualitative analysis of responses while still capturing information that would be lost in surveys alone (Adams 2015).

Interview questions focused on understanding the priorities and challenges related to transitioning to clean energy that each community experiences. Due to the flexibility of this interview technique, the questions within the interviews were moderately tailored to each group of respondents to better capture respondents' unique perspectives and experiences on technical assistance projects. The interviews were designed to offer a safe space to share feedback, knowledge, and challenges. A full list of interview questions is included in Appendix B.

Interviews were held virtually with one entity at a time with one or more representatives. Interviewees were provided questions ahead of time to prepare for the interview. All video interviews were recorded and transcribed by Microsoft Teams and lasted approximately 40 to 60 minutes (Appendix C outlines interviewer best practices). After every interview, the analysis team accessed the video and transcripts from the secure data repository. The transcripts were de-identified and checked for errors, and then interviews were distilled so that responses were matched with questions within a spreadsheet to facilitate thematic analysis (Figure 2). See Section 3.5 for more information about data management and confidentiality. Results are summarized in the key findings section below.

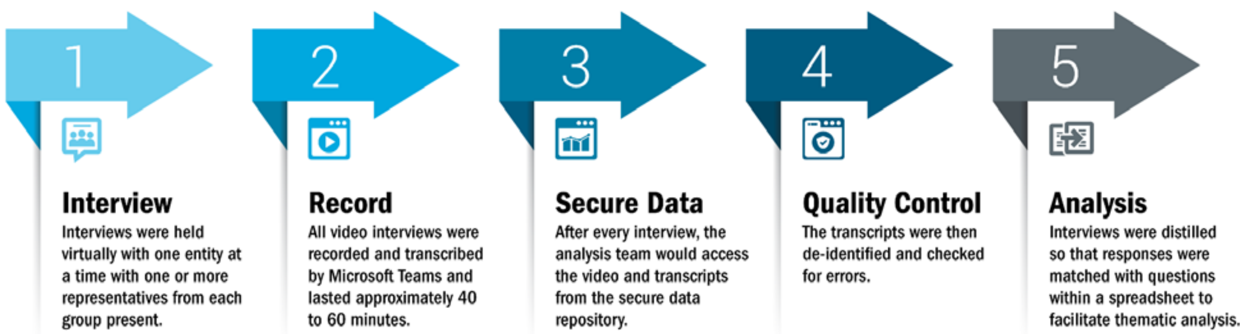

Figure 2. Interview process.

Graphic by Tara Smith, NREL

The themes that were derived from the interviews formed the basis for the recommendations to improve the DRF, found in the conclusion of this report. These recommendations will be integrated into a DRF design document that will be created during Task 2.

3.4 Survey

Participants who consented to a 15-minute survey were provided a link through Google Forms to complete electronically (Appendix D). Survey categories included basic project information, communication, and project scoping and implementation. Survey participants were anonymous;

a code was used in place of a name (see Section 3.5). Survey links were sent to participants at least one week in advance of their scheduled interviews.

Surveys were the hardest to deploy and yielded the least helpful results across groups because of the limited context that each respondent could provide. A total of 16 surveys were completed. The groups that took surveys were technical assistance leads, regional leads, and regional partners. While the results of the surveys were less informative than the interview responses, the survey did prime interviewees on the questions that would be asked in the subsequent interview.

3.5 Data Management and Confidentiality

All participants were assigned a random designating code in place of their names on all surveys and interviews. Only the DRF assessment team has access to these codes and the individuals they are assigned to in a data sheet separate from the data collected in the survey and interview.

Data are stored on a password-protected and secure NREL server. All DRF assessment team members have access. All identifiable data will be deleted from the server following completion of data analysis, no later than the end of the project, October 1, 2023.

To protect the confidentiality of evaluation participants, raw data will not be published or shared with other DOE national laboratories. Composite summaries will be shared with national laboratories and DOE staff interested in the development of the DRF. Upon request, this report will be shared with program participants.

3.6 Thematic Analysis

Thematic analysis is the method by which patterns of meanings are determined from across a qualitative data set. This methodology comprises multiple steps involving familiarization with the data, extraction of key themes and patterns, and then revision and interpretation of the themes (Braun and Clarke 2021). Most of the themes in this analysis were determined inductively: the themes were extracted post hoc based on the interview responses to open-ended questions. Interview questions were analyzed deductively: the responses to interview questions inquiring about the arc of a technical assistance project were matched to the steps in an energy transition, which had been created ad hoc. These steps were based on the literature review that informed Task 1.1 (Arkema et al. 2022).

The analysis team read through the interview responses for each question, identifying themes and noting particularly unique or unusual statements. Using both inductive and deductive thematic analysis, the team created “frequency charts” by grouping similar themes and quantifying their frequency among responses, where higher frequency indicated more significant themes (see charts in Appendix E). To provide context for the extracted themes, the team performed qualitative reviews, in which themes from each group’s responses were compared within and between groups to ascertain how each group experienced technical assistance projects and how experiences may have differed based on respondents’ roles within the projects. The steps of the thematic analysis are diagrammed in Figure 3.

Figure 3. Thematic analysis process.

Graphic by Tara Smith, NREL

The benefit of this approach is that it allowed the team to consider emerging themes throughout the process and to discuss ideas about overall technical assistance program design effectiveness. Additionally, the team was able to make changes to the interview questions to focus on getting the most relevant information; these changes were incorporated regularly throughout the process. The drawback of this approach is that it left room for the team's individual biases in the interpretation of which topics were most important. However, the potential for bias was mitigated through discussions between the analysis and interview teams following each thematic analysis. The teams met weekly to review the frequency charts to ensure the responses appropriately mapped to themes and resonated with the content provided by the interviewees.

While the responses with the highest frequencies in the interviews were used as the initial basis for theme development, the themes were further refined by considering the nuances within the interviews as well as the context of which group was being interviewed. The potential of selection bias in the interviews was considered during the theme development and during the solicitation for interview participants; the sampling pool was ultimately limited, as the ETIPP program was relatively new at the time of this research. Finally, with limited sample sizes, selection biases are unavoidable, which is why nonstatistical methods were used to interpret the interview responses (Robinson 2014; Galvin 2015). To have statistically suitable sample sizes for the interviews to eliminate selection bias, we would have needed more than 30 respondents within each group, which was not viable for the scope of this work (Galvin 2015).

4 Key Findings

This section highlights key takeaways identified across all the stakeholder interviews. The intent is to capture the commonly supported themes for the framework. While the interviews largely focused on the ETIPP technical assistance program, these findings are not intended to present an evaluation of the program. ETIPP serves as an example for technical assistance programs and provides the DRF team a means to better understand and articulate key steps in community energy transitions.

Each interview provided a wealth of information about each stakeholder's context, challenges, opportunities, and thoughts on how DOE could support communities in achieving their clean energy transition goals. NREL has transcripts for all interviews; the transcripts are long and detailed. Therefore, the DRF team identified the top 2–5 takeaways from each group and broke them out by the category of research questions.

4.1 ETIPP Technical Leads

ETIPP technical leads lead and conduct the technical assistance effort scoped for any one community, including production and deliverables.

4.1.1 Program Design and Effectiveness

- **Allowing sufficient time for scoping is crucial for shaping project progress.** Scoping was a commonly used term in the interviewees' responses to this set of questions. In discussing how work kicked off within the projects, over half of the respondents mentioned scoping was among the top priority. When asked what the arc of a technical assistance project consists of, all respondents mentioned scoping and convening at the beginning of the process. Additionally, many responses tied project success to developing a clear scope and workplan at the beginning of a project.
- **Community co-development and involvement during the scoping process is critical, as it helps shape project success.** Community co-development in the scoping process relies on the community's experience to capture project goals; in turn, the technical assistance team assembles experts within national laboratories to help the community achieve its goals. Therefore, frequent communication with the community for understanding goals and developing a clear scope, providing resources for bringing in data and institutional knowledge, and discussing and addressing challenges was an important factor in shaping project success and increasing data collection and knowledge transfer opportunities.

4.1.2 Influence of How Information Is Exchanged

- **Consistent interactions with the community drive essential knowledge transfer opportunities needed for project progress.** Since many of these projects took place during the pandemic, it is evident that normal operations were affected. In discussing how site visit limitations affected project progress, most responses mentioned gaps in communication, relationship development, and data collection opportunities. While there were some technical assistance leads that did not believe COVID limited project progress or success, most technical assistance leads agreed the limited relationship development and opportunities for trust-building and fostering collaboration hindered the speed at which they could move forward. In-person site visits tend to yield more information sharing than can typically occur remotely and allow for a level of communication that is often more difficult to achieve virtually.

- **When planning, having a resilient and reliable energy source is prioritized over positive impact to the environment.** Project scope, analysis, and decisions were mainly focused on increasing energy reliability and resilience for communities. Since many communities rely on fossil fuels or diesel as their primary energy source, diversifying their energy sources from the perspective of cost, long-term availability, and reliability during outages has been of primary interest. Although also important, reducing carbon emissions and impacts to climate and ecosystems tended to be a secondary priority. Some community members had questions about how the integration of alternative resources, such as hydropower, would impact them or the community as a whole (i.e., effects on water flow and fish populations).
- **Scoping allows communities and technical assistance providers the opportunity to address community values and project priorities.** Energy resilience, climate resilience, and ecosystem values were commonly considered during the project planning stage. Having these values in mind helped clarify primary drivers and where to prioritize efforts during project scoping. Communities seeking technical assistance through ETIPP were primarily motivated by self-sufficiency and having reliable sources of energy, and climate or environmental benefits were identified as "bonus" outcomes.

4.1.3 Community Readiness

- **Within ETIPP projects, technical assistance involves a multitude of diverse and/or technically adjacent activities.** A holistic community assistance approach is necessary to address the variety of roles needed to advance a project and make it effective. Although technical assistance, such as data collection, analysis, and modeling, is required for community projects, additional assistance with capacity-building, outreach, and strategic planning is also important to ensure community assistance needs are met on all fronts.
- **Technical leads are unsure and tend to be risk-averse when determining a community's readiness for certain technology readiness levels (TRLs).** Most technical leads feel they do not have a strong sense of the factors that influence an appropriate TRL for community-driven renewable energy demonstration projects but say that communities that are highly risk-averse require a technology with higher maturity. This leaning toward more mature technology may influence what potential solutions are presented to a community during the scoping process.

4.1.4 Technical and Programmatic Needs

- **In general, work products are shared with the community team and include analysis results and a summary report.** Many projects share the modeling results with the community and discuss the costs and benefits of the various options or scenarios. This is typically done in the form of a PowerPoint presentation, written document, or both to help community leads understand the results in a digestible format.
- **There is some level of disconnect between the technical leads and the community, making it difficult for the technical leads to identify challenges.** Challenges with leadership and the pace at which the project started, miscommunication about roles and

task ownership, and lack of communication with the communities were all challenges identified through the course of the projects. Additionally, difficulties in setting and agreeing upon expectations between communities and technical assistance providers has impacted project progress in some circumstances.

4.2 ETIPP Regional Leads and Regional Partners

Regional leads are technical monitors of ETIPP projects who coordinate the regional partners, technical leads, and community leads to manage projects and address challenges.

Regional partners are generally nonprofit organizations that are subcontracted to support community engagement for ETIPP projects within their geographic region. Regional partners work with the team to ensure ETIPP projects are adapted to local contexts and constraints.

4.2.1 Program Design and Effectiveness

- **Scoping, communication, relationship-building, and the presence of a project champion all strongly correlate with the success of a project.** In most communities, building strong relationships between the project champion, regional partner, and technical assistance leads from the start has been key for information gathering and project progression. It also promotes understanding of the end product and helps inform future decision-making processes and investments.
- **Project champions are key for creating synergies necessary for project progress and success.** The presence of one or more project champions within the community is instrumental in guiding a project's priorities, coordinating groups, connecting individuals with the right teams, gathering the information needed to move forward, and making decisions when needed. Having key personnel to navigate policy issues, find funding, and seek out technical assistance is critical in helping communities make technical transitions successfully. Examples of project champions include a community's mayor, citizen organizers, town council members, and active city committee members. Generally, one project champion is present in ETIPP projects.

4.2.2 Influence of How Information Is Exchanged

- **Project turnover affects knowledge transfer and project progress, which indicates that individuals are carriers of skills and knowledge.** It is common to experience turnover within technical assistance project teams, both on the community side and DOE/national laboratory side. Planning for turnover early in a project (e.g., having redundant roles, engaging a greater number of people) helps mitigate knowledge transfer gaps and project slowdowns. This is especially important on the community side, where turnover tends to be common, and projects can be understaffed.
- **In-person meetings and site visits are generally considered valuable; however, their absence does not weaken program design.** COVID-related limitations on in-person meetings and site visits were accounted for at the start and expectations set accordingly. A small number of projects had the opportunity to conduct in-person meetings and/or site visits. While all regional leads and partners agree that in-person interaction could have helped (or did help) in fast-tracking rapport-building with community and data collection to some extent, their absence did not weaken or would not have weakened the eventual outcomes. Alternatively, as noted in the technical lead section above, most technical

assistance leads agreed the limited relationship development during COVID and limited opportunities to build trust and foster collaboration hindered the speed at which they could move forward.

- **The information exchange was uneven between technical assistance providers and the community.** Communications strategy largely relies on the technical assistance team getting information relevant to the scope of the project. Two distinct features of information gathering are (1) identifying selected informants from the community to provide information and (2) requesting information from the community informants. As a result, program design in all cases is highly susceptible to disruptions and delays from turnover in staff and informants.
- **Communication can be insufficient at certain stages of projects while technical assistance providers work "in the background."** Results are reported to the communities during scheduled meetings. Less formal and more open communication channels, such as online communication platforms, have been suggested to bridge this gap.
- **It is difficult to anticipate scoping needs at the beginning of a project. A technical approach to scoping (such as that used in an engineering project) makes it challenging to identify where communities are in their energy transition.** It was easier for technical and community leads to identify what should have been included in the scope rather than what could have been removed. Responses indicate that understanding what to scope at the beginning of the project can change over time, and a more encompassing approach should be identified to make scoping more conducive to meeting communities where they are in an energy transition. The respondents commonly mentioned wanting the following added to the project scope: presentations and public products, greater community involvement and communication, objectives for all stakeholders, greater relationship development, data and information gathering, and expectation management about the process.

4.2.3 Community Readiness

- **There are differing priorities between regional leads and regional partners regarding what communities need.** Regional leads adopt the technical assistance project scope as their lens when interpreting requests for additional support and resources to meet goals. Additionally, they are focused on written documents and developed models as necessary components of ETIPP projects. Regional partners, on the other hand, take a broader view of community needs. They recognize the limits of the project's scope of support and identify other opportunity areas from a wider range of entities. Further, regional partners identified relationship development and communication as fundamental to ETIPP projects. Therefore, regional partners have vital roles in grounding the project and its deliverables to match communities' needs. These differing priorities may stem from how NREL has defined the roles of regional leads and regional partners within ETIPP (see Section 3.2).
- **Differing priorities within the project team and partner organization dynamics present roadblocks that negatively impact project progress.** Coordination, jurisdiction, priorities, and sensitivity to trust around information sharing among institutional partners/stakeholders involved with the communities are identified friction points. Such dynamics may be barriers to the needs and projected outcomes of the

technical assistance process. In one circumstance, there was friction between power companies and municipal groups, which made it difficult for the technical assistance providers to get questions answered and move forward with the project. In another example, a municipal planning department was not interested in collaborating with external organizations, which placed the role of mediation on the regional partner.

4.2.4 Technical and Programmatic Needs

- **There appears to be differing perspectives on the relevance of technical work products and additional programmatic support between regional leads and regional partners.** Echoing the differing perspectives on community needs in the previous section, regional leads feel the work products are sufficient outcomes of the technical assistance; the onus of using the products rests with the community. Regional partners alternatively emphasized greater clarity, guidelines, and recommendations that help communities contextualize and leverage the work products for next steps. These differing perspectives may stem from how NREL has defined roles of regional leads and regional partners within ETIPP.

4.3 ETIPP Community Representatives

A community representative is the person from the community or organization who applied for ETIPP assistance. Community representatives are often project champions.

4.3.1 Motivation

- **Energy resilience and minimizing cost of energy are drivers for communities to apply to the ETIPP program.** Power outages and disruptions for communities are not uncommon and present challenges for some community members. The primary goal for communities is to explore options for energy resilience and bringing reliable, backup power to their community. Secondarily, communities are interested in replacing their backup diesel generators with renewable technologies, specifically to help lower the cost of energy.
- **ETIPP is valuable to communities because it provides (1) accessible assistance for technical validation on ideas and (2) the quantitative expertise to achieve clean energy goals.** Generally, communities applied to ETIPP to seek additional technical knowledge and support in exploring high-reward projects and goals they had in mind. The opportunity to partner with DOE and the national laboratories to address clean energy goals provides the communities with a strong foundation to build from, especially when applying for grant opportunities. Many communities come prepared with ideas, and the partnerships with the national laboratories help assess, test, and communicate those ideas to the public with a stronger voice to illustrate the big picture.
- **Although most communities are interested in exploring early-stage technologies, many prefer that the technology is thoroughly tested.** Some communities are open to being a pilot community to help advance early-stage renewable energy technologies. This is especially true for communities that have compromised ecosystems and are eager to minimize impacts through the integration of clean energy and help their economies. Having DOE by their side to provide expertise and information to guide next steps generally helps communities feel more comfortable with adapting technologies with lower TRLs. For other communities, it is too costly and difficult to introduce early-stage

technologies, especially those that are very remote and experience long lead times and delays. They would prefer that a technology is at least tested for a few years before being introduced to the community.

4.3.2 Experience

- **Technical assistance projects generally started off slowly with a focus on scoping. Group dynamics, inertia in determining direction, translating jargon/technical speak from technical assistance providers, and the number of stakeholders and opinions were factors that influenced challenges with pacing.** For many communities, getting traction early on and navigating the number of players in meetings and on calls was the biggest challenge. Consequently, projects started off slower in forming ideas and directions. Communities struggled with understanding technical jargon early in the project, and technical assistance providers likely struggled to communicate without using technical jargon, which served as a barrier in driving constructive conversations and decision-making processes. Communities generally worked through this difficulty with either regional leads or regional partners, who encouraged the technical assistance providers to give presentations and hold discussions without technical jargon.
- **After the scoping phase, technical assistance projects shift focus to data collection and sharing and the contextualizing of data.** A big part of reaching the end result was connecting with the appropriate channels (through meetings or site visits) that could provide the information and data needed to continue analysis. In communities where expectations of technology or infrastructure outcomes were well-defined and a project champion was present, the data needed were readily available. Project champions were particularly critical in this phase, as they were key to pulling together data or providing information based on their backgrounds and expertise.
- **Most project champions are members of the city/community government or are subject matter experts.** From the perspective of community representatives, local government members and subject matter experts generally serve as the key representative or participant for the community on the project. They are highly involved in project meetings, contribute knowledge of data, provide feedback, and make linkages that help keep the project moving forward.

4.3.3 Lessons Learned

- **The participation of the community and its role in shaping the end work products (reports/models or analyses/presentations) is mostly concentrated on problem definition and the drafting of end work products.** Key personnel from the community felt highly involved in identifying, sourcing, and sharing data with the technical assistance team in early stages. This is a key activity in defining the problem and scope for the technical assistance team. The community representatives also felt engaged in reviewing, revising, and providing feedback on work products, helping to tailor them to the audience communication needs/styles. Community involvement in the technical analysis process was limited.
- **Communities need more personnel capacity in general. Technical assistance programs, in general, can leverage resources to build lasting internal capacities within communities.** All partner communities that we interviewed experience a deficit in trained personnel such as engineers, planners, and policy and public-facing coordinators.

This is a known barrier to programmatic development activities in general. The capacity hindrance is reportedly replicated in technical assistance programs, limiting the communities' involvement in analyses, evaluation, and nuanced interactions with technical assistance teams. Additional capacity development is a precondition for higher return from any technical assistance project and should be a key focus of assistance providers, local and federal governments, or industry and other partner organizations.

- **Consistent coordination between groups, effective and early definition of the scope and goals, and greater relationship development are identified as the main lessons learned to transfer to other community projects.** Investing effort and time up front in relationship development helped team members within the technical assistance team and the communities learn from each other and communicate more effectively. The relationship development is most effective when guided by the goal of helping communities visualize problems and potential solutions in systemic ways. Framing problems collaboratively also helped build better understanding among lab teams and community representatives.
- **The majority of ETIPP projects were able to meet the communities' goals by the end or approaching the end of the project.** Though project scope and goals changed in most ETIPP projects, community representatives felt that their goals were satisfactorily met, as negotiated in the scope of work. It should be noted that the work products produced by the technical assistance program are stepping stones or intermediate goals in the pathway to a larger energy goal in the community. Additional work and resources will be required to effectively use the work products.

4.4 Technical Assistance Program Leads

Technical assistance program leads are national laboratory representatives from a variety of programs that provide technical assistance for clean energy initiatives.

The technical assistance programs leads represent the following:

- Office of Indian Energy technical assistance
- Community Local Energy Action Program (C-LEAP)
- Los Angeles 100 (LA100) Equity Strategies
- Energy Storage for Social Equity Initiative (ES4SE)
- SolSmart
- Clean Cities Coalition Network.

4.4.1 Program Design and Effectiveness

- **Relationship-building, project co-development, and the presence of a project champion all contribute to project success.** The interaction between communities and technical assistance providers typically varies by community. In some cases, communities work with technical assistance program leads and hold regular meetings; in other cases, the lead applicants or project champions coordinate internally and take results back to the full coalition to discuss. But the main tenants hold across the work, where relationship-building is emphasized and is the foundation for how scoping evolves.
- **Most technical assistance programs are competitive in nature and generally have an application process.** For competitive applications, the applicants are typically down-

selected based on a set of criteria. To ensure all aspects of equity and inclusion are considered, applications in some programs are then typically reviewed by a team of external, unbiased individuals (e.g., industry personnel) to provide feedback and assist in continuing the application selection process. In other programs, applications are reviewed by DOE or national laboratories.

- **Turnover affects project communication and pace; for those projects where site visits were scoped, COVID impacted project pace.** For communities, building relationships with technical assistance providers is an important aspect of project progress. Turnover can have a significant impact on those relationships, especially with communities that do not have long track records of working with DOE or the national laboratories. Additionally, getting new staff up to speed with tasks they may be unfamiliar with (e.g., contract and proposal processes) is a timely effort that can set a project's timeline back. Relationship development became harder during COVID, which caused limitations in communication and affected scoping processes and pacing.

4.4.2 Community Readiness

- **Communities need additional technical assistance and resources from the federal government outside the scope of the funded technical assistance project.** All technical assistance program leads indicated that communities need much more assistance than can be provided in a single project, especially when talking about big-picture energy transitions.
- **Recommended solution TRL depends on the community and is based on their risk appetite, needs, and financial capacity.** For many communities, the TRL they are willing to accept depends on the nature of the energy transition. Some communities with more available funding and less risk-aversion may be willing to participate and provide feedback for pilot projects. This is especially true if it is not timely to wait for access to more mature technologies and a lower TRL technology helps advance the community's clean energy goals. By contrast, communities that have less available funding are generally more averse to risk and prefer a higher-TRL technology.
- **Community involvement, the presence of a project champion, and risk appetite are the factors that influence the success of technical assistance projects.** Engagement from the communities is important to ensure technical assistance leads have the feedback they need to make decisions and provide results that produce a useful result for the community. A project champion that is passionate and engaged is essential in driving those conversations and building the relationships essential in developing the trust between the community and DOE/national laboratories. Strong relationships impact successful scope writing and the negotiation of challenges throughout the technical assistance projects.

4.4.3 Technical and Programmatic Needs

- **There is consistency across technical assistance programs with useful tools (complex software/models, simple software, communication platforms) and end work products (public-facing documents, presentations).** In addition to Microsoft Office tools (i.e., PowerPoint, Excel, Word), all community projects benefit from software and models for activities, such as techno-economic microgrid modeling and analysis (PVWatts®, SAM, HOMER®, REopt®)and understanding low-income energy affordability data (LEAD).[10] Additionally, communications platforms (Microsoft Teams, Zoom, Jamboard) and document sharing platforms (Google Drive, SharePoint, Box) are essential tools for communicating and presenting information with different stakeholders. End work products are often communicated and shared to communities through presentations and slide decks and/or a public-facing document or technical memo.

- **Community involvement and building effective teams and partnerships help contribute to a successful project.** Engaging with communities and having iterative, dynamic relationships across stakeholders is important in ensuring communication needs are being met at various stages of the project (scoping, needs assessment). Often, effective community teams are developed by engaging with a regional partner or hiring specialized staff such as consultants. Regional partners or specialized staff can amplify the voice of the communities by facilitating meetings and conversations, filling in knowledge gaps between DOE/national laboratories and the communities, and having enough of a position of power to challenge DOE/national laboratory leadership in decision-making.

4.5 DOE Sponsors

The DOE sponsors are representatives from various DOE offices that manage technical assistance projects, including: WPTO, the Wind Energy Technologies Office, Energy Transitions Initiative, Geothermal Technologies Office, DOE front office, and Office of Electricity.

4.5.1 Program Design and Effectiveness

- **It is difficult for DOE to adequately fund communities directly.** Due to structural barriers with technical assistance funding mechanisms, it is difficult for DOE to fund communities directly. This limitation is often a topic of conversation within projects and program design for technical assistance programs. To overcome this barrier, offering community members gift cards or working with national laboratories to provide direct support through creative funding mechanisms are methods to compensate communities for participating in surveys, meetings, and focus groups.
- **DOE provides planning assistance, oversight, strategic guidance, funding, and resources to achieve the objectives of technical assistance programs.** From the perspective of DOE sponsors, DOE provides the tools necessary to help communities determine what they want from an energy transition (i.e., building a clean energy transition road map). DOE also helps communities understand what a clean energy transition future looks like for the community and map out how to get there. Part of this includes getting the right coalition together to keep the project moving forward.
- **Some technical assistance programs are relatively new, and lessons learned are still being collected, whereas other technical assistance programs are well-established. It appears that a successful technical assistance program includes building and maintaining partnerships with communities, community-based organizations, and regional partners while addressing community needs.** For program success,

[10] PVWatts is NREL's photovoltaic (PV) system performance and cost calculator; SAM is NREL's System Advisor Model, a techno-economic software model; HOMER is NREL's Hybrid Optimization of Multiple Energy Resources model; REopt is NREL's web-based techno-economic decision support platform; and LEAD is the U.S. Department of Energy's Low-Income Energy Affordability Data Tool.

maintaining partnerships includes keeping individual technology offices engaged, continuing the funding and support of the technical assistance effort, forming coalitions that last, and keeping momentum going. Another success metric is being responsive to community needs, which includes positioning communities for follow-on funding (either directly through individual technology offices, other technical assistance programs, other agencies, or other funding opportunities), informing future work, working toward the goal that the community wants and agrees on, and providing clear next steps.

- **National labs generally administer technical assistance programs and manage turnover.** On the DOE/laboratory side, a beneficial practice to address turnover is to develop a charter that new individuals on a project can review to understand the objectives of the program and what DOE's role is in supporting the program. Additionally, consistent meetings with the DOE management team and laboratory administrators helps team members keep apprised of program progress. Role redundancy, training, and facilitating transitions have also been instrumental in mitigating the gaps with turnover.
- **Most technical assistance programs are competitive in nature due to limited funding and have an application process and/or merit review associated.** Due to limitations with resources, funding, and staffing to commit to one cohort at a time, most technical assistance programs are competitive, but applications are generally set up with low barriers to entry. Often, applications are down-selected using a merit review selection process based on the applications that best fit the technical assistance being asked for. In these circumstances, fitting the community to a type of technical assistance is balanced with communities' needs, such that communities lacking capacity are still considered.

4.5.2 Community Readiness

- **Leveraging existing non-DOE networks for outreach is the most common method to get communities' attention for technical assistance programs.** Marketing the opening of application periods is most effectively done through distribution lists of contacts, social media platforms, partner networks of regional partners, state organizations, and people that have deep roots in communities.
- **Communities need additional technical assistance and resources from the federal government outside the scope of the funded technical assistance project.** Most DOE sponsors indicated that communities need more assistance than can be provided in a single project. Oftentimes, project scopes list more work than can be funded, and teams narrow the scope by what can and cannot be included.
- **Strong partnerships and relationships are just as important in the success of technical assistance programs as having a project champion/coalition of project champions.** The main factor in community projects that influences the success of a technical assistance effort is having a coalition of multiple stakeholders that work well together, are well organized, and can make decisions efficiently. This is especially effective in the face of turnover and political changes. The presence of a project champion that can coalesce the community around a single idea and agree on a single path forward is a critical factor in influencing project success.

4.5.3 Technical and Programmatic Needs

- **From the perspective of DOE sponsors, lessons learned are generally proactively addressed through meeting discussions, annual reviews, and iterating throughout the technical assistance program.** Hosting annual review meetings, workshops, and poster sessions to learn from each other's work, developing cross-laboratory teams, and acknowledging what is not working help to address lessons learned and establish takeaways to transfer to other projects or programs.

4.6 Key Findings Across Groups

4.6.1 ETIPP Groups

- **Scoping is crucial, and community involvement during this phase of ETIPP projects is especially important.** Defining the scope with significant community involvement was cited as the main lesson learned to avoid barriers to project progress. Defining the scope early but also building flexibility for iterative re-scoping throughout the project helped communities make progress toward their clean energy transition goals.
- **ETIPP projects involve assisting communities in their energy transition beyond strictly providing technical assistance.** Outreach, building capacity within the community, project planning, and securing contractors or additional funding were important facets of ETIPP projects.
- **Project champions are situated within communities as either a subject matter expert or part of local government and have access to information and people.** Project champions guided priorities, provided institutional knowledge, coordinated groups, and were very involved in project outreach.
- **Initial communication between technical assistance providers from the national laboratories and communities tends to be slow due to use of jargon and technical language in technical assistance projects.** When presentations or meetings between technical assistance providers and communities did not rely on technical speak or acronyms, coordination and project progress was more efficient.
- **There are differing perspectives on the relevance of technical work products.** The technical assistance team views the work products as sufficient outcomes of the technical assistance; the onus of using the products rests with the community. Community-based organizations alternatively emphasized greater clarity, guidelines, and recommendations that help communities contextualize and leverage the work products for next steps.

4.6.2 DOE Sponsors and Technical Assistance Program Leads

- **Partnership development and relationship-building with communities and other organizations is a fundamental part of technical assistance programs.** Building well-organized coalitions within technical assistance projects kept communities motivated and united around a focused goal, and helped projects maintain forward momentum despite staff turnover.
- **Most technical assistance programs are competitive in nature and have an application process and/or merit review associated with them.** Limited resources such

as funding and personnel necessitate competitive applications for technical assistance projects, and merit reviews ensure that justice and equity are considered when communities are selected for technical assistance projects.

- **It is difficult for DOE to adequately fund communities directly.** From the perspective of DOE administrators, structural barriers limit the ability to directly fund communities. Therefore, indirect methods, such as offering gift cards, working with community-based organizations through subcontracts, and reimbursing individuals for participating in surveys, have been used in previous projects to close this gap.
- **Lack of sustained funding from DOE results in limited capacity-building in technical assistance projects.** Technical assistance projects often cover the planning, design, and analysis facets of clean energy transitions. Often, projects do not have an adequate number of staff to be able to manage projects and complete the tasks at hand. These capacity issues limit access to the right level of expertise needed for technical assistance.

4.6.3 All Groups

- **Technical assistance programs temporarily build capacity (particularly with respect to technical expertise), but there is a need for sustained assistance beyond the life span of technical assistance projects.** Technical assistance projects are effective at designing clean energy transitions and conducting requisite data collection and analyses, but communities need additional assistance and capacity-building to implement the designs, deploy technologies, and maintain and troubleshoot equipment.
- **Communities need additional types of assistance to achieve project objectives in clean energy transition.** Technical assistance projects often involve a significant amount of time and effort for nontechnical work such as scoping, managing team dynamics, outreach, seeking additional funding, and general capacity-building.
- **Over the arc of technical assistance projects, three of the eight phases identified in the DRF Subtask 1.1 literature review were emphasized in survey and interview responses (also illustrated in Figure 4).** First is scoping (Phase 1 in Figure 4), which involves verifying information and aims stated in the community's application and gaining further insights to narrow down the technical aspects in which assistance can be provided by the technical assistance team. In some cases, scoping includes creating an opportunity for laboratory teams and community groups to familiarize (pre-scoping or onboarding stage) with each other and for the lab teams to set preliminary expectations. The second activity is data collection and baseline assessment (Phase 2 in Figure 4), where scoped tasks are executed by laboratory technical assistance team members with involvement of community representatives, commonly led by the project champion. Finally, the product delivery activity (Phase 6 in Figure 4) involves presentations and information sharing with community and other stakeholders. However, since the projects are ongoing, the relative effectiveness and challenges faced by this discrete arc in each of the project types cannot be fully assessed.

Figure 4 shows a stream map for the five role groups within technical assistance program communities and teams. The streams illustrate how frequently key themes were documented in participant interview responses to the question, "What is the arc of a technical assistance project?” The themes were mapped to the phases identified in the DRF Subtask 1.1 literature review. For example, responses in all five groups had relatively high frequency of key themes in their responses to questions related to scoping, which was mapped to Phase 1. Some groups’ streams narrow or swell for other themes—the net effect of the stream map shows the relative occurrence of aspects of specific phases of a technology assistance program.

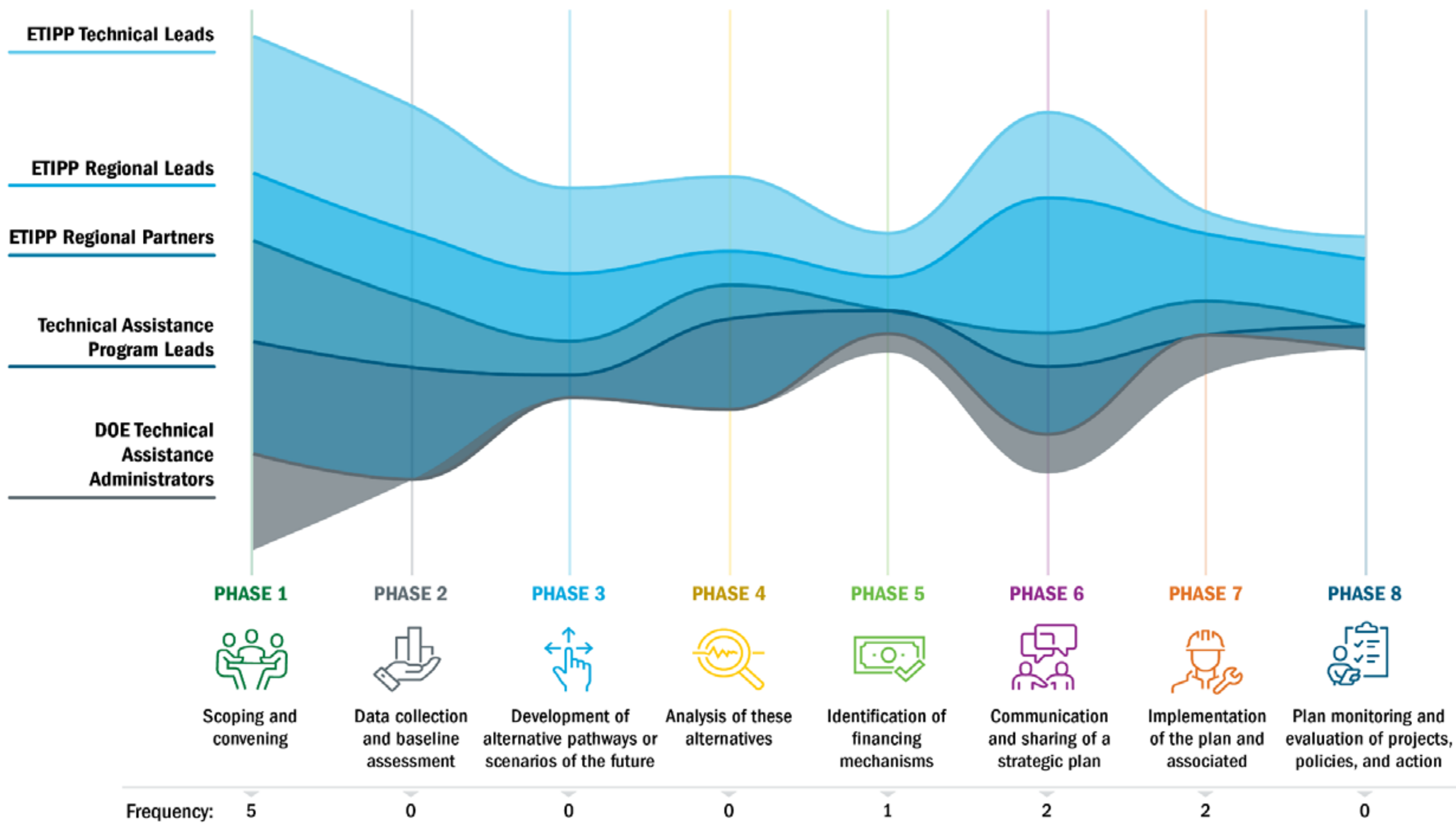

Figure 4. Arc of a technical assistance project. The individual height of each group's stream in the graph corresponds to how frequently key themes were documented in participant interview responses to the question, "What is the arc of a technical assistance project?" The themes were mapped to the eight phases identified in the DRF Subtask 1.1 literature review.

Graphic by Tara Smith, NREL

5 Conclusion

The outreach and engagement effort yielded three main results. First, there are echoes of the key phases in effective science policy processes (Arkema et al. 2022) for renewable energy projects in the technical assistance programs discussed in this report. This often iterative process includes (1) scoping and convening, (2) data collection and baseline assessment, (3) development of alternative pathways or scenarios of the future, (4) analysis of these alternatives, (5) identification of financing mechanisms, (6) communication and sharing of a strategic plan, (7) implementation of the plan and associated projects, and (8) monitoring and evaluation of projects, policies, and action with respect to the plan.

In practice, scoping generally includes defining partnerships and roles, establishing a workplan, developing a rapport between partners, and ensuring workplan is feasible given resources, timeline, and expertise (Rosenthal et al. 2015). A difference can be noted in scoping activities between cases where a community has reasonably well-defined expectations of technology or infrastructure outcomes, as opposed to more exploratory cases where communities are aiming to address existing challenges through energy infrastructure and are not tied to a specific technology choice or other energy system upgrade/efficiency measures. Technical assistance project arcs appear to struggle to adapt to the emergent needs in the latter situation, as described in this report.

Outreach data collected for this report show that many technical assistance projects are linearly structured and could benefit from an adaptive management approach. Adaptive management tests predictions against observations, which allows for iterative recalibration of the management process at predetermined decision points as learning occurs throughout the length of a project (Williams 2011). This approach aligns with the Subtask 1.1 report finding, which emphasized the importance of developing participatory processes that allow for iterative collaboration between communities, scientists, and government throughout an energy transition.

Second, while technical assistance programs temporarily added capacity from the national laboratories (particularly with respect to human capacity and technical expertise) to communities, there is a need for sustained assistance beyond the funding life span of technical assistance projects. Communities need additional assistance to achieve project objectives in clean energy transitions. Due to barriers with funding mechanisms, it is difficult for DOE to fund communities directly. Technical assistance projects generally cover the planning, design, and analysis facets of clean energy transitions. These capacity issues limit access to the right level of expertise needed for technical assistance and may limit how a community proceeds in its clean energy transition.

Lastly, outreach to the first cohort of ETIPP communities strongly indicates that communication between technical assistance providers from national laboratories and communities tends to be slow due to the use of technical jargon. Communities struggled with understanding technical jargon early on in the project and technical assistance providers likely struggled to communicate without using technical jargon, which served as a barrier in driving constructive conversations and decision-making processes. Deliberate use of community-specific plain language early in project scoping can go a long way in communicating more effectively and meeting a community where it is—important ingredients in relationship-building for technical assistance projects.

5.1 Recommendations for the DRF

The DRF is being developed to support emerging opportunities with respect to the deployment and demonstration of marine energy. By taking a more holistic approach to the energy transition—rather than considering technology innovation, technical readiness, and demonstration in isolation—the DRF has the potential to help DOE and the national laboratories enable realistic and scalable energy solutions and take measurable steps toward achieving the country's decarbonization, climate resilience, and energy justice goals. The recommendations for the development of the DRF iterate on the findings from the Subtask 1.1 report (Arkema et al. 2022). The recommendations are summarized below:

- Sustained, consistent, and iterative collaboration among communities, national laboratories, and DOE within an adaptive management framework is essential to a productive community-driven energy transition and the demonstration of renewable energy technology.
- Sustained and consistent funding is key to supporting community-driven energy transitions. Funding options and mechanisms should also be considered earlier in energy planning and community-driven energy transitions to prevent lapses in funding and capacity-building.
- Communities vary in clean energy priorities, ambition, and capacity; challenges; and need for support. The DRF should help the national laboratories and DOE better understand a community's stage (or readiness) in its energy transition and "meet a community where it is" with the appropriate technical assistance using community-centered plain language.
- Communities want to learn from other communities that are facing or have overcome similar challenges in pursuit of similar energy transitions. The DRF should help the national laboratories and DOE better connect communities with others in a peer-to-peer process that shares lessons learned in technology education, technical support, and demonstration support.
- While technical assistance programs temporarily added capacity from the national laboratories (particularly with respect to human capacity and technical expertise) to communities, there is a need for sustained capacity, funding, and support beyond the funding life span of technical assistance projects.

5.2 Next Steps

The outreach and engagement campaign, along with the review of the literature, tools, and case studies lays the groundwork for the DRF. The next steps for DRF are:

1. The team will use the information from the two Task 1 reports to inform the design and application of the DRF (Tasks 2 and 3). The DRF team will continue to iterate based on these findings and recommendations.
2. The DRF will inform Powering the Blue Economy and the Resilient Coastal Communities strategy and present a vision for community-driven, ecologically sustainable design that seeks to co-optimize energy resilience, ecosystem resilience, and community development goals.

3. The broader team will implement strategies to externally communicate the findings from the two Task 1 reports, such as leveraging them in future meetings and conferences and potentially carving out pieces that could form the basis for a peer-reviewed publication.

Glossary

Term	Definition
Community	A group of individuals who are living in geographic proximity to one another, or geographically dispersed but experiencing common conditions (e.g., migrant workers or Native Americans). This broad definition generally applies to DOE-sponsored technical assistance efforts, though narrower definitions of community are sometimes specified within each program's eligibility requirements. For example, in some technical assistance programs, a community may be broadly defined as a group of people with a shared value or interest.
Ecosystem values	The value of functions performed by uplands, wetlands and other surface waters to the abundance, diversity, and habitats of fish, wildlife, and listed species. These functions include but are not limited to providing cover and refuge; breeding, nesting, denning, and nursery areas; corridors for wildlife movement; food chain support; and natural water storage, natural flow attenuation, and water quality improvement, which enhances fish, wildlife, and listed species utilization.
Organization	Local governments (e.g., municipalities, counties, cities, towns), tribal organizations, community-based nonprofits and nongovernmental organizations, special-purpose districts (e.g., school districts, water districts, sewer districts), municipal utilities and electric co-ops.
Project champion	An influential person who is willing to use their influence to help the project succeed.
Resilience	The ability to anticipate, prepare for, and adapt to changing conditions, and to withstand, respond to, and recover rapidly from disruptive events. This definition includes energy resilience as well as other forms of resilience such as climate, natural disaster, social, economic, and/or ecological resilience.
Technical assistance	Assistance provided through national laboratories, regional and national associations of state decision-makers and subject matter experts, and federal government staff. The existing and ongoing types of assistance include: • Data collection and assessment activities to help states, localities and tribes determine impacts, evaluate policy options and identify technology and market strategies • Convenings of public officials and stakeholders to share best practices, tackle key issues and build consensus for preferred courses of action

Term	Definition
	• Education and training through workshops and webinars to raise knowledge levels and better equip policy and decision makers to address local and regional needs • Consultations for quick-turnaround analysis involving technical experts advising policy and decision makers on specific matters of interest.

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Appendix A. Deployment Readiness Framework Task Structure

Task 1 - Background Analysis and Engagement:

- Subtask 1.1 - Review existing literature/models/tools/approaches/existing programs for assessing and analyzing community readiness and understanding steps in process for energy systems demonstration or deployment
- Subtask 1.2 - Engage and coordinate with NREL administration, DOE, regional partners and lab technical assistance leads to inform development of the framework. Engage with ETIPP and other communities to inform development of the framework.

Task 2 - Develop DRF outline for WPTO-sponsored community readiness assessment designing approaches and tools that will be developed as part of the DRF:

- Subtask 2.1 - Define the framework/approach needed for the WPTO-sponsored community readiness assessment, based on review and engagement conducted in Task 1
- Subtask 2.2 - Lay out methods for developing/tailoring approaches and tools for assessing community readiness and supporting communities in the energy transition, including roles and responsibilities, and revisions to timeline etc.

Task 3 - Co-develop the approach/framework with communities to inform investments in pilot and demonstration activities:

- Subtask 3.1 - Produce a draft/beta version of framework
- Subtask 3.2 - Review draft/beta version of framework with input from lab leads of technical assistance projects and communities
- Subtask 3.3 - Adapt framework, tools, and approaches as necessary based on review and testing
- Subtask 3.4 - Develop outputs/products to communicate about the framework and make it accessible.

Appendix B. Interview Questions

B.1 Interview Questions for ETIPP Technical Leads

Hello! Thank you for agreeing to be interviewed for the Deployment Readiness Framework project. Below please find the list of questions the interviewer will ask during your hour-long interview. Your responses will be recorded during the meeting and will be processed by a small team working on the project. Your answers will be anonymous in project reports.

Technical assistance program design and effectiveness:

1. What does interaction between the community/organization and TA providers look like right now? How did you kick off work?
2. What does the arc of a technical assistance project look like within ETIPP?
3. What does project success look like and who defines or determines success?
4. If you answered yes to previous failed or successful energy projects in the community, can you say more about how those projects may impact the success of this technical assistance project?
5. Is there a project champion in the community you're serving? If so, what is their role in the technical assistance project?
6. What are lessons from your community that are transferable to other communities?

Influence of how information is exchanged on perceived effectiveness of technical assistance programming:

1. Has there been turnover in the project team? If so, how have the changes impacted project progress?
2. Are site visits limited due to COVID? If so, has the lack of site visits impacted project progress?
3. Is there a third party outside of the community/organization that is driving the technical assistance engagement?
4. What do you wish was included in the project scope, but isn't? What do you wish was removed from the scope?
5. If you answered that these values (energy resilience, climate resilience, and/or ecosystem values) were taken into account during project planning, please say more.

Perceived determination of community readiness:

1. What support are communities requesting–both technically and regarding the process?
2. Does the community/organization need additional technical assistance outside the scope of the project? Are there resources that DOE could provide beyond technical assistance?

3. In the survey, if you indicated that there are social, structural, or cultural barriers that are obvious roadblocks to project progress or implementation, can you say more about the barriers?
4. What are the factors (e.g. risk appetite, strategic planning) that influence an appropriate TRL (technology maturity) for a community-driven renewable energy demonstration project?
5. What TRL (technology maturity) should a renewable energy technology be before it's suggested to a community?
6. What tools are most useful for community/organization-driven technical assistance projects?
7. What tools are missing for community/organization-driven energy transition projects?

Conclusion:

1. What is the end work product of this technical assistance project?
2. How was the product communicated to the community?
3. Is there anything else you'd like to add? Did I miss anything?

B.2 Interview Questions for ETIPP Regional Leads and Regional Partners

Hello! Thank you for agreeing to be interviewed for the Deployment Readiness Framework project. Below please find the list of questions the interviewer will ask during your hour-long interview. Your responses will be recorded during the meeting and will be processed by a small analysis team. Your answers will be anonymous in project reports.

Technical assistance program design and effectiveness:

1. How did work kick off (refer to length of scoping process selected in survey answers)?
2. What does interaction between the community/organization and TA providers look like right now?
3. What does the arc of a technical assistance project look like within ETIPP?
4. What does project success look like and who defines or determines success?
5. In the survey, if you answered yes there is a project champion, what is their role in the technical assistance project?
6. Is there a third party outside of the community/organization that is driving the technical assistance engagement?
7. In the survey, if you answered yes to previous failed or successful energy projects in the community, can you say more about how those projects may impact the success of this technical assistance project?
8. Has there been turnover in the project? If so, how have the changes impacted project progress?

Influence of how information is exchanged on perceived effectiveness of technical assistance programming:

1. Please say more about your role as a regional lead or regional partner and how you communicate with the entire project team.
2. Were site visits limited due to COVID? If so, has the lack of site visits impacted project progress?
3. If you answered that these values (energy resilience, climate resilience, and/or ecosystem values) were taken into account during project scoping, please say more.
4. In the survey, if you indicated that there are social, structural, or cultural barriers that are obvious roadblocks to project progress or implementation, can you say more about the barriers?

Perceived determination of community readiness:

1. Does the community/organization need additional technical assistance outside the scope of the project? Are there resources that could be provided to the community beyond technical assistance? Who should provide those resources?
2. In the survey, if you answered yes to community/organization completed strategic planning prior to starting the technical assistance project, can you say more about how that has or hasn't influenced the project?
3. What are the factors (e.g. risk appetite, strategic planning, community champion) that influence the success of the project?
4. What TRL (technology maturity) should a renewable energy technology be before it's suggested to a community?
5. What tools are most useful for community/organization-driven technical assistance projects? What tools are missing for community/organization-driven energy transition projects?

Conclusion:

1. What do you wish was included in the project scope, but isn't? What do you wish was removed from the scope?
2. What is the end work product of this technical assistance project? How was the product communicated to the community?
3. What are lessons from your community that are transferable to other communities?
4. Is there anything else you'd like to add? Did I miss anything?

B.3 Interview Questions for Communities in Cohort I of the ETIPP Program

Hello! Thank you for agreeing to be interviewed for the Deployment Readiness Framework project. Below please find the list of questions the interviewer will ask during your hour-long interview. Your responses will be recorded during the meeting and will be processed by a small team working on the project. Your answers will be anonymous in project reports.

Motivation

1. What prompted your community to pursue clean energy projects?
2. What prompted your community to seek technical assistance from ETIPP?
3. What were the community's goals when applying to ETIPP?
4. Did your community draw on lessons learned from previous energy projects?
5. Is your community interested in learning about and helping to advance early-stage renewable energy technologies, or do you think that renewable energy technologies should only be introduced to communities once they've been thoroughly tested?

Experience

1. How did work start with the ETIPP technical assistance project and what did it look like?
2. How has the ETIPP technical assistance project evolved from the start to where you are now? (key steps like data collection, iteration, communication flow)
3. Who were the key participants from your community on this project?
4. What were some challenges you (community) encountered during the course of the project?

Outcomes

1. What is the end work product of the ETIPP technical assistance project?
2. How was the community involved in the development of the end product?
3. Were your community's goals achieved by the end of the project?
4. What additional expertise or capacity does your community need to continue with your clean energy goals? And who do you think should provide it?
5. What are lessons from your community that are transferable to other communities?
6. Is there anything else you'd like to add? Did I miss anything?

B.4 Interview Questions for Technical Assistance Program Leads at National Laboratories

Hello! Thank you for agreeing to be interviewed for the Deployment Readiness Framework project. Below please find the list of questions the interviewer will ask during your hour-long interview. Your responses will be recorded during the meeting and will be processed by a small analysis team. Your answers will be anonymous in project reports.

Technical assistance program design and effectiveness:

1. In the survey, you indicated the program is either competitive or non-competitive, can you say more about your answer? (clean cities)
2. What does the arc of the technical assistance project look like?
3. What does interaction between the community/organization and TA providers look like?

4. What does program success look like?
5. Who defines or determines success?
6. Can you say more about the role of community/organization champions in technical assistance projects?
7. Does turnover (community/organization and lab) impact individual project or overall program progress?
8. How has COVID impacted site visits and project progress in your program?

Perceived determination of community readiness:

1. Do communities/organizations in your program often need additional technical assistance outside the scope of the funded technical assistance project?
2. Are there resources that could be provided to the community/organization beyond technical assistance?
3. Who should provide those resources?
4. Do communities/organizations complete strategic planning prior to starting the technical assistance projects in your program?
5. What are the factors (e.g. risk appetite, strategic planning, community champion) that influence the success of technical assistance projects?
6. What TRL (technology maturity) should a renewable energy technology be before it's suggested to a community?

Tools and lessons learned:

1. What tools are most useful for community/organization-driven technical assistance projects?
2. What tools are missing for community/organization-driven energy transition projects?
3. How are work products communicated to the community/organization?
4. What are lessons from your program that are transferable to other technical assistance programs?
5. Is there anything else you'd like to add? Did I miss anything?

B.5 Interview Questions for DOE Technical Assistance Administrators

Hello! Thank you for agreeing to be interviewed for the Deployment Readiness Framework project. Below please find the list of questions the interviewer will ask during your hour-long interview. Your responses will be recorded during the meeting and will be processed by a small analysis team. Your answers will be anonymous in project reports.

Technical assistance program design and effectiveness:

1. What led to the development of this technical assistance program?
2. What are DOE's objectives for this technical assistance program?

3. What is your role as a sponsor of this program?
4. Is the technical assistance program competitive or non-competitive, and why?
5. From where you sit, what does the arc of the technical assistance program look like?
6. What does program success look like to DOE?
7. How do you measure success at DOE?
8. Who defines or determines the success of any one technical assistance effort?
9. How does the program account for or address turnover in DOE, labs, and communities over the arc of a technical assistance program?
10. Was funding communities/community-based organizations/individual community members to participate in outreach activities considered part of the program design?
11. What are the limitations of this technical assistance program design?

Perceived determination of community readiness:

1. How do communities/organizations find out about this technical assistance program?
2. How does this program proactively seek out communities/organizations for technical assistance?
3. Do communities/organizations in your program often need additional technical assistance outside the scope of a funded technical assistance project?
4. What is within DOE's control regarding this additional need and associated funding?
5. From your perspective, what are the factors in the community/organization (e.g. risk appetite, strategic planning, community champion) that influence the success of this technical assistance program?
6. What TRL (technology maturity) should a renewable energy technology be before it's suggested to a community and why? *(Figure B.1)*

Technology readiness level (TRL)		Description
1	Basic principles observed and reported	Scientific research begins to be translated into applied research and development. Examples include paper studies of a technology's basic properties.
2	Technology concept and/or application formulated	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3	Analytical and experimental critical function and/or characteristic proof of concept	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate the analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4	Component and/or breadboard validation in laboratory environment	Basic technological components are integrated to establish that they will work together. This is relatively low fidelity compared with the eventual system. Examples include integration of ad hoc hardware in the laboratory.
5	Component and/or breadboard validation in relevant environment	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so they can be tested in a simulated environment. Examples include high fidelity laboratory integration of components.
6	System/subsystem model or prototype demonstration in a relevant environment	Representative model or prototype system, which is well beyond that of TRL 5, is tested in its relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.
7	System prototype demonstration in an operational environment	Prototype near or at planned operational system. Represents a major step up from TRL 6 by requirement demonstration of an actual system prototype in an operational environment (e.g., in an aircraft, a vehicle, or space).
8	Actual system completed and qualified through test and demonstration	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9	Actual system proven through successful mission operations	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Figure B-1. Technology readiness levels and descriptions.

Source: U.S. Government Accountability Office. 2020. "Technology Readiness Assessment Guide: Best Practices for Evaluating the Readiness of Technology for Use in Acquisition Programs and Projects [Reissued With Revisions on Feb. 11, 2020.]. *Accessed May 19, 2023.* https://www.gao.gov/products/gao-20-48g.

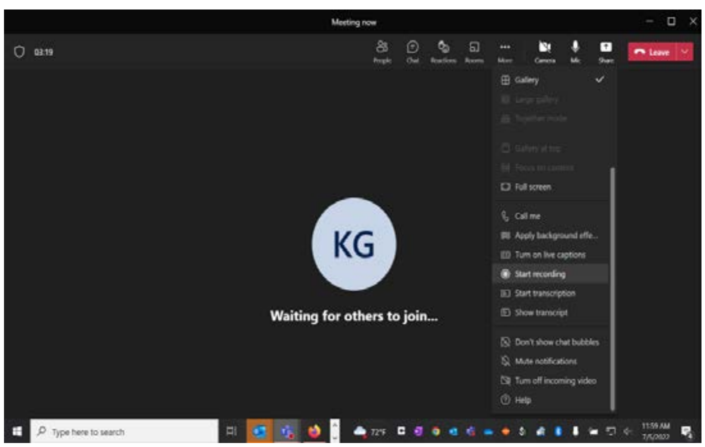
Tools and lessons learned:

1. What tools are most useful for community/organization-driven technical assistance projects?
2. What tools are missing for community/organization-driven energy transition projects?
3. What tools are most appropriate for DOE and the National Labs to provide?
4. How are you incorporating lessons learned and work completed into continuous improvement for the program and for technical R&D portfolios at DOE?
5. Is there anything else you'd like to add? Did I miss anything?

Appendix C. Interview Best Practices

C.1 DRF Subtask 1.2 Interviewer Best Practices Document

- Send a reminder about the interview a week before the interview (both in an email and updated teams invite).
- Double check and make sure you share the survey not in editor mode. If you use the link above, you will be find, if the link corrupts for some reason, here is how you create a shareable link to the survey:
    - To send the fillable form, go to the document named “DRF Survey” in the 1.2 outreach folder, select the “send” button on the upper right side of the document, and select “send form by link” option, and be sure to select “shorten url.” (see snip below)
- Set up the meeting through Teams to ensure you can record and get transcripts of your conversation. Make sure to trial the recording before your first interview.
- Before you start recording, please remind the interviewee that they are being recorded and that their answers will be anonymous in any reporting we do.
- To record the interview (both audio and transcripts):
    - Once you start the meeting select “more” at the top of the meeting
    - A drop-down menu appears and scroll down until you see “start recording”
    - A popup will tell you that “recording and transcription has started”



- A transcript window will pop up on the right side and both of you can close out of that window so you don’t have to see the transcripts.
- Share the interview questions so the interviewee can see the questions as you ask
- Start with the first question and proceed!
- **Make sure to mute yourself after you ask a question.**
- Once the meeting is done, you can download the audio recording and transcripts and save to the interview transcripts folder with the name of project and date of interview.
- **Please download the transcript as a word file, and then download the file as a .vtt file. Upload the .vtt file into this reader**

https://web.microsoftstream.com/VTTCleaner/CleanVTT.html and add the text generated from the .vtt cleaner to the transcript document at the end. Here is an example.

C.2 A Few Notes About Interviews:

- Keep the interview to an hour no matter what. Set up a second meeting if needed to finish up the interview (total of 2 hours).
- If the interviewee wants to comment more broadly outside the scope of the program/project we are interviewing for, that's fine. We just need to flag it in the interview by asking them to state (for the transcripts) how they are answering.
- Some folks start with a lot of talking and explaining about the project/program in the first two questions, Let them go as long as they need and then summarize what they've said when we get to the questions they've already answered. Make notes while listening and make sure to repeat what they said at the beginning at the question where the answer truly belongs.
- Keep your camera on and try to actively listen.
- Speak when:
  - Asking the question
  - Summarizing/clarifying a point
  - Answering questions the interviewee may have about the questions.

Appendix D. Surveys

https://drive.google.com/drive/folders/1rZgoMJ_IqfEd2MQ0MpsLx_EHLUc28nvf

Appendix E. Example Frequency Charts

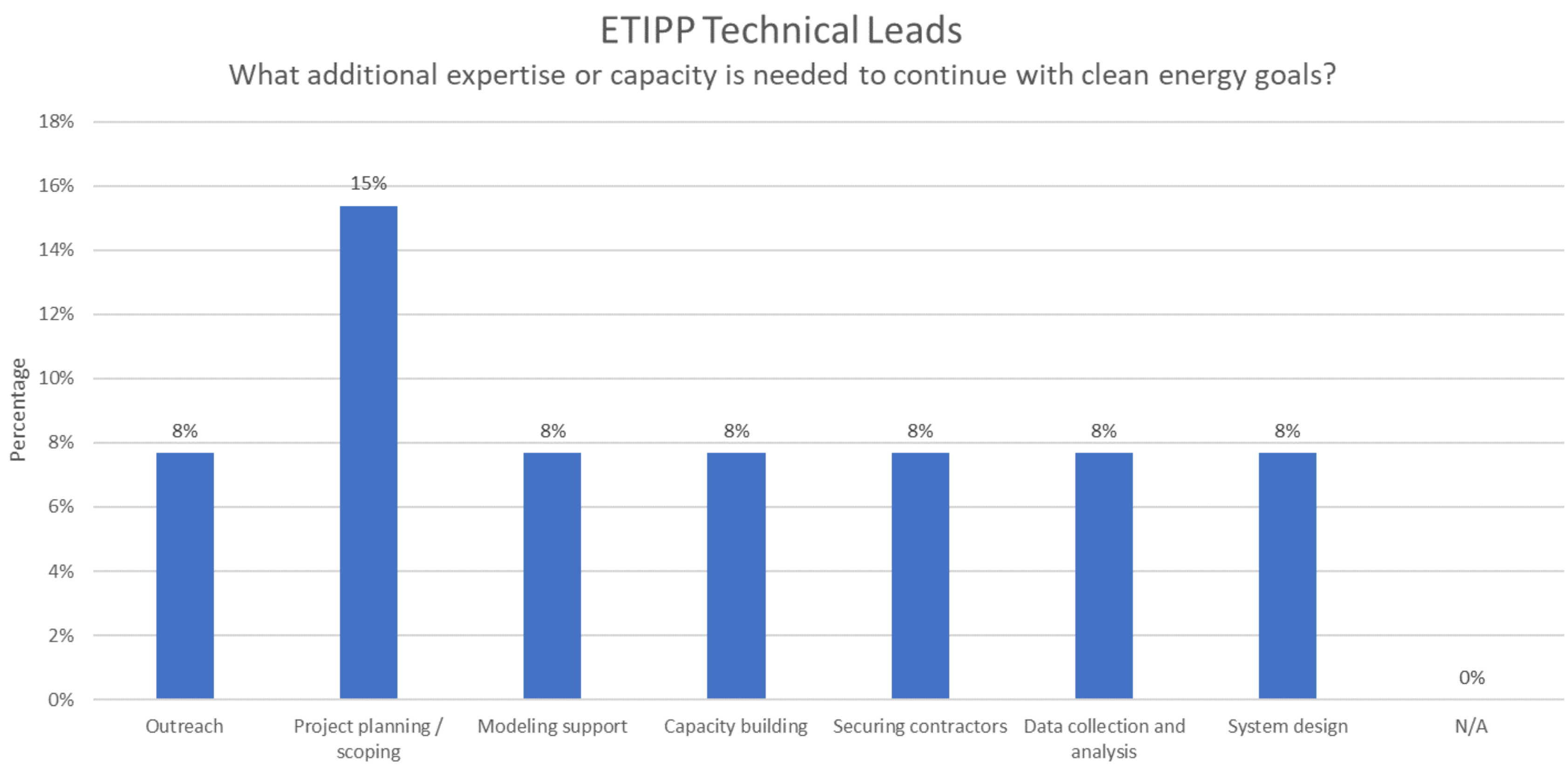


Figure E-1. Example frequency chart for ETIPP technical leads

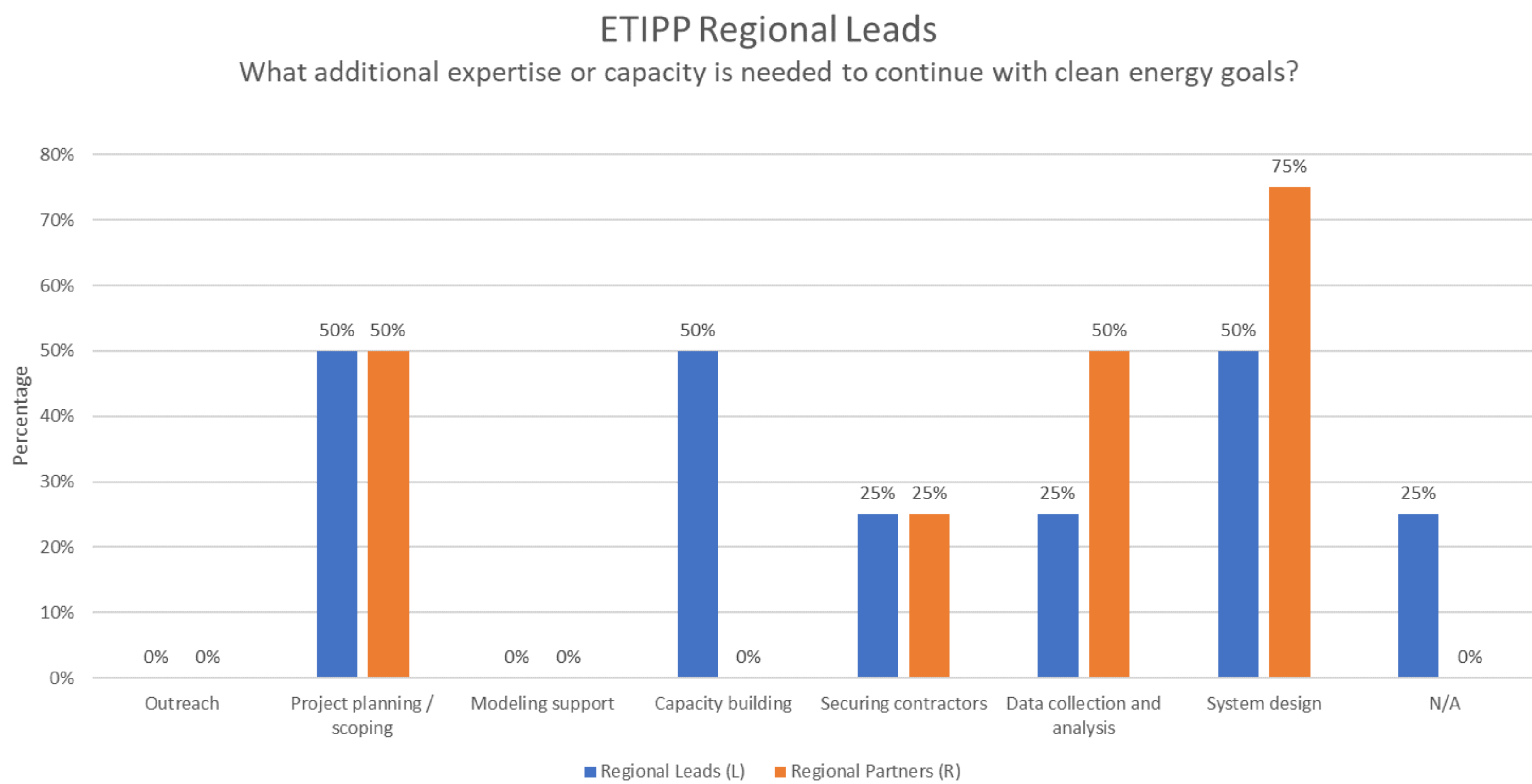


Figure E-2. Example frequency chart for ETIPP regional leads and partners

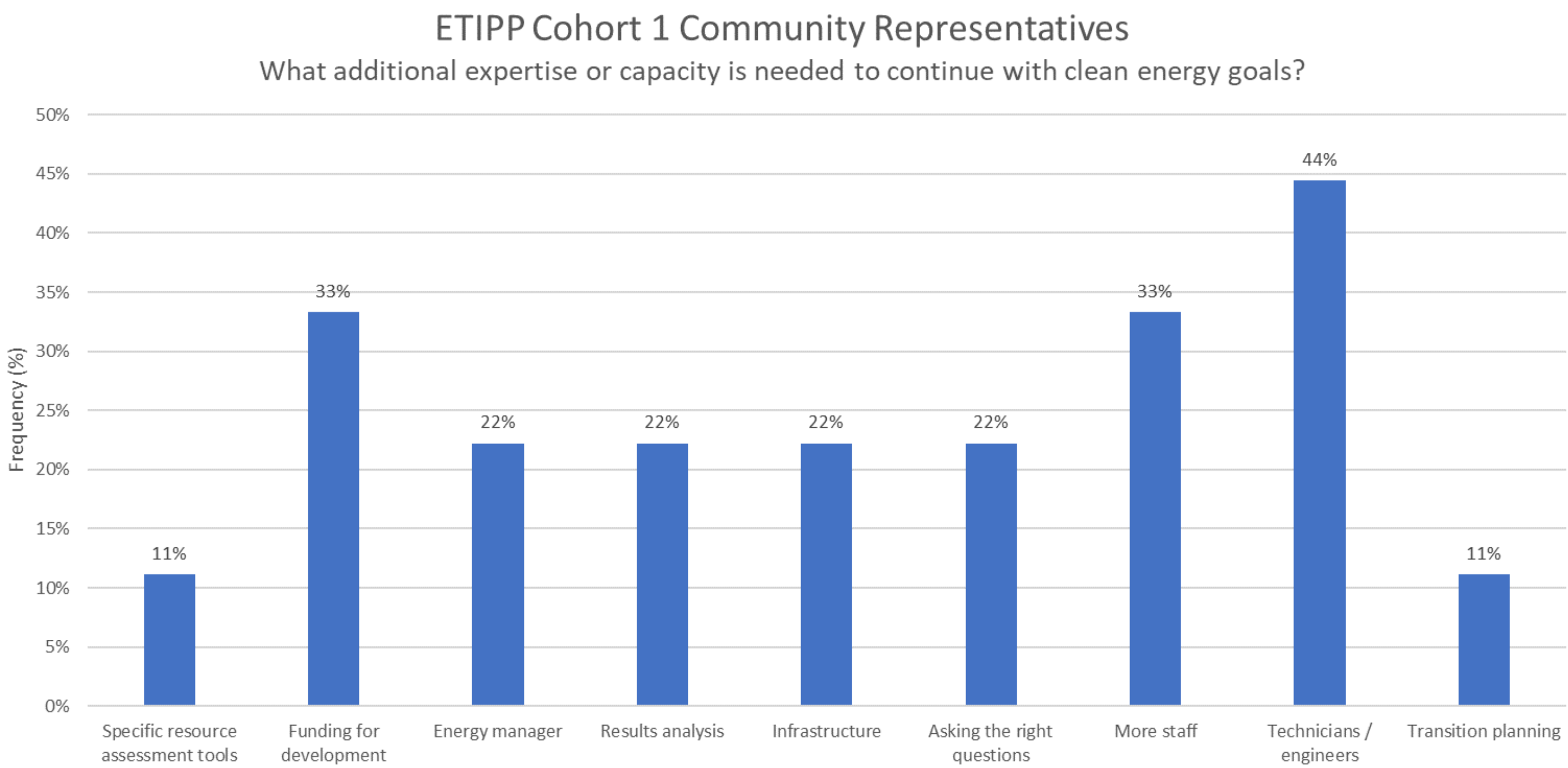


Figure E-3. Example frequency chart for community representatives from ETIPP Cohort 1

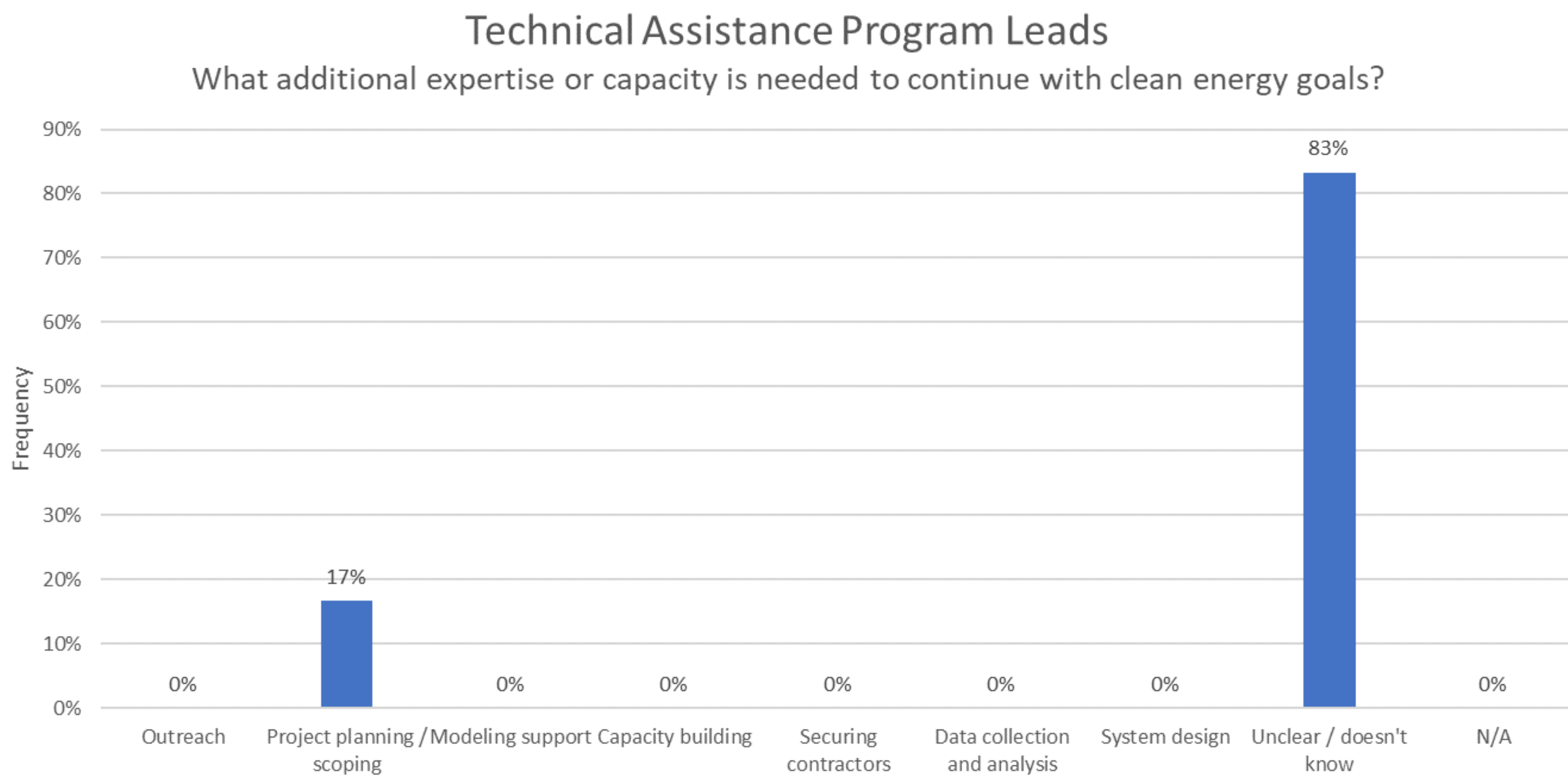


Figure E-4. Example frequency chart for technical assistance program leads

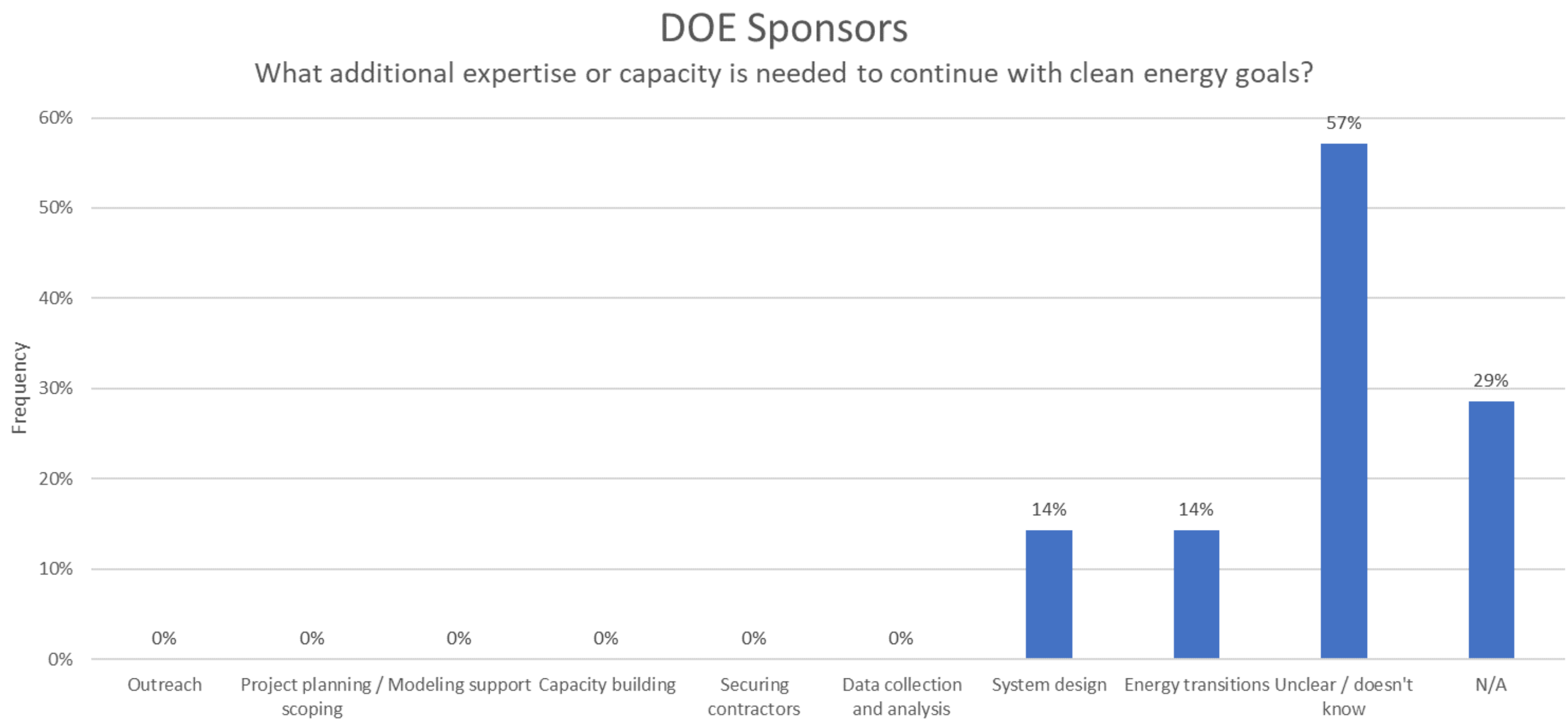


Figure E-5. Example frequency chart for DOE sponsors