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A Health Effects
Institute Affiliate

Guiding Principles for Research and Stakeholder Engagement

HEI-Energy

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Trusted Science, Clean Environment, Better Health

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Introduction to this Guide

HEI-Energy's Mission

The mission of HEI-Energy is to provide high-quality and impartial science that is relevant to energy policy decisions. Initially, HEI-Energy is funding research on the potential human population exposures and health effects from onshore development of oil and natural gas from shale and other unconventional resources (UOGD) across the United States.

Purpose of the Guide

To help achieve HEI-Energy's mission, this guide specifies broad principles for:

- Ensuring the quality of all HEI-Energy work, including funded research and special reports, and
- Guiding effective multidirectional engagement with stakeholders to foster the utility of research for informing decisions about protecting public health.

The guide provides a high-level view of how HEI-Energy works, distilling myriad guidance documents, protocols, fact sheets, and other operational information posted on our website into the basic principles and concepts that make HEI-Energy a reliable source of impartial science about UOGD.

Intended Users of the Guide

The guide is intended for use by HEI-Energy staff, committees, and funded investigators to convey (1) how HEI-Energy is designed to produce high-quality science while simultaneously engaging with stakeholders throughout each phase of research, and (2) their role in delivering high-quality, credible science. The guide will also be useful to all stakeholders as it explains how HEI-Energy works and the process for stakeholder engagement. HEI-Energy's stakeholders include individuals from all levels of government, industry, non-governmental organizations, academia, and community groups, including those representing environmental justice¹ communities, and individual community members.

A Governance Structure that Promotes Independent Research

HEI-Energy aims to provide much-needed scientific support for decisions about UOGD that best protect public health. To achieve this aim, HEI-Energy employs a governance structure that mirrors the one successfully employed for more than 40 years by its parent organization, the Health Effects Institute (HEI). Key components of this structure consist of:

- Independent governance of HEI-Energy with leadership by an independent board of directors who have extensive experience in science and policy but not affiliated with sponsors,
- Joint funding from the oil and gas industry, governmental agencies, and, occasionally, foundations,
- High-quality science with thorough research oversight and in-depth review by committees of knowledgeable scientists, with members vetted for bias and conflict of interest,
- After confirming that they meet objectives for quality, open and extensive sharing of all data and results, and
- Science targeted to make better informed decisions without advocating policy positions.

¹ HEI-Energy has adopted the United States Environmental Protection Agency's definition of environmental justice: "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (<https://www.epa.gov/environmentaljustice>).

A Research Process that Ensures Scientific Quality and Effective Stakeholder Engagement

The process HEI-Energy uses to deliver science involves extensive oversight by HEI-Energy staff and Committees and engagement with a wide range of stakeholders that continues from research planning through peer review and reporting (Figure 1). HEI-Energy’s [Research Committee](#) consists of internationally recognized experts that define specific research requests and select, oversee, and ensure the quality of all research and special reports funded by HEI-Energy. The Research Committee has the added responsibility of ensuring that HEI-Energy funds a body of research that, over time, cumulatively adds to information needed for policy decisions about UOGD. To help ensure that it funds only the most useful research that can inform health-protective UOGD policy and answer stakeholder questions, HEI-Energy and its Research Committee periodically:

- Oversee production of special reports surveying the broader scientific literature and, occasionally, specific topics of interest to our stakeholders, and
- Host stakeholder workshops and open houses to solicit questions and recommendations for research and special reports.

Overview of HEI-Energy Research Process

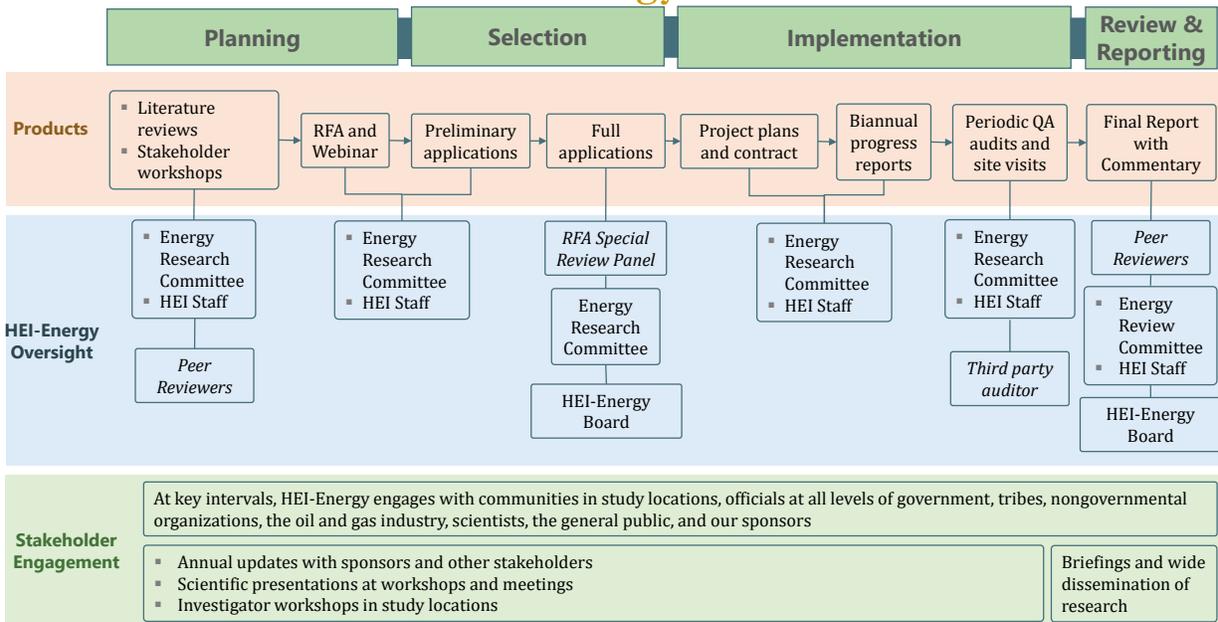


Figure 1. Overview of HEI-Energy research process, highlighting the extensive oversight to ensure quality and ongoing engagement with a wide range of stakeholders.

Research Planning

Literature Review and Stakeholder Consultations

At its start, HEI-Energy pursued a multiyear effort to identify the most salient gaps in knowledge about the potential impacts of UOGD and to develop a research program addressing the knowledge gaps pertaining to potential human exposures and health effects that can inform health-protective UOGD policy. This effort included preparation of several planning documents and policies and hosting of research planning workshops with a broad range of stakeholders (Appendix A). To support its ongoing research planning, HEI-Energy continues to track the scientific literature, regularly updating its online [UOGD literature citation database](#) and [spatial bibliography](#), and periodically updates the literature reviews and hosts stakeholder workshops to assess evolving research needs.



Study Solicitation

The Research Committee is responsible for defining, implementing, and overseeing HEI-Energy's research program. Once the Research Committee has defined an area of inquiry, HEI-Energy issues a Request for Applications (RFA) to announce broadly to the scientific community that research applications are being solicited. RFAs describe the research sought by the Research Committee and the criteria for scientific quality and stakeholder engagement used to evaluate research applications.

HEI-Energy strongly encourages applicants to diversify their research teams by including individuals from groups that are underrepresented² in environmental exposure and health research and, to the extent appropriate given the study location(s), attuned to and knowledgeable about the communities in which the studies are taking place.

Research Selection

Application Review

Depending on a number of factors related to any given RFA, such as the likely number of applications, HEI-Energy may initially solicit Preliminary Research Applications and, based on the Research Committee's review of them, invite a subset of applicants to submit Full Research Applications.

Full Research Applications are first reviewed for scientific quality by an ad hoc Special Review Panel, comprised of scientific experts, and then reviewed by the Research Committee to evaluate their scientific merit and to develop an integrated research program. This review also includes evaluation of each applicant's plan for stakeholder engagement. Studies recommended by the Research Committee undergo final approval by the Board of Directors, based on their review of the procedures, independence, and quality of the selection process.

Coordination for a Cohesive Research Program

HEI-Energy's research program includes studies conducted across major oil- and natural gas-producing regions of the United States. Given variability in operations, regulations, and environmental conditions across the regions, the Research Committee works with investigators to coordinate research to allow for comparisons and, in so doing, generally improves understanding of variability in exposure across the regions and generalizability of the research.

HEI-Energy facilitates this coordination by selecting appropriate studies and hosting Investigator Workshops before research begins. The goals of the workshop are to ensure that (1) research methods, protocols, and approaches to reporting and interpreting findings are coordinated and harmonized across study locations and research teams, (2) plans are in place for sharing data and metadata among research teams and with the public, and (3) joint learning and planning occurs for stakeholder engagement. Given their oversight responsibilities, members of the Research Committee participate in Investigator Workshops. Once research begins, HEI-Energy continues to host periodic Investigator Workshops to report on study progress and preliminary findings and to make recommendations about modifications to the study design as warranted by preliminary findings.

² HEI-Energy has adopted the National Institutes of Health (NIH) definition of underrepresented populations in the U.S. Biomedical, Clinical, Behavioral and Social Sciences Research Enterprise: underrepresented populations includes individuals from racial and ethnic groups underrepresented in health-related sciences on a national basis, individuals with disabilities who are defined as those with a physical or mental impairment that substantially limits one or more major life activities, and individuals from disadvantaged backgrounds, recognizing that women from these three backgrounds face particular challenges at the graduate level and beyond in scientific fields (Source: <https://grants.nih.gov/grants/guide/notice-files/NOT-OD-20-031.html>).

Research Implementation

Oversight by the Energy Research Committee

The Research Committee provides oversight and feedback while studies are ongoing. This oversight includes review of biannual progress reports that provide an opportunity for the Research Committee to ask questions and, as needed, make recommendations for optimizing study design and generally ensuring that the research is on track to achieve the desired objectives. Occasionally, the Research Committee's oversight may include additional technical experts, site visits, and third-party quality assurance/quality control audits to ensure that all research quality objectives are being met.

Engagement with Study Location Communities and Other Stakeholders

HEI-Energy requires its funded investigators to regularly engage with stakeholders, especially those living near study locations. This engagement begins with HEI-Energy hosting "kick-off" workshops in study locations with research teams and local community members and other stakeholders. Engagement continues at key intervals during research implementation with appropriate communication vehicles (e.g., open houses, site visits, umbrella website, fact sheets, and webinars, and live-streaming webinars with research teams). Traditionally underrepresented communities may face challenges that inhibit participation in public meetings and workshops; HEI-Energy and its researchers employ several strategies (e.g., transportation and childcare) to lower barriers to their participation.

Peer Review and Reporting

All HEI-Energy research is subjected to the highest standard of independent peer review and made freely available to the public in its entirety, including underlying data and all results, subject to confidentiality requirements (e.g., personal data of study participants).

Investigator Reports

When studies are complete, investigators submit a final research report to HEI-Energy that explains the rationale and background, describes the methods, and reports all results and the sources of data and how they may be obtained by third parties. Reports include a summary of what has been learned and an interpretation of results in the context of relevant scientific research. (For more information on final reports, see the [HEI Investigator's Guide](#)).

Review by the Energy Review Committee

Investigator reports undergo extensive peer review by the Energy Review Committee. Review Committee members possess expertise comparable to Research Committee members, but the two Committees function entirely independently of one another. The Review Committee receives outside independent reviews of the reports from project-relevant experts. It then conducts its own critical, in-depth evaluation of the investigator's final report and writes a commentary highlighting the study's scientific contributions, limitations, and relevance to policy questions in the context of changing UOGD technology and regulation, and the broader scientific literature.³ In its commentary, the Review Committee can highlight additional research needs, which the Research Committee might choose to incorporate in a future RFA or RFQ.

³ HEI-Energy's special reports undergo a separate but similarly rigorous peer review as those employed with Investigator reports. For each special report, such as the Research Committee's literature reviews, an HEI scientist who has not been involved in the development or production of the report identifies leading independent scientists with relevant expertise to conduct a thorough peer review of the special report's methods, analysis, results, and interpretation. HEI-Energy special reports are published only after the authors have revised the report in line with the peer review comments. Like research funded by HEI-Energy, special reports are freely available to the public.

Reporting on Research Data and Findings

HEI-Energy communicates the complete findings of the studies it funds in research reports, which consist of the investigator's final report and the Energy Review Committee's commentary on the study. In addition, HEI-Energy publishes a Statement, written for non-scientists, that summarizes the scientific background and rationale for funding the study, the investigator's approach and methods, the key findings, and the Committee's interpretation of the study. All documents are available to the public free of charge and through HEI-Energy's website.

HEI-Energy is committed to engaging with stakeholders beyond the scientific research community to encourage successful application of findings to UOGD policy deliberations. Toward this end, HEI-Energy communicates research with targeted stakeholder audiences, such as policy makers at all levels of government and communities where HEI-Energy funds research.

Providing access to data from studies is an important element in ensuring scientific credibility, especially for studies that are relevant to policy development. HEI-Energy has developed a policy to provide access to data for completed studies in a manner that facilitates the review and validation of the work. The policy also protects the confidentiality of any volunteers who may have participated in the study and respects the intellectual interests of the investigators who conducted the study.

Synthesis of Research Findings

Once an initial body of research is complete and final reports are published, HEI-Energy produces a synthesis document that integrates results from all studies and describes how they collectively improve the understanding of the research topic. This report will be shared widely and discussed in workshops hosted by HEI-Energy to reach decisions about the need for and scope of additional research.

Appendix A: HEI-Energy’s Research-Related Policies and Resources

Based on a multiyear effort to develop a research program to address the most salient gaps in knowledge about the potential human exposures and health effects of unconventional oil and natural gas development (UOGD), HEI-Energy produced several research planning documents and policies and hosted six stakeholder workshops across the United States. Modeled after the practices of HEI that have been honed over some 40 years, the planning documents and policies guide HEI-Energy’s research program. They are summarized in Table A-1 and are freely available at HEI-Energy’s website (hei-energy.org).

Table A-1. HEI-Energy Research Planning Documents and Events*

Document/Event	Description
Strategic Research Agenda	HEI-Energy began planning its research program in 2014 under the oversight of a 13-member Special Committee on Unconventional Oil and Gas Development. The Special Committee reviewed literature on the potential impacts of UOGD and hosted three research planning workshops. The result of the Special Committee’s work was a 2015 Strategic Research Agenda, which identified what is known and not known about the potential human health, ecologic, and societal impacts of UOGD and provided guidance for future research to fill identified knowledge gaps. This Research Agenda informed subsequent planning for the HEI Energy Research Program.
Implementation Plan	This report, prepared by HEI-Energy staff, describes how HEI-Energy has organized to conduct research that addresses research questions in the Strategic Research Agenda about human exposure and health effects. The plan is designed to ensure maximum credibility and quality, communicate results for effective use in decision making, evaluate the research program, and strategically plan to ensure the effort is on track to achieve desired goals.
Quality Management Plan	This plan, prepared by HEI-Energy staff, describes HEI-Energy’s internal systems, and those employed in sponsored research, for assuring the generation of high-quality and credible scientific information and measurement data
Policies	These policies are designed to safeguard scientific quality and avoid potential conflicts of interest, with research and underlying data clearly documented and made publicly available free of charge. The policies include (1) Conflict of Interest, (2) Quality Assurance and Management Guidelines, (3) Data Management, Preservation and Access, and Use of Human Subjects
Research Planning Workshops	HEI-Energy hosted stakeholder workshops across major oil- and natural gas-producing regions in the United States. Workshops included presentations from a range of experts and participation from a broad field of stakeholders representing federal, state, and local government, communities, nongovernmental organizations, industry, and academia. At each workshop, the Research Committee benefited from the recommendations from participants for research that would be useful for establishing UOGD policy that protects public health.
Literature Reviews	The Research Committee prepared two special reports that summarize its reviews of the health and exposure literature. These reviews complemented the research planning workshops in helping to understand the most critical research needs for achieving a cohesive body of research that would contribute to UOGD policy decisions.
Request for Applications	Once the Research Committee completed the research planning phase and defined the most important scientific topics of inquiry, HEI-Energy issued a research solicitation to



Table A-1. HEI-Energy Research Planning Documents and Events*

Document/Event	Description
	announce broadly to the scientific community that research applications are being sought. HEI-Energy's first set of solicitations took the form of Requests for Applications (RFAs); in the future, HEI-Energy may also issue Requests for Qualifications (RFQs) to conduct more directed study protocols.
* All HEI-Energy planning documents, workshop and webinar materials, and reports are available free of charge at hei-energy.org . Once its funded research is underway, HEI-Energy anticipates using HEI's well-honed guidance for preparation of research progress reports (https://www.healtheffects.org/research/investigators/progress-reports) and final research reports (https://www.healtheffects.org/research/investigators/final-report).	

Appendix B: Stakeholder Engagement Principles and Roadmap for Individual Studies

This appendix includes HEI-Energy’s general principles for stakeholder engagement in the context of individual research projects. The appendix describes extensive stakeholder involvement, which might be needed for some studies while other studies might require a much lower level of involvement. Early on, researchers and HEI-Energy must make strategic decisions about the intensity of engagement, form of engagement, and options for paying for engagement, with these factors impacting the approach to stakeholder recruitment.

Principles for Engagement

The following principles for stakeholder engagement serve as guidelines to ensure that researchers funded by HEI-Energy are well positioned to keep communities and stakeholders abreast of research plans and developments, to hear and address any stakeholder concerns and, where appropriate, to integrate stakeholder and community input into the research plans. HEI-Energy has also developed a recommended “Stakeholder Engagement Roadmap,” which details a set of practical stakeholder engagement steps that reflect these principles. The Roadmap should be viewed as a model for stakeholder engagement that aligns with HEI-Energy’s principles for stakeholder engagement. Some components of the Roadmap will be required for all researchers, such as the initial “kick-off” workshop and participation in investigator joint learning events. The other components of the Roadmap offer an example of the process for stakeholder engagement that researchers could adapt to integrate with their existing stakeholder engagement plans as needed to ensure alignment with the guiding principles.

- 1) **Define the value your research team is hoping to create for the communities in and around your study sites as a basis for engaging and gaining insight from the community.** A crucial first step for effective stakeholder engagement is for the researchers to be clear about what value they expect to create for the community. To achieve this aim, researchers should try to put themselves in the shoes of local community members and consider why their research is relevant to their lives. With this clarity, researchers will have a stronger message to communicate to stakeholders and community members and will cultivate more meaningful and sustained community and stakeholder engagement. Of course, this value can only be honed and improved by engaging the community in the conversation about what matters to them and what they value.
- 2) **Work in partnership with local organizations that have strong relationships and ties to the communities and around study sites for all aspects of stakeholder engagement.** Where possible, working in partnership with local organizations with relationships and ties to the community, including environmental justice leaders, in and around study sites will help researchers adapt their stakeholder engagement strategy to the local context. Partner organizations can play a key role in helping researchers better understand the communities where they will be operating, providing guidance on navigating local politics, advising on message development, and serving as a bridge to the local communities. Relationships of trust are not built overnight and establishing a long-standing, trusted relationship in a community takes time, commitment, and perseverance. They will help to ensure that research brings anticipated benefits without inadvertently introducing challenges (e.g., community conflict that can arise if HEI-Energy or research team members do not deliver consistent information to the entire community in a timely manner).
- 3) **Proactively reduce the barriers to participation by following best practices for engaging underrepresented communities.** Researchers should plan to make all reasonable accommodations to reduce the barriers to participation for community members in and around their study sites. This work should be couched in an analysis of the demographics of the study sites. Depending on the demographic findings, stakeholder workshops and open houses might benefit from specific accommodations, such as language translation service or workshop designs that incorporate tribal engagement protocols. The stakeholder engagement Roadmap below offers suggested practices to reduce barriers to participation. It is important to remember that there may be strong skepticism of research and researchers among some communities. For example, communities of color may have been adversely affected by research or seen research projects come and go with little gain

for their community. Additional effort may well be necessary to engage such communities, and they will expect a commitment to transparency, engagement, and “staying power.”

- 4) **Practice transparency and open communication.** From the onset of each research project, researchers should endeavor to communicate clearly and practice transparency with stakeholders, especially community members. Specific focus should be placed on ensuring that they understand the purpose of the research, potential research outcomes, the study design, the aspects of the research plan that are and are not subject to change based on stakeholder input, and the research timeline, including the schedule for communicating with them. Transparency is to some degree in the eyes of the beholder, so transparency guidelines should be decided on in collaboration with the community. For instance, sharing detailed technical reports for a study may appear transparent, but if it is inaccessible to most, transparency has not been achieved.
- 5) **Commit to continued learning and reflection on stakeholder engagement practice.** As each study progresses, researchers will learn more about the needs and opportunities for stakeholder and community engagement in and around their study sites. Researchers are asked to proactively reflect on how their stakeholder engagement plan can be improved and to share lessons learned with others in their HEI-Energy research cohort. Expect that engagement plans will need to evolve and improve as the research team and the community learn how best to work together.

Stakeholder Engagement Roadmap

The success of HEI-Energy depends strongly on cooperation among government, industry, communities, and other stakeholders to create an environment of trust in which research and literature reviews can be relied on to support sound decision making. Effective and timely engagement with stakeholders is essential to promoting such an environment. To achieve this goal, HEI-Energy identifies and engages with a diverse set of stakeholders interested in its research from the planning stage through completion, reporting on progress at key intervals along the way. We additionally require investigators to submit “Stakeholder Engagement Plans” with their applications for funding. This section describes HEI-Energy’s approach to multidirectional engagement with communities living in research locations and other stakeholders that have an interest in the research funded by HEI-Energy.

Stakeholder understanding and use of research depends on effective engagement that commences with research planning. Stakeholder involvement began in the earliest stages of HEI-Energy’s program with their participation in [research planning workshops](#) during 2014-2018. These workshops contributed to preparation of HEI-Energy’s Requests for Applications (RFAs) that were issued in fall, 2020. Similar events will be conducted for future RFAs.

Applications submitted in response to RFAs must include a Stakeholder Engagement Plan framework describing the following elements:

- Research team members with the expertise and responsibility to implement the plan, including management of high conflict issues and innovative methods of engagement.
- Anticipated stakeholder groups and the approach that will be used to identify interested community members in the study area and other stakeholders.
- Strategies to promote constructive stakeholder engagement and multidirectional communication and to foster relationships among the research team, community members, industry representatives, government officials, and other local stakeholders.
- Plans for effective engagement at key intervals during the research program, including presentation of interim findings following sufficient peer review.
- Expected outcomes from implementation of the plan and measures of success.

Investigators funded by HEI-Energy work with HEI-Energy and other funded research teams to refine and harmonize the approach to stakeholder engagement.

Before Research Begins

Joint Learning. Before research begins, HEI-Energy will bring the various investigator teams together for a discussion of their individual engagement plans. The purpose of this workshop will be to begin the process of exchanging knowledge and information and sharing best practices on stakeholder engagement, with a focus on each investigator's stakeholder engagement plan. Investigators learn from examples of best practice and from discussing common pitfalls and how to avoid them. HEI-Energy staff also provide clear direction around goals and expectations for community involvement. Importantly, researchers should arrive at this initial training sessions prepared to develop products like stakeholder maps, key messages, and a refined stakeholder strategy. Such collaborative learning will continue once research has begun, with periodic opportunities for the teams to learn and share with one another about engagement all along the research process.

Stakeholder Mapping. Investigators will develop a stakeholder map to orient their teams to the full landscape of stakeholders who may have interests or concerns related to their research plans. With this stakeholder map in hand, researchers will be better prepared to target stakeholder engagement activities to the varying needs of their audience. For example, some stakeholders may be clear candidates for active participation in a stakeholder advisory committee. Others may simply need to be kept abreast of updates via public outreach mechanisms such as social media posts or fact sheets. During the stakeholder mapping activity, researchers can also reflect on which stakeholders might best serve as partners for stakeholder and community engagement throughout the research process. Additionally, the stakeholder map that researchers develop can be cross-checked with any stakeholder suggestions provided by HEI-Energy's stakeholders. As a final component of the stakeholder mapping exercise, researchers should consider what key messages and information they intend to convey to their stakeholder groups in language and form accessible to laypersons. This process should include a particular focus on mapping typically marginalized stakeholders (e.g., environmental justice communities and disengaged subpopulations).

Develop Stakeholder Engagement Evaluation Framework. Before research begins, each team of investigators should develop a framework for measuring progress that reflects the desired outcomes for stakeholder engagement at their study site(s). Researchers may find it helpful to develop a logic model to structure their evaluation framework and evaluate work based on both outputs and outcomes. Examples of output measurements would include the number of workshops and open houses organized, the number of community members participating in meetings, the diversity and range of interests represented at meetings, and the number of communication activities conducted. Outcome measures would be captured through surveys provided to stakeholders and the public, capturing responses to engagement-related questions and tracking changes over time.

Research Commencement

Kick-Off Workshop. HEI-Energy foresees the need to host workshops in study locations before research begins so that the research team can meet with local stakeholders (e.g., community members, local NGOs, governmental and tribal officials, industry representatives, scientists conducting relevant research in the location, and others). The workshops will have at least three objectives: (1) provide notice about the study and assist stakeholders in understanding the research plan, objectives, and assumptions, and place the study in the context of the overall HEI-Energy Program, (2) explain the engagement approach through the phases of research, and (3) hear from stakeholders and discuss their questions, concerns, priorities, and ideas. Understanding the research plan will equip community members with the knowledge needed to comprehend the study intent, methods, limitations, and results.

In addition to advancing the goals above, these workshops will be an opportunity to present the outcomes of previous research planning workshops so that participants understand how community input fed into the research selection process. These workshops should also make clear what aspects of the research design are and are not subject to change.

Engagement would continue at key intervals during research to provide updates and, as appropriate, interim findings, and it would end after research is complete and final results have been reviewed by the Energy Review Committee. The Research Committee will work with investigators to develop and implement plans for communicating interim and final results.

Research that involves multiple study locations spread across large geographic areas (e.g., statewide studies or multi-regional studies) might require other forms of stakeholder engagement (e.g., webinars) to encourage comprehensive participation or separate meetings in the various study locations. Given the ubiquity of on-line meetings during the COVID-19 pandemic, this may be an effective approach.

Workshops and open houses will be repeated in each study location at pre-determined intervals, with the opportunity for participants to hear interim results of research.

Convene Core Stakeholder Group. Researchers may choose to convene a Core Stakeholder Group to serve as “community partners” to the researchers for ensuring effective engagement with the broader community, troubleshooting challenges, and providing input. The broader community includes environmental justice communities and vulnerable groups, such as women, children, and individuals who are elderly, disabled, or homeless/displaced. This core group could be as small as 3 to 4 key influential individuals in a community to a larger, more representative group of the community through a committee or work group of 10 to 20. Of course, the ability and resources to manage a small group of local experts is meaningfully different than managing a large, diverse stakeholder group.

Building a Foundation for Equity & Access. It is important to keep in mind that traditionally underrepresented communities in public processes may face challenges that take precedent over public meeting, workshop, and open house participation. These challenges have been exacerbated by the Covid-19 pandemic. Researchers are encouraged to leverage the strategies outlined below to lower the barriers to participation for traditionally underrepresented communities.

- **First, actively seek out and work with stakeholders with ties to underrepresented communities.** Community leaders, and the heads of organizations that serve underrepresented and environmental justice communities will best know how to ensure that those communities are engaged with the research. During the initial stakeholder mapping activity, researchers should identify stakeholders who can represent and serve as a bridge to traditionally underrepresented communities.
- **Offer to cover participation costs.** Some communities may be deterred from participating in HEI-Energy workshops because of associated costs, travel or otherwise. Offering to reimburse these expenses where appropriate may increase participation by traditionally underrepresented communities.
- **Make it easier to show up and participate.** Offering childcare at meetings, or ease of a means for transportation to workshops and open houses. Provide on-line training on how to use Zoom or other on-line platforms, including on smart phones, not just computers. Provide closed-captioning and as needed, multi-lingual translation.
- **Learn about any specific tribal or religious practices or cultural preferences.** Be sensitive to the practices and preferences in your planning.
- **Multiple engagement opportunities.** Hold meetings at varying times, including nights. Allow people to participate meaningfully in-person on a continuing basis or just once or twice, on-line, or in writing, and consider options for respecting privacy concerns.
- **Engage with youth and local schools.** Researchers might organize workshops, open houses, or webinars with local schools to share about their research and the scientific process. Students will be able to share this information with their families. This approach would serve to expand engagement in the research and perhaps inspire some future scientists.

During Research

Periodic Meetings with Stakeholders. Investigators should host periodic convenings with stakeholders to understand stakeholder interests and concerns and to provide updates on the research. The updates would include (1) the research timeline, (2) progress on any research milestones or challenges encountered, (3) any changes to the study design and rationale for changes, (4) high-level insights from research conducted to date, (5) and a preview of next steps. These meetings would be open to the public. These could be as simple as quarterly 1-hour lunch or evening webinars to periodic in-person, extensive working meetings and workshops.

Communications & Media Engagement. HEI-Energy will aim to host an umbrella website, with each study site occupying a subpage. Researchers will be expected to maintain their subpage with up-to-date content. Researchers are encouraged to leverage social media channels to promote engagement with their work, as appropriate, though the approach to moderation of social media sites is a variable that must be considered. Research teams should also be engaged with traditional media, including sources that serve diverse audiences (e.g., print newspapers and Spanish language radio). Generally, research teams' communications strategies should extend from the stakeholder engagement plans and analysis of stakeholder groups. Site specific communications strategy and alignment with HEI-Energy's communications activities will be addressed in the pre-research training / join-learning session.

Continued Joint Learning & Sharing of Best Practice in Community Engagement. Researchers will be convened for mid-research workshops (possibly bi-annual) to discuss progress on stakeholder engagement plans and to share challenges and successes.

Post Research

Evaluate. Evaluate the effectiveness of community engagement with a focus on both outputs (e.g., the number of workshop participants) and outcomes (how well local communities understand the nature of the research being conducted in their communities and how relevant the research feels in relation to their concerns). Effective evaluation of stakeholder engagement processes will require research teams to plan how they would evaluate their stakeholder engagement before research begins.