Energy Research & Social Science 97 (2023) 102967

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Original research article

Preferences and perceived barriers to pursuing energy sovereignty and renewable energy: A tribal nations perspective

Don Lee [a,*], Chelsea Schelly [a], Valoree S. Gagnon [a], Sarah Smith [b], Shardul Tiwari [a]

[a] Department of Social Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931, USA
[b] Committee for Alternative and Renewable Energy, Keweenaw Bay Indian Community, 16429 Beartown Road, Baraga, MI 49908, USA

ARTICLE INFO

Keywords:
Community-engaged research
Tribal energy
Energy sovereignty
Energy justice
Community ownership
Community governance
Renewable energy transition

ABSTRACT

This paper proposes two contributions to the literature on the social acceptance (SA) of energy systems and public perceptions of renewable energy (RE) transitions. The first contribution is methodological, recognizing more effective and inclusive forms of engagement begin with building reciprocal relationships and collaborative research partnerships operationalizing the tenets of energy justice. Employing these methodological recommendations, we conducted a collaborative, inclusive, and equitable research design and engagement practice by collaborating with Tribal members on research with expressly mutual benefits. In this work, a years-long collaboration of Tribal members and non-Tribal researchers developed a methodology to survey respondents at an accessible and culturally relevant community event to learn about preferences and perceived barriers to transitioning to RE. A second contribution is empirical. The results suggest shared priorities for energy solutions that enhance energy sovereignty, i.e., community control and ownership of energy services provisioning. They also demonstrate widespread awareness regarding barriers to a RE transition and simultaneously, some potential misperceptions about the challenges to transition. This study reinforces the need for SA research to move beyond asking what technologies receive public support and where those technologies should be sited to consider how access and transparency in planning processes, collaboration, engagement, development, ownership, and benefits are organized and can be radically reconfigured to enable the just transition to a decarbonized energy system.

1. Introduction

Typically, energy development occurs through top-down centralized planning via state or local government entities [1] and lacks substantive "engagement and meaningful participation in decision-making" [2, p.7]. This often results in the disproportionate siting of environmentally harmful energy-related extractive practices and power generation in Indigenous and other marginalized communities [3–7].

In this study, we employ a methodology operationalizing the tenets of energy justice in collaborative research built on long-term commitments to and relationships with a Tribal Nation seeking socially acceptable pathways to renewable energy (RE). Historically, Indigenous communities have been subjected to unjust and exploitive research practices [8–14]. Shaw et al. propose a "Seasons of Research Framework" to build, strengthen, and sustain "equitable research partnerships with/by/as Indigenous communities" [11, p. 5] based in the Indigenous theoretical framework offered by Ermine, Simonds, and others blending Indigenous and Western epistemologies with the goal of redefining research relationships and methods [9,11,12,15]. Indigenous scholarship and long-standing relationships with Tribal members from the Keweenaw Bay Indian Community (KBIC) inform our understanding and researcher positionality in the context of "Indigenous self-determination," [11] advancing the work of Shaw and others by operationalizing methodologies that center trust relationships and collaboration, the decolonization of processes, and ensuring shared benefits in conducting this research.

Through a years-long collaboration funded in part by the National Science Foundation (NSF) Convergence program, the MICARES project facilitated partnerships between Tribal members and university researchers and students [16] to study socio-technological system transitions "exploring the social, cultural, and technological dimensions of energy system transitions at the household, community, and regional levels" [17]. This effort created an explicitly collaborative research space for developing research design, timing, venue, data analysis, and

* Corresponding author.
E-mail address: dolee@mtu.edu (D. Lee).

https://doi.org/10.1016/j.erss.2023.102967
Received 11 July 2022; Received in revised form 15 January 2023; Accepted 23 January 2023
Available online 2 February 2023

discussion. This work is premised on providing information for the use and benefit of the Tribe, recognizing "the agenda Indigenous peoples set is a self-determined one, rooted in the laws and sovereign practices of distinct Indigenous Nations" [18, p.651] The research and methodologies center on recognizing and honoring the sovereignty of our partner Tribe.

In 2021, MICARES team members, in partnership with the KBIC Natural Resources Department (NRD), attended the annual KBIC powwow to learn more about community perceptions of energy, including priorities for and perceived barriers to RE transitions. KBIC is a northern Great Lakes Ojibwe Tribal Nation, located in Michigan's Upper Peninsula, a very cold and snowy climate that is primarily rural, with aging housing stock and infrastructures. Forests, fisheries, and gaming are the primary economic drivers for the Tribe. The research team worked with KBIC Tribal members through the Tribe's Committee on Alternative and Renewable Energy (CARE) and NRD to first understand what the Tribe wanted to know and to whom the questions should be posed. Together, we developed a short form survey that included questions regarding opinions on improving energy systems, challenges to using RE, priorities for energy at home, and support for community energy initiatives.

The KBIC powwow celebrates Tribal culture and traditions creating space for dialogue and engagement with an intentional and ethical connection to physical space and cultural place [12,19] without a rigid agenda or timeline. This facilitated leisurely interactions and opportunities to learn about Tribal energy needs and priorities in a cultural context. The annual powwow is open to the public, and Tribal members and descendants attend each year, as do many non-Tribal members from the local region and the state creating an opportunity to compare responses from Tribal and non-Tribal respondents. The empirical data show that Tribal and non-Tribal community members share similar perceptions, perspectives, preferences, and priorities regarding RE. The data also show clear understanding of the barriers to the RE transition posed by the incumbent fossil fuel energy and utility regimes. This finding suggests opportunities to mobilize new research agendas and new forms of engagement to tackle barriers to RE transitions, while developing useful engagement tools and data for communities.

The literature review examines culturally relevant methods of engaging Tribal communities with a focus on collaboration in design and delivery, substantive engagement and participation in the research, and flattened hierarchies. We explore structures of power and acknowledge the history of exploitation of Indigenous peoples and other underrepresented communities in past research, and recognize that community engaged research can contribute to reshaping power structures between communities and traditional decision makers. We then turn to energy justice and argue that centering the tenets of energy justice in the facilitation of community-engaged research fosters collaboration and empowers communities. We examine how procedural fairness and the development of trust relationships are critical for Tribal energy projects to enhance Tribal energy sovereignty. Finally, we link community engagement, Tribal sovereignty, and energy justice to social acceptance (SA) research, arguing that work on SA can be further developed to consider not only what technology and where but also by whom, for whom, and with what benefits to communities hosting energy developments. Our analysis demonstrates that when asked, community members have a sophisticated awareness of the obstacles to the development of RE in their community and share specific preferences for the development of RE resources.

2. Community based energy transition planning and processes based in energy justice

Community-based participatory research as a component of community-engaged research is framed in "equitable community involvement in research" [16, p. 427] focused on partnerships between academics and communities [16,20]. Our goal was to engage a diverse group, including Tribal members and non-Tribal participants, in a culturally relevant setting, taking a community-based participatory approach [21–26, see also 27]. Community participation in energy planning often involves public meetings with agendas developed and scheduled within "structures of privilege" [28, p. 317], which exacerbate marginalization and create barriers to participation for underserved communities [24,29]. Rather than making room at the same table that perpetuates the ongoing exclusion of Indigenous people and other groups who are silenced or ignored through continued reliance on colonized systems of planning [1,18,30], some scholars argue that we must walk away from the table and take collaboration to the streets [29].

Community engagement involves "the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people" [31, p. 9]. Community engagement is a tool that can help develop trust relationships [9,32,33], improve communication, mobilize allies, and secure resources [34,35]. Engaging Tribal entities requires a commitment from researchers to acknowledge, respect, and value, Tribal knowledge [9,11,27] and avoid "tokenistic engagement" [9, p. 8]; genuine engagement can address conditions of mistrust [10], marginalization [36], and historical injustices resulting from ongoing colonization [9].

Centering energy justice in the development of energy policy can empower impacted communities to lead in the design, implementation, and maintenance of socially, culturally, and regionally appropriate energy technologies. This can support a just distribution of benefits and burdens based on rationales not normally considered in mainstream feasibility studies, including human rights conventions [37], the recognition of disproportionate burdens on vulnerable communities, and systemic barriers to just energy transitions [38,39]. Centering Indigenous frameworks that prioritize culturally embedded values, local knowledge, and community sovereignty can inform energy transitions planning in diverse cultural contexts [24]. Individual and community identities and perceptions, as well as relations within and among groups, shape relationships of power. Engagement that positions researchers as learners through long term relationship building and centering of community priorities can more genuinely address community needs [25,40,41, see also 31], including the need for an energy transition that centers justice in both processes and outcomes.

2.1. Community engagement and structures of power

Communities impacted directly by energy development decisions are often not included in the planning process [42–44]. Arnstein [45], in the well-known "typology of citizen participation" [45, p. 26], assesses degrees of citizen power reflected in community engagement efforts ranging from performative [9] "power holder" offerings (intentionally empty exercises in participation that create the optics of empowered engagement) to substantive and meaningful community empowerment leading to "citizen control" [45, p. 33]. "Citizen control" represents the guarantee that autonomous citizens can exercise political power to manage their resources, develop policies, and negotiate with outside entities. According to Arnstein, favorable outcomes for communities resulting from community engagement are dependent upon the degree to which citizens attain power through that engagement [45].

Political power attained through democratic processes is the most certain path to ensuring just energy transitions [46]. Attaining energy and climate justice will be possible only through the systemic democratic alignment of social, economic, political, and technical systems [47]. This is contingent upon dismantling the political and regulatory framework that perpetuates the systemic social, economic, and ecological injustices of incumbent energy regimes [38] and developing community capacity for energy governance [11,46] where communities are empowered "to lead and control the process" [48, p. 1839]. This, we argue, can only occur when "citizen control" is realized through engagement that results in the impacted communities having control of

energy planning and decision making. Distributed energy systems with diversified ownership and management can arguably distribute risks and benefits more evenly [49]. Community engagement and participation in energy development at the local scale can ensure the integration of social values in energy projects [50].

Research with Indigenous people requires a long-term commitment to ethical engagement [27] and deliberate attention to "the distinct ethical values that will inform the research practices in partnership with one another" [11, p. 3]. Flattening hierarchies and moving away from rigidly formulated planning processes make space for voices that might not otherwise be heard [9,27]. In contrast, colonized processes that center the needs and priorities of researchers and that marginalize diverse community experiences perpetuate mistrust [11], marginalization [36], and historical injustices [9]. Our positionality as researchers has been informed through Indigenous scholarship and working relationships and friendships with Tribal members. Our team of researchers lives and works on the homelands of the Ojibwe people. Don Lee is a descendent of settler colonizers studying the energy transition at the nexus of energy justice and political economy, with views on energy justice and Indigenous sovereignty informed by personal experience and work as a community organizer and activist. Chelsea Schelly is a descendent of settler colonizers whose research focuses on sustainability transitions at the intersection of society and technology with the aim of addressing longstanding social inequities through engaged research. Valoree "Val" Gagnon is an early career assistant professor, and a naturalized U.S. citizen and Korean adoptee, with interdisciplinary expertise in human dimensions and environmental policy focused on elevating Indigenous peoples and knowledge, facilitating equitable research practice and design. Sarah Smith is a member and former CEO of the Keweenaw Bay Indian Community, an Anishinaabe Tribe, whose business is centered around inspiring and empowering Tribal people to build up their communities. Shardul Tiwari is a descendant of settlers in the Shivalik region of the Himalayas whose research focuses on sustainable energy transition for marginalized communities with the aim of addressing distributional inequities in the energy system through collaborative research. Collectively we approach this work as active learners who prioritize collaboration and consultation while purposefully aiming to decolonize our thinking and processes.

2.2. Engagement and social acceptance of renewable energy

Research on the social acceptance (SA) of energy technology focuses on understanding and reducing opposition to the deployment of energy projects, originally based on perceptions of risk associated with nuclear power [38,51,52]. In their 2007 paper, Wüstenhagen et al. [53] suggest that there are three dimensions of SA, including "socio-political, community, and market acceptance" [53, p. 2683]. This foundational work illustrates that energy development can be derailed without social support.

Much of the early work on SA was reactionary, aiming to understand community opposition to local projects. Some scholars argue that opposition is based on a "not in my back yard" attitude (often coined "NIMBYism"), suggesting that opposition occurs due to aesthetics [38,54–56], property value [51,54], and other points of contention. There is a growing body of literature pushing back on the "NIMBYism" concept, which is critical of framing opponents of RE projects as misinformed, deviant, or selfish [38,57–60]. This more recent work in SA suggests that local place identities and place attachments [61–63] are more complex than the NIMBY concept and that concerns about the distribution of economic benefits [64,65] also shape the dynamics of SA. Social factors such as trust [66], perceptions of fairness [67], and distribution of benefits [64,65] are also key to SA.

Much of the literature focuses on the importance of trust when discussing relationships between publics and government entities and project developers [40], but the literature rarely extends consideration to trust when it comes to understanding the local knowledge and the needs of the impacted communities [33]. There are multiple contexts in which the issues of trust become important in community engaged research. Trust relationships align with the tenets of energy justice when processes lead to outcomes that ensure public benefit through substantive stakeholder engagement as perceptions of procedural fairness are important to developing mutual trust [68].

This project extends research on SA of RE in two significant ways. First, the research design demonstrates the value of addressing SA proactively rather than reactively, asking what communities want rather than asking why they will not accept what is offered. Methodologically, we illustrate how community engagement can move beyond planning meetings and engagement sessions to meet people where they are and engage with communities on their own terms. Second, findings suggest that public perceptions of energy transitions involve complex considerations beyond technology and location, including scale, ownership, sense of place, community participation in planning for energy transitions, and the barriers standing in the way. These empirical insights suggest that research on the SA of RE can be improved by considering how RE intersects with dimensions of energy justice.

2.3. Engagement, energy justice, and energy sovereignty

Community engagement centered on the tenets of energy justice can provide a path to reverse the disparities caused by energy extractivism by addressing and reversing the root causes associated with them. The right of communities to participate in decisions that impact them with regards to the energy transition are issues of procedural, recognition, and distributive justice [47]. Procedural justice requires citizens to have full information, agency in decision making, and assurances of legal redress [47]. Recognition justice acknowledges the intrinsic value and rights of all people equally and seeks to ensure community needs and vulnerabilities are formulated into energy project development, and that access to energy services align with the cultural and social values of impacted communities [69–71]. Distributive justice seeks to ensure the fair distribution of burdens and benefits, including "a certain set of minimal energy services which enable them to enjoy a basic minimum of wellbeing" [47, p. 440] as energy systems are decarbonized [72].

Empowering impacted communities to lead in the design, implementation, and maintenance of socially, culturally, and regionally appropriate energy technologies can provide a pathway to just distribution of benefits and burdens and creates a pathway to restorative justice [38]. This requires confronting and restructuring relationships between Indigenous people and colonial structures of power [9] to use the deployment of RE as a mechanism for reconciliation [73]. In the Native American tradition of law, peacemaking or *hozhooji naat'aanii* in the Navajo language, is central to resolving conflict through a process centering "relationships, reciprocity, (and) solidarity" rather than rules and punishment [74,75].

In the context of energy transitions, restorative justice recognizes past harms created by incumbent energy regimes and attempts to remedy those harms by ensuring not only the equitable distribution of energy, but the acknowledgement of those harms, and remuneration for past economic and ecological harms [40]. This entails ensuring the democratic structural organization of decision-making including considerations of governance and ownership [76]. Advancing collaborative community energy planning centered on the tenets of energy justice can lead to the adoption of RE in ways that align with community values, serve community needs, and empower communities to act on decisions related to energy transitions [77]. Energy security and sovereignty can be achieved by developing energy policy based on outcomes of substantive community participation, centered in the tenets of energy justice [38,77,78].

3. Methodology and case study

KBIC NRD staff have ongoing collaborative partnerships with the

local University involved in this work, and these long-term collaborations are supported by research designed to address priorities identified by the Tribe and forms of engagement supported by the Tribe. The work described here was conducted as one aspect of a larger study on energy transitions in the state of Michigan, U.S. [NSF Award #1934346]. The survey methodology was developed to provide a convenience sample from participants in a targeted group [79] to assess community perceptions, perspectives, preferences, and priorities for existing and potential future energy systems serving a community. Both the content of the survey and the process of engagement at the Tribe's annual powwow were developed through a collaboration of Tribal members and Tribal and non-Tribal researchers working in partnership with KBIC.

MICARES partners from KBIC identified the powwow community gathering as an ideal choice to engage Tribal members and non-Tribal attendees to create inclusive opportunities for data collection. The people in attendance chose to attend and are therefore excited to be there and likely in a good mood. Tribal Nation members are predisposed to think more deeply about their Native American identity at this time, while Tribal members drum and dance in their regalia. Experienced participants who were also project partners felt that attendees were likely to feel a renewed sense of Tribal community togetherness and feel more inclined to do something proactive to contribute (like completing a short form), which might not occur on a regular day. The atmosphere also embraces nature and the desire to live in right relations with her.

Climatic change is already resulting in increased severity and regularity of disaster events. In the community studied here, a hundred-year flood event occurred in 2019. Shortly after, the water of Keweenaw Bay (where KBIC is located, in a bay of Lake Superior) rose above ground level and spread out before then retreating into the bay. These extreme water events create risks for secure access to energy services. In addition, natural gas and propane prices have increased, yet wages in this area remain well below national average [80]. These experiences likely shape the way that local participants responded to the survey questions, as they came up in discussions with local participants.

Tribal researchers who are known in the community provided credibility and accessibility to the community. Using a deeply reciprocal approach beginning with the development of a trust relationship, this research evolved through an iterative, collaborative process with intention to flatten power dynamics between university researchers and Tribal staff [27]. Having Tribal leaders and researchers facilitating substantive engagement opportunities demonstrates a commitment to ensuring outcomes are aligned with the public interest [68].

The method of engagement also helped to address the challenges posed in the literature of identifying community members for collaboration when conducting community-engaged participatory research [81–83]. In this case, the community defined itself through an organic assembly of individuals who share communal (and in the case of powwow, also spiritual) bonds, rather than by who is available to attend a planning meeting with a rigid agenda, at a specific time, that may be inconvenient for many community members, especially those who are most marginalized, minoritized, or vulnerable. While our process does not fully address the concern of including all impacted community members, it goes beyond limiting feedback to input from select community members empowered by either affluence, influence, or interest who represent the community at large, while marginalizing community members who might otherwise experience barriers to participation [84–86, see also 87].

3.1. Survey design and distribution procedure

The one-page (two-sided) short form survey included six questions (Appendix 1). Two of these questions were open-ended and requested basic demographic information. Because the powwow is open to the public and attended by a diverse audience, the project team expected participation from both Tribal and non-Tribal members and from both local and non-local residents. Questions included whether the respondent was a "Tribal member or descendent" and where they live currently, including only "village, township, city, or state."

KBIC Tribal leadership coordinated our presence at the powwow to recruit short form participants. Data collection was conducted for two days. KBIC Tribal members have been part of the project team since its inception, and they were involved in developing the research protocol and recruiting participants by tabling at the powwow. The research team attended as a vendor with a booth setup that included a tent, table, banners, and some items of interest, including a working solar panel display with battery storage, small carnival-type prizes like kites, coloring materials and stickers for children, and solar gadgets that were given away through a drawing as an incentive to participate.

Two or more team members were present at the booth throughout the weekend to recruit study participants. Team members engaged with people they already knew through familiarity in the community as well as soliciting responses by approaching passers-by with a quick "elevator pitch" informing them of the short opinion form about renewable energy and that they would be eligible to enter a drawing to win one of several solar powered prizes if they completed the form. A solar demonstration utilizing two different types of solar panels, battery storage, and instrumentation that showed the power production of the solar panels was on display to help interest participants and start conversations. Consent from participants followed the IRB-approved process.

3.2. Data

Subject groups were sorted and analyzed as follows: *KBIC/Local* (Group 1) (n = 23) includes all respondents who identified as KBIC tribal members or descendants who live in the local area. *Non-Tribal (Local)* (Group 2) (n = 18) includes all non-Tribal respondents who live in the local area. *MI Tribal* (Group 3) (n = 44) includes all Tribal respondents (including KBIC members and descendants) who live in Michigan. *All Tribal* (Group 4) (n = 57) includes all Tribal respondents (including KBIC members and descendants) from all locations. *All Respondents* (Group 5) (n = 104) includes all respondents from all locations. Non-Tribal Nations members who are not local to the area are captured only in this group. Groups were structured in this way to ensure that the project answered the questions of primary interest to KBIC regarding the perspectives of their members and how they compare to other local perspectives and other Tribal perspectives. Non-exclusive categories were organized and produced semi-concentrically beginning with local KBIC members, then including non-Tribal locals, all Michigan Tribal members, all Tribal member respondents, and finally all respondents from all locations (see Fig. 1). Groups are numbered to streamline verbiage in the analysis (Figs. 1–5).

3.3. Analysis

The data were analyzed with IBM SPSS Statistics (version 26) (IBM Corp., 2019). As the study is exploratory in nature and involves nominal level variables, the results are most suitable for descriptive statistical analysis rather than any predictive analyses. The results below are discussed in terms of percentages and frequency of responses, which serves the purpose of this study.

3.4. Limitations of the study

The one-page (two-sided) short form survey included six questions. During data collection, potential respondents were asked to fill out 3 answers per question but told that was not a requirement for participation. Once the surveys were collected, we decided to only examine surveys that were fully and correctly completed in strict compliance with the instructions on the survey. Ensuring that surveys were fully and correctly completed would increase usable data. In some cases, respondents engaged researchers with stories about their experiences with energy use, including challenges related to high energy costs, the power

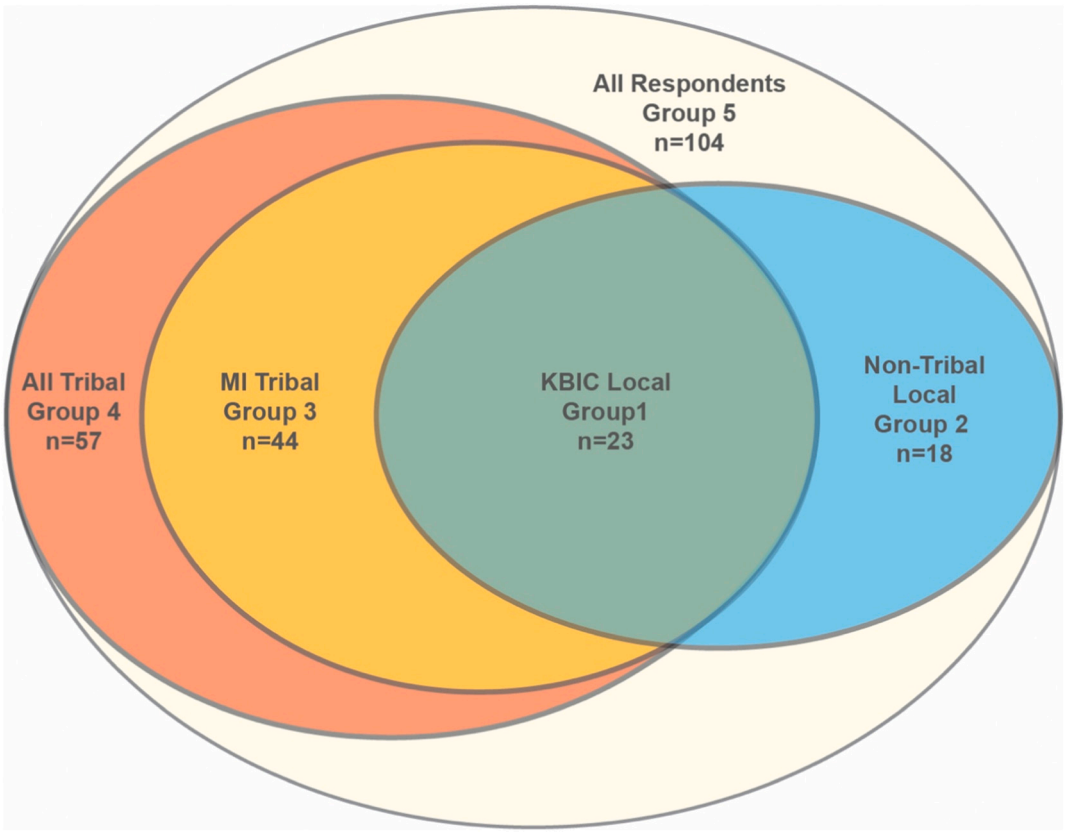

Fig. 1. Categorization of respondent groups by Tribal affiliation and location of residence.

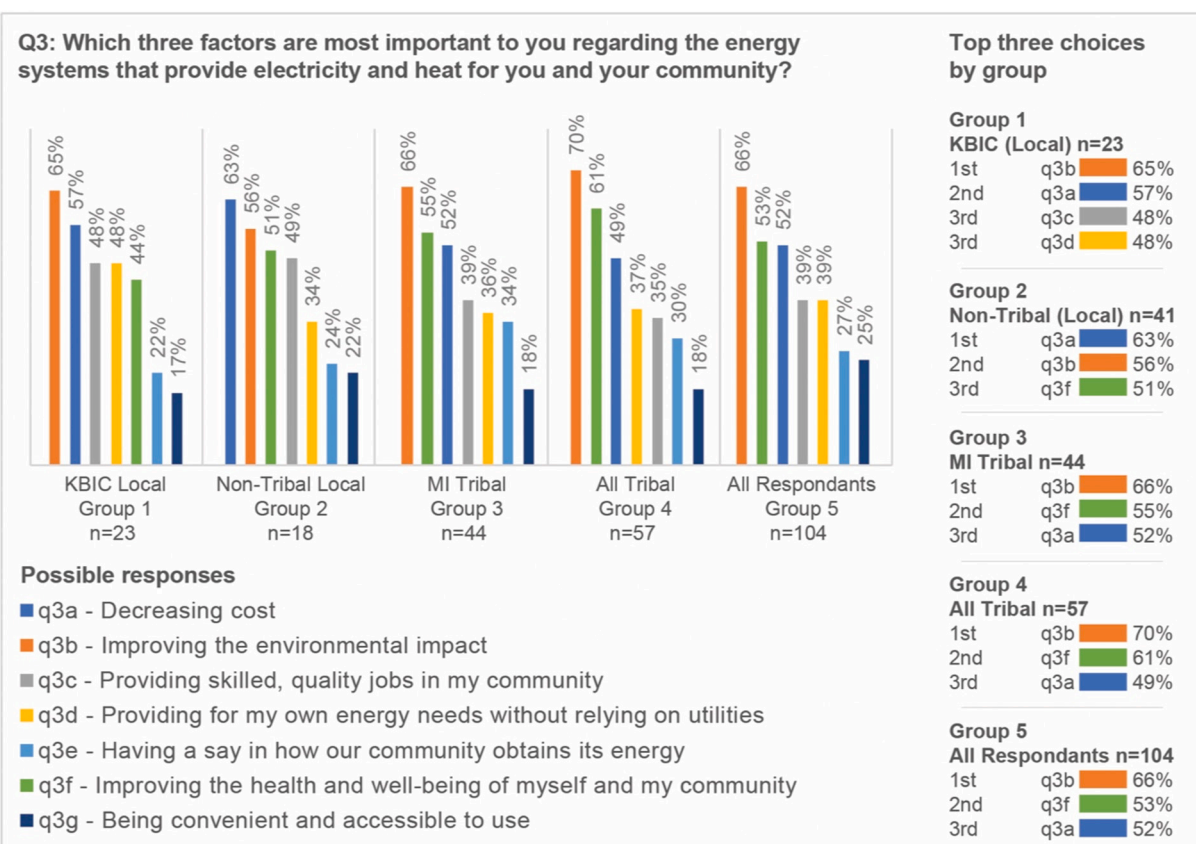

Fig. 2. Priorities for energy systems.

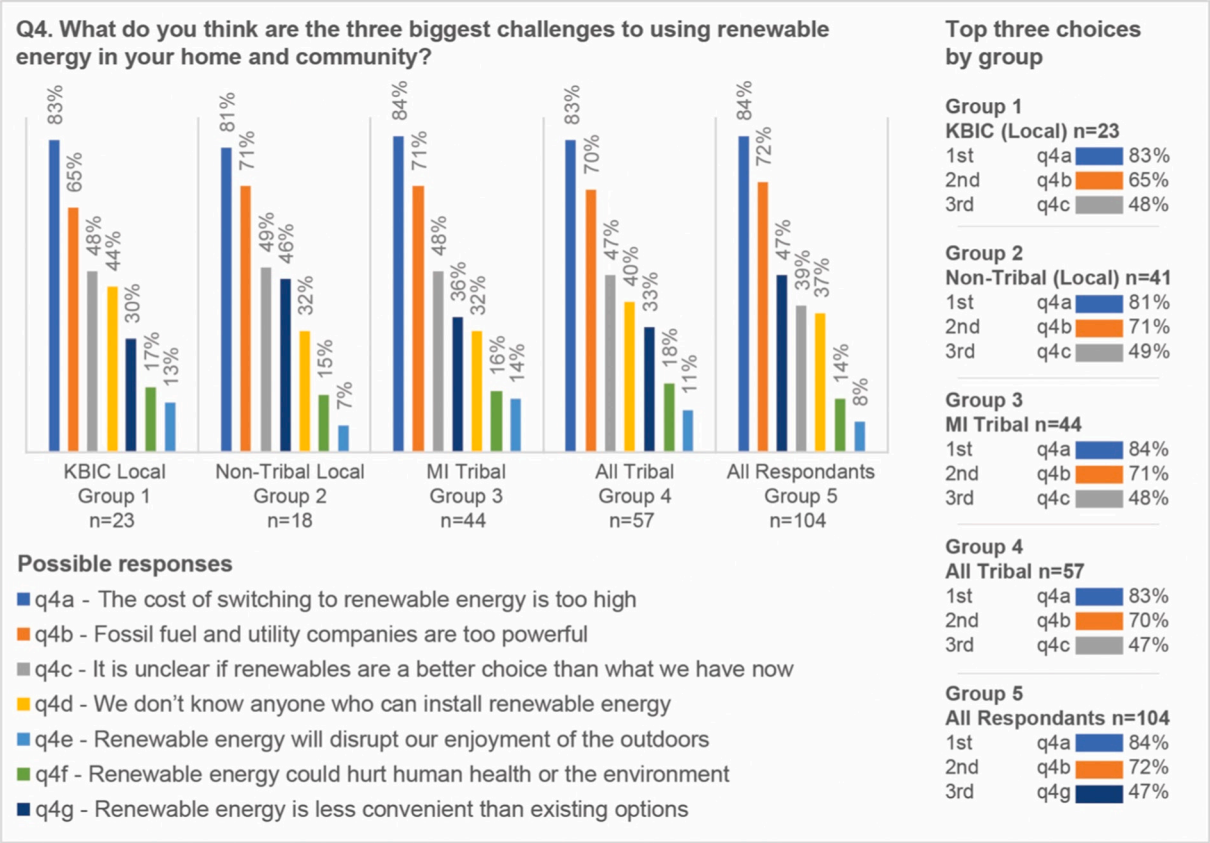

Fig. 3. Biggest challenges to using renewable energy.

of incumbent energy regimes, and feelings of helplessness in adopting renewable energy. Storytelling as a research method can help researchers engaged in community-based research gather information and understand lived experiences [88–91] through a relational approach to engagement [92]. Complementary methods like storytelling and interviews in future community engagement and SA studies could garner depth that a survey cannot.

4. Findings

To address both study objectives (learning about public perceptions and exploring the value of the adopted method), this section reports the statistical analysis from the surveys while experiential data based on engagement at the powwow is presented in the discussion. The survey results suggest wide agreement on what is important when it comes to energy decision making, what the barriers are to changing energy systems, and what should be prioritized at the household and community scales when it comes to energy transitions. The experiential data illustrates the value of our methodological approach for culturally appropriate and inclusive engagement processes.

Groups were categorized as described in Section 3.2. The majority (60 %) of KBIC member respondents were local; the remaining KBIC member respondents resided in areas both within (35 %) and outside (5 %) of Michigan. Within the 104 surveys analyzed, respondents from eleven Tribal Nations are represented. A total of 192 surveys were completed, and the 104 surveys that were fully and correctly completed in strict compliance with the survey instructions were analyzed. We omitted surveys with blank answers or those with less or greater than three answers for Q3-Q6.

Question three (Q3) asked respondents to choose three factors they considered to be most important regarding energy systems (verbatim question and summary of results in Fig. 2). All respondent groups ranked "Improving the environmental impact" and "Decreasing cost" among their top three priorities, with the percentage ranging from 56 to 70 % and 49–63 % respectively. Respondent Groups 2–5 ranked "Improving the health and well-being of myself and my community" among their top three priorities, with the percentage ranging from 51 to 61 %. Group 1-*KBIC Local* diverged from this factor and were split evenly (48 % each) ranking third "Providing skilled, quality jobs in my community" and "Providing for my own energy needs without relying on utilities."

Question four (Q4) asked respondents to choose three biggest challenges to RE adoption (verbatim question and summary of results in Fig. 3). All respondent groups ranked "The cost of switching to renewable energy is too high" first and "Fossil fuel and utility companies are too powerful" as second, with the percentage ranging from 81 to 84 % and 65 % to 72 % respectively. Respondent Groups 1–4 ranked "It is unclear if renewables are a better choice than what we have now" as third with the percentage ranging from 47 to 49 %. Group 5 (the only group to include non-Tribal and non-local respondents) diverged from this factor, with 47 % of respondents selecting as a third option "Renewable energy is less convenient than existing options."

Question five (Q5) asked respondents to choose options for improving energy usage in their home (verbatim question and summary of results in Fig. 4). Ranking across respondent groups were the same. Respondent groups ranked "Install solar panels" as their first choice, with the percentage ranging from 73 to 91 %. All respondent groups ranked "Make energy efficiency improvements (LED light bulbs, high efficiency appliances, improved insulation)" as their second choice, with the percentage ranging from 57 to 67 %. Perhaps reflective of the northern climate in which this work took place, all respondent groups ranked "Install a wood or pellet stove or boiler for renewable heat and/or hot water" as the third choice, with the percentage ranging from 41 to 52 %.

Question six (Q6) of our survey asked respondents to choose

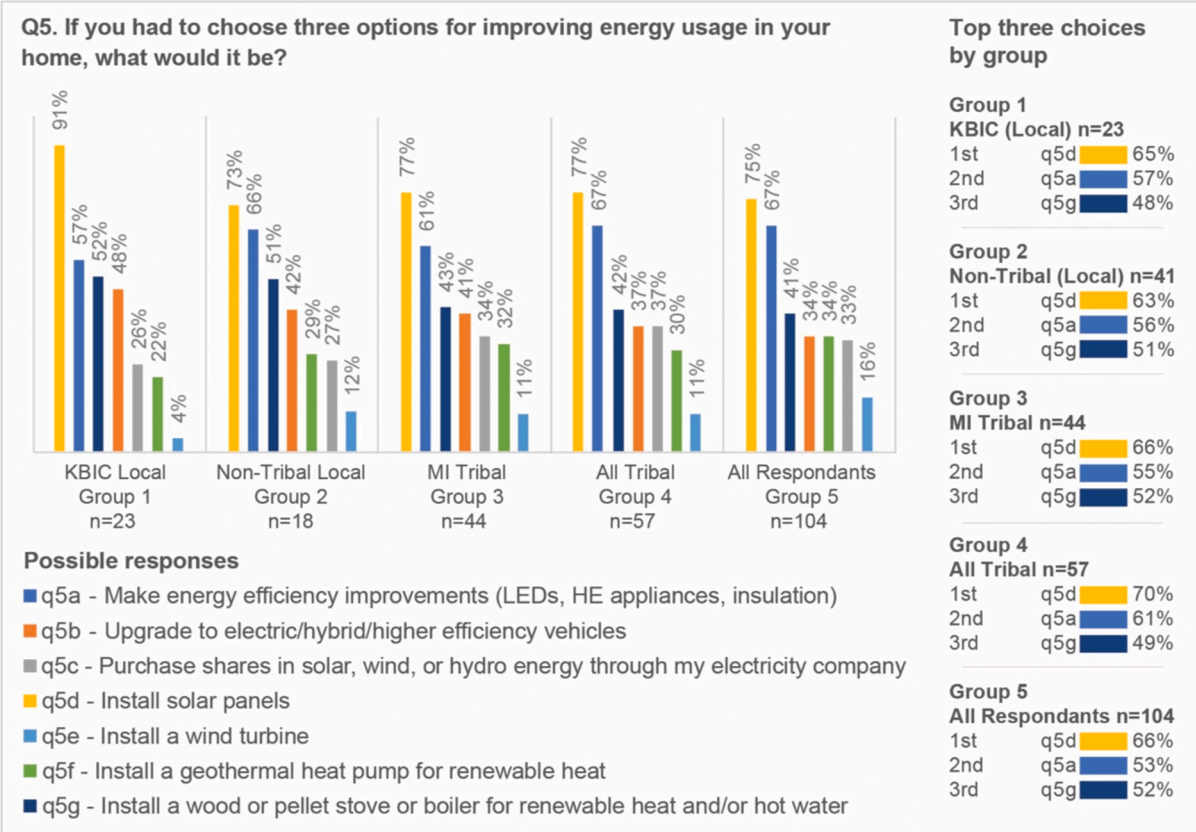

Fig. 4. Priorities for improving home energy usage.

community energy initiatives they would be most likely to support (verbatim question and summary of results in Fig. 5). All respondent groups ranked "Community-wide solar electricity" as their first priority with the percentage ranging from 68 to 91 %. Respondent groups diverged in their second and third priorities. All respondent groups prioritized "Community-wide strategic energy planning" in their top three with the percentage ranging from 35 to 46 %. Respondent Groups 2, 4 & 5 ranked "Community-wide energy efficiency improvements (LED light bulbs, high efficiency appliances, improved insulation)" in their top three priorities with the percentage ranging from 37 to 39 %. Respondent Groups 1, 2 & 5 ranked "Change in building codes to require reductions in energy use in new construction and efficiency upgrades for existing structures" in their top three priorities with the percentage ranging from 35 to 39 %. Group 1 & 3 identified "Community-wide hydroelectric energy" in their top three priorities with 39 % of respondents selecting that option.

Results show that priorities and preferences do not vary widely across the differentiated respondent groups, and that there is clear agreement on perceived obstacles and preferences for the RE transition. All groups were motivated to reduce costs and improve environmental conditions as important considerations for energy systems. All groups recognized that incumbent fossil fuel and utility companies have the power to obstruct the deployment of RE. All groups perceived that the costs of transitioning to renewables is also an obstacle. Support for solar as a solution for both community and household configurations ranked the highest across all groups, with support for a variety of efficiency programs and initiatives also ranked highly across respondent groups.

5. Discussion

All respondent groups ranked decreasing both costs and environmental impacts as top priorities. Most respondents (69 %) reside in Michigan's Upper Peninsula (UP). Michigan is ranked in the top 15 states for highest electricity prices [93], and UP residents pay rates up to 67 % higher than their downstate counterparts [94,95]. Over 30 % of Americans live in some sort of energy poverty. While there are different thresholds of energy poverty, a commonly prescribed attribute is the need to forego basic needs to afford to pay energy bills [96]. These conditions likely illuminate the choice of decreasing energy costs as a priority. The UP is also the home of over 4.5 million acres of state and national forest (approximately 45 % of the total land mass) [97] and is sought after for recreational opportunities in remote and austere conditions. People who reside in the UP self-identify as hardy, practical, and resilient people with an affinity for nature and the outdoors, which likely drives environmental concerns.

All respondent Groups 2–5 ranked community benefits as a top priority. Group 1 (*KBIC Local*) chose "Providing skilled, quality jobs in my community" and "Providing for my own energy needs without relying on utilities." Both responses can be interpreted as ways to improve the health and well-being of the KBIC community, and both create a pathway to Tribal sovereignty. Many of the jobs within the Tribal community are low paying positions that are supplemented with government subsidies that pay for energy based on income. Subsidies like those available for Tribal RE development through the recently passed Inflation Reduction Act can change this dynamic by creating Tribal energy jobs that enable the deployment of cheaper, cleaner, distributed RE. Utilizing subsidies to empower Tribal RE projects rather than perpetuate status quo energy systems operationalizes the priorities of Tribal sovereignty. Tribal control of decisions regarding the deployment of energy sources and organization of energy systems ensures local control and local benefits.

When asked about the three biggest challenges to using renewable energy in their home and community, all respondent groups ranked "The cost of switching to renewable energy is too high" and "Fossil fuel

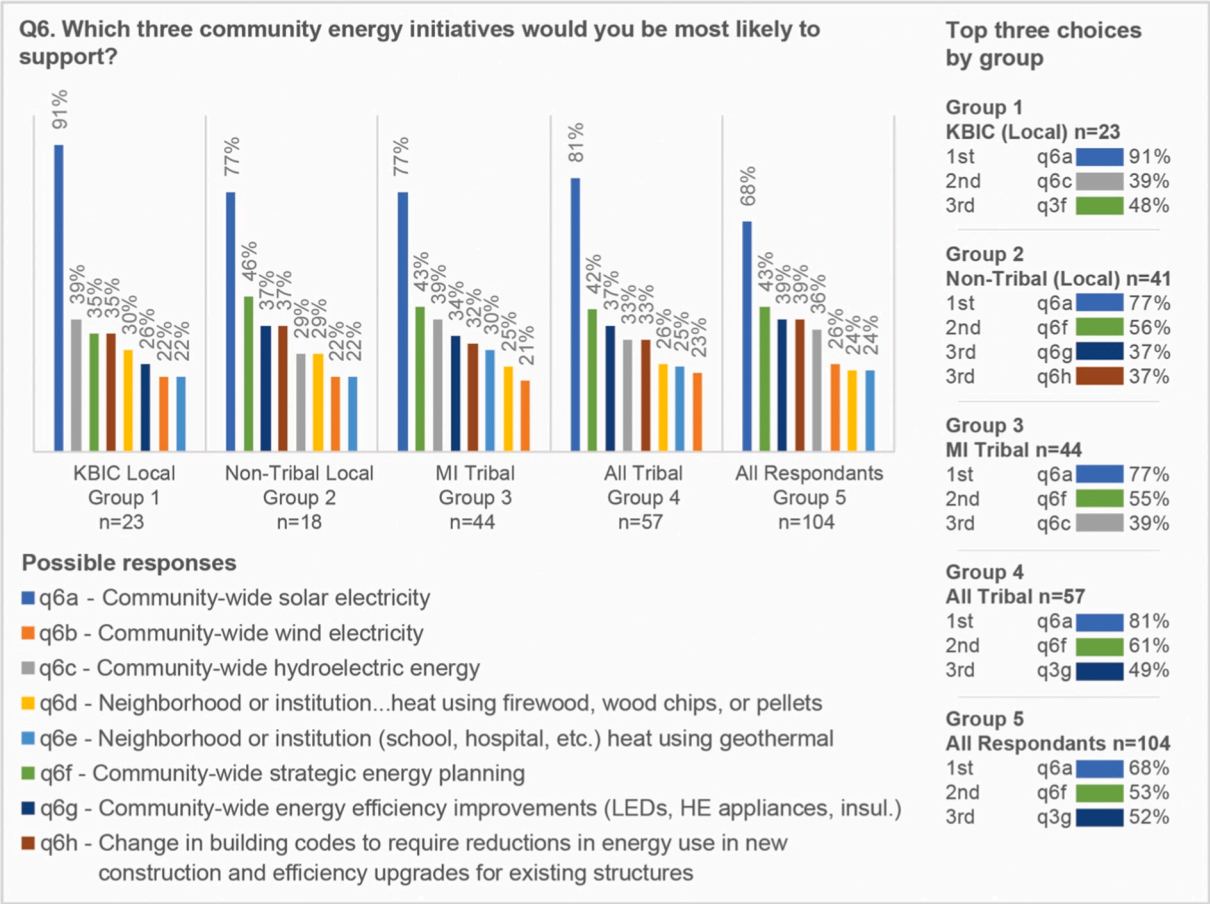

Fig. 5. Support for community energy initiatives.

and utility companies are too powerful," first and second in that order by percentage. The third most common responses among all groups (groups 1–4 responded that "It is unclear if renewables are a better choice than what we have now" and Group 5 chose "Renewable energy is less convenient than existing options") express skepticism. This demonstrates some tension between perceived barriers and benefits of RE and the reality, particularly when considering their preferences in the answers provided in Q5 (If you had to choose three options for improving energy usage in your home, what would it be?).

All groups perceived that the costs of transitioning to renewables are an obstacle, despite evidence to the contrary [98–102]. Calculating the cost of transitioning to RE resources is extremely complicated. It is estimated that transitioning to RE will require a global investment of $30 trillion dollars [102]. The levelized cost of electricity (LCOE) is a basic formula that calculates the break-even price for an energy project calculated over the expected service lifetime of the equipment. To fairly compare different technologies, all attributes should be considered including service life, decommissioning, and applicable subsidies. The unit of measurement of LCOE is currency/kilowatt hour (kWh), or megawatt hour (MWh) [103]. The LCOE of energy produced from grid scale solar PV ranges from $28-$41MWh and onshore wind ranges from $26–$50 MWh [101]. The only competitive fossil fuel power generation system is combined cycle gas, which has an LCOE ranging from $45 to $74 per MWh. While there are costs to transitioning to RE, grid scale solar PV and onshore wind are the cheapest energy generation technologies without qualification [101].

Examining the second observation regarding the role of the fossil fuel industry as a barrier to RE reveals a stronger link between public perception and empirical reality. From 2000 to 2016, climate lobbying expenditures exceeded $2 billion, with environmental organizations and the RE sector outspent 10:1 by sectors opposed to legislation related to climate mitigation [104]; after the 2017–18 midterm election cycle, that disparity increased to 13:1 [105]. From 2005 to 2015, the fossil fuel industry spent $2.9 billion on advocacy advertising, $1.3 billion on lobbying, and $827.9 million in campaign contributions at all levels of government [106]. Seventeen U.S. Senators have received lifetime political contributions exceeding $1 million, ranging from just over $1 million dollars for West Virginia Democrat Joe Manchin, to over $8.5 million dollars for Utah Republican Mitt Romney, which includes funds supporting his 2012 presidential campaign [105]. Three examples of legislation passed in the U.S. House of Representatives, but not given a hearing in the U.S. Senate demonstrate the firewall of political power built by the fossil fuel industry through lawmakers; *The American Clean Energy and Security Act of 2009* otherwise known as the Waxman-Markey bill, House Resolution 109 of the 116th Congress, also known as the *Green New Deal* [106] and most recently H.R.5376 - 117th Congress, also known as the *Build Back Better Act* [107]. Additionally, given the power of the Senate in making appointments to the Judiciary, the fossil fuel industry is emboldened to challenge lawsuits related to eminent domain [108], climate change [109,110], pollution [111], and the entire spectrum of fossil fuel-related societal ills litigated against them. The willingness of the fossil fuel industry to expend these resources demonstrates that lobbying expenditures are "highly profitable for these groups" [112, p. 34].

Despite scientific consensus on anthropogenic climate change [113], contrarian perspectives are disseminated by fossil fuel interests, using widespread public relations campaigns undermining climate science and the efficacy of renewable energy resources as a solution. The most prolific of these cases is the decades-long "advertorial" campaign run by ExxonMobil [114]. These examples demonstrate the economic and

political power of incumbent energy producers and their history of obstructing policies that enable transitioning to RE sources. These examples support public perceptions of the role of the fossil fuel industry in posing a barrier to RE and provide evidence that potentially helps to explain the skepticism and uncertainty regarding RE as a better choice than incumbent systems, despite scientific consensus to the contrary. The barriers to RE deployment also illustrate the value in working to support Tribal energy sovereignty through Tribes establishing their own utility authority or by controlling who can provide energy on the reservation. Setting up a utility authority through an ordinance passed by the Tribe provides more negotiating power to the Tribe on behalf of its members with utility companies proposing or already doing business within Tribal jurisdiction.

Priorities for improving home energy systems were consistent across all groups, with solar energy receiving strong support. For community-scale energy systems, Both KBIC and MI Tribal respondents identified community-wide hydroelectric power as a community energy initiative priority. There are several hydroelectric power projects in the area around KBIC, and these sites are maintained as natural hiking areas that locals visit often. Ojibwe people have a strong connection to the water; there is an annual walk and breaking of the water ceremony and the Tribe recently attained treatment as a State for water quality [115]. This result confirms previous work suggesting that people are supportive of energy systems that are familiar to them [116] and reiterates the importance of developing local energy solutions based on local identities, priorities, and values.

In many cases, Tribal Nations and communities have been organizing to meet energy decarbonization goals in the absence of leadership at the federal level in the United States [46,117–119]. However, the Biden/Harris administration has appointed a diverse team of policy professionals to senior leadership, including Black, Indigenous, and people of Color. The recent passage of the Inflation Reduction Act increases the *Tribal Energy Loan Guarantee Program* from $2- to $20-billion and provides $75 million to support the administration of those funds [120]. The administration also launched the *Justice40* initiative to ensure adequate climate mitigation efforts committing "to deliver at least 40 percent of the overall benefits from Federal investments in climate and clean energy to disadvantaged communities" [121]. This initiative operationalizes this accountability by quantifying the outcomes which include adequately funded administration of grants and guaranteed low-interest loans to fund the development of energy projects in marginalized communities [38].

Using these data, Tribal entities can pursue and identify resources to bolster capacity to develop RE projects. The recent *Bipartisan Infrastructure Law* codified formal consultations with Tribal entities supporting RE deployment. Tribes can use this opportunity to engage with Federal entities to develop strategic planning, implementation, and deployment of RE resources. During a recent DOE tribal consultation meeting attended by researchers and Tribal members (March 29, 2021), multiple Tribal participants noted the deficiency of funding to develop capacity, specifically regarding positions in energy planning.

Tribal Nations may seek partnerships beneficial to both their community and surrounding communities. Engaging with outside organizations such as university researchers provides opportunities for inclusive advancement in RE development through long-term partnerships that build trust and center Tribal priorities. In these partnerships, researchers must be prepared to participate as learners rather than leaders, allowing Tribal partners to determine both the content and the structure of engagement leading to substantive participation, stronger relationships, and improved outcomes.

Reciprocal partnerships based on mutual trust can help address the lack of administrative capacities within Tribal Nations to engage Tribal members or respond to federal and state opportunities. Currently, KBIC has a formal committee (the Committee on Alternative and Renewable Energy, CARE) formed to advance RE and address energy issues. However, all KBIC staff have full time duties and responsibilities that do not allow for dedication to this area, which leads to lack of time committed and lack of support for long term planning and development of projects. Having a partnership between Tribal government and University researchers can help address the limited administrative capacity of Tribes seeking opportunities to enhance energy sovereignty, a priority identified by KBIC members in survey responses.

Despite general interest in and support for RE, most participants did not really know how to explore adoption for their homes and community members appeared to want to learn more. Thus, while education is not a replacement for reciprocal engagement, this experience suggests there are opportunities to provide educational sessions on energy efficiency, renewable energy, and financing options as part of a community engagement process for energy justice researchers.

In some cases, respondents engaged researchers with stories about their experiences with energy use, including stories about challenges related to energy costs, for example, keeping heat settings low or limiting the use of appliances to save energy. There were also several impassioned conversations about incumbent energy regimes and their opposition to locally-owned, renewable energy which are reflected in survey responses. Others expressed interest in learning how to deploy solar at home. This level of engagement provided an opportunity for the researchers to share some basic knowledge, including expectations of contractors, potential tax credits, and net metering tariffs. In cases where community-based participatory research occurs, researchers who are knowledgeable about these specifics can provide more dynamic engagement and share knowledge about opportunities, obstacles, and the feasibility of RE for homes and communities.

6. Conclusion

The democratization of energy planning begins with restructuring relationships, research practices, and community engagement outside of the power structures that perpetuate the ongoing marginalization of communities. Effective energy planning can help ensure integration of social values regarding not only what kind of technology is sited in which physical places, but also how the energy transition is organized in terms of transparency and access to planning processes, collaboration, engagement, development, ownership, and benefits. The data show Tribal and non-Tribal community members share similar perceptions, perspectives, preferences, and priorities regarding a transition to RE.

The data also show that there is no confusion about the barrier to this transition posed by the incumbent fossil fuel energy and utility regimes. Respondents recognize that the entrenchment of incumbent actors in the fossil fuel and utility industries creates obstacles to the planning and development of RE transitions. Meeting aggressive global decarbonization goals will require identifying and eliminating systemic legal, regulatory, and economic obstacles that perpetuate the ecological and social harms perpetuated by incumbent energy regimes, and this research suggests that people are aware of the barriers posed by the current energy regime in limiting the potential transition to RE.

Using explicitly collaborative research design, our methodology can be a vehicle to empower Tribes and communities at large, to directly engage in research to reveal preferences, provide data, and inform the development of pathways to RE transitions. This methodology can be a powerful tool in planning and engagement spaces. However, empowering communities to develop their own pathways to transitioning beyond these stages is exceedingly difficult within the constraints of current legal and regulatory structures. To fully realize citizen control (Arnstein 1969), the regulation and business models of incumbent energy regimes will need to be transformed to work under the direction of and for the benefit of communities, including the sovereign Tribal Nations within U.S. territorial boundaries.

Declaration of competing interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgements

Funding for this work has been provided to a large, transdisciplinary research team through the National Science Foundation Convergence program, on a project titled "GCR: Michigan Community & Anishinaabe Renewable Energy Sovereignty [MICARES]," award #1934346.

Appendix. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.erss.2023.102967.

References

[1] M. Hibbard, M.B. Lane, K. Rasmussen, The Split personality of planning, J. Plan. Lit. 23 (2008) 136–151, https://doi.org/10.1177/0885412208322922.
[2] A.M. Levenda, I. Behrsin, F. Disano, Renewable energy for whom? A global systematic review of the environmental justice implications of renewable energy technologies, Energy Res. Soc. Sci. 71 (2021), 101837, https://doi.org/10.1016/j.erss.2020.101837.
[3] H.P. Bedi, 'Our energy, our rights': national extraction legacies and contested energy justice futures in Bangladesh, Energy Res. Soc. Sci. 41 (2018) 168–175, https://doi.org/10.1016/j.erss.2018.04.009.
[4] J.R. Owen, D. Kemp, J. Harris, A.M. Lechner, É. Lèbre, Fast track to failure? Energy transition minerals and the future of consultation and consent, Energy Res. Soc. Sci. 89 (2022), https://doi.org/10.1016/j.erss.2022.102665.
[5] D. Kemp, E. Lèbre, J.R. Owen, G. Marston, The energy-extractives nexus and the just transition, Sustain. Dev. 29 (2021) 624–634, https://doi.org/10.1002/sd.2163.
[6] B.K. Sovacool, D.J. Hess, R. Cantoni, Energy transitions from the cradle to the grave: a meta-theoretical framework integrating responsible innovation, social practices, and energy justice, Energy Res. Soc. Sci. 75 (2021), 102027, https://doi.org/10.1016/j.erss.2021.102027.
[7] N. Bainton, D. Kemp, E. Lèbre, J.R. Owen, G. Marston, The energy-extractives nexus and the just transition, Sd. 29 (2021) 624–634, https://doi.org/10.1002/sd.2163.
[8] D. Barkin, The political economy of autonomous development, Sustainability 11 (1998) 5–32.
[9] H.E. Castleden, D. Martin, A. Cunsolo, S. Harper, C. Hart, P. Sylvestre, R. Stefanelli, L. Day, K. Lauridsen, Implementing indigenous and western knowledge systems (part 2): "you have to take a backseat" and abandon the arrogance of expertise, Int. Indig. Policy J. 8 (2017), https://doi.org/10.18584/iipj.2017.8.4.8.
[10] D. Schlosberg, D. Carruthers, Indigenous struggles, environmental justice, and community capabilities, Glob. Environ. Polit. 10 (2010) 12–35, https://doi.org/10.1162/glep_a_00029.
[11] E.L. Shaw, V.S. Gagnon, E. Ravindran, Seasons of research with/by/as the Keweenaw Bay indian community, J. Great Lakes Res. (2022), https://doi.org/10.1016/j.jglr.2022.04.007.
[12] V.W. Simonds, S. Christopher, Adapting Western research methods to indigenous ways of knowing, Am. J. Public Health 103 (2013) 2185–2192, https://doi.org/10.2105/AJPH.2012.301157.
[13] K. Whyte, Settler colonialism, ecology, and environmental injustice, Environ. Soc. 9 (2018) 125–144, https://doi.org/10.3167/ares.2018.090109.
[14] J.R. Owen, D. Kemp, J. Harris, A.M. Lechner, É. Lèbre, Fast track to failure? Energy transition minerals and the future of consultation and consent, Energy Res. Soc. Sci. 89 (2022), 102665, https://doi.org/10.1016/j.erss.2022.102665.
[15] W. Ermine, The ethical space of engagement, Indigenous Law J. 6 (2007). https://jps.library.utoronto.ca/index.php/ilj/article/view/27669/20400.
[16] R.W. Glover, L. Silka, Choice, power and perspective: the neglected question of who initiates engaged campus-community partnerships, Gateways Int. J. Community Res. Engagem. 6 (2013) 38–56, https://doi.org/10.5130/ijcre.v6i1.3192.
[17] Partnering with communities to facilitate energy decisions and transitions. https://micares.net. (Accessed 13 April 2022).
[18] L. Porter, H. Matunga, L. Viswanathan, L. Patrick, R. Walker, L. Sandercock, D. Moraes, J. Frantz, M. Thompson-Fawcett, C. Riddle, T.(Ted) Jojola, Indigenous planning: from principles to practice/a revolutionary pedagogy of/for indigenous planning/settler-indigenous relationships as liminal spaces in planning education and practice/indigenist planning/what is the work of non-indigenous people in the service of a decolonizing agenda?/Supporting indigenous planning in the city/film as a catalyst for indigenous community development/being ourselves and seeing ourselves in the city: enabling the conceptual space for indigenous urban planning/universities can empower the next generation of architects, planners, and landscape architects in indigenous design and planning, Plan. Theory Pract. 18 (2017) 639–666, https://doi.org/10.1080/14649357.2017.1380961.
[19] E.S. Casey, How to get from space to place in a fairly short stretch of time, in: S. Feld, K.H. Basso (Eds.), Senses of Place, School of American Research Press, 1996, pp. 13–52.
[20] K.D. Key, D. Furr-Holden, E.Y. Lewis, R. Cunningham, M.A. Zimmerman, V. Johnson-Lawrence, S. Selig, The continuum of community engagement in research: a roadmap for understanding and assessing progress, Prog. Community Health Partnersh. 13 (2019) 427–434.
[21] R.M. Emerson, R.I. Fretz, L.L. Shaw, Participant observation and field notes, in: P. Atkinson (Ed.), Handbook of Ethnography, Sage, 2001, https://doi.org/10.4135/9781848608337.
[22] J. Page-Reeves, Community-based participatory research for health, Health Promot. Pract. 20 (2019) 15–17, https://doi.org/10.1177/1524839918809007.
[23] P. Reason, H. Bradbury, Handbook of Action Research: Participative Inquiry and Practice, 2nd ed., Sage, 2007.
[24] M. Schaefer, L.S. Olabisi, K. Arola, C.M. Poitra, E. Matz, M. Seigel, C. Schelly, A. Adesanya, D. Bessette, Understanding socio-technological systems change through an indigenous community-based participatory framework, Sustainability-Basel 13 (2021) 2257, https://doi.org/10.3390/su13042257.
[25] L. Silka, G.D. Cleghórn, M. Grullón, T. Tellez, G. in collaboration with the L.R.I. Working, Creating community-based participatory research in a diverse community: a case study, J. Empir. Res. Hum. Res. 3 (2007) 5–16, https://doi.org/10.1525/jer.2008.3.2.5.
[26] N.B. Wallerstein, B. Duran, Using community-based participatory research to address health disparities, Health Promot. Pract. 7 (2006) 312–323, https://doi.org/10.1177/1524839906289376.
[27] V. Gagnon, H. Gorman, E. Norman, Power and politics in research design and practice: opening up space for social equity in interdisciplinary, multi-jurisdictional and community-based research, Gateways Int. J. Community Res. Engagem. 10 (2016) 164–184, https://doi.org/10.5130/ijcre.v10i1.5307.
[28] R. Margerum, C. Robinson, The Challenges of Collaboration in Environmental Governance, 2016, https://doi.org/10.4337/9781785360411.
[29] J. Rongerude, G.F. Sandoval, From the table to the street: strategies for building a more inclusive collaborative process, in: R.D. Magerum, C.J. Robinson (Eds.), The Challenges of Collaboration in Environmental Governance, 2016, pp. 317–337, https://doi.org/10.4337/9781785360411.00026.
[30] N. Bouvier, R. Walker, Indigenous planning and municipal governance: lessons from the transformative frontier, Can. Public Adm. 61 (2018) 130–134, https://doi.org/10.1111/capa.12249.
[31] DHHS, Principles of community engagement, National Institute of Health, 2011. https://www.atsdr.cdc.gov/communityengagement/pdf/PCE_Report_508_FINAL.pdf.
[32] M.R. Greenberg, Energy policy and research: the underappreciation of trust, Energy Res. Soc. Sci. 1 (2014) 152–160, https://doi.org/10.1016/j.erss.2014.02.004.
[33] K. Jenkins, D. McCauley, R. Heffron, H. Stephan, R. Rehner, Energy justice: a conceptual review, Energy Res. Soc. Sci. 11 (2016) 174–182, https://doi.org/10.1016/j.erss.2015.10.004.
[34] N. Shore, Re-conceptualizing the Belmont report, J. Community Pract. 14 (2006) 5–26, https://doi.org/10.1300/j125v14n04_02.
[35] N. Wallerstein, Empowerment to reduce health disparities, Scand. J. Public Health 30 (2002) 72–77, https://doi.org/10.1177/14034948020300031201.
[36] C. Mang-Benza, J. Baxter, Not paid to dance at the powwow: power relations, community benefits, and wind energy in M'Chigeeng First Nation, Ontario, Canada, Energy Res. Soc. Sci. 82 (2021), 102301, https://doi.org/10.1016/j.erss.2021.102301.
[37] M.C. Branco, Political Economy for Human Rights, Routledge, 2019.
[38] S. Baker, Revolutionary Power: An Activist's Guide to the Energy Transition, Island Press, 2021.
[39] K. Hochstetler, Political Economies of Energy Transition, Cambridge University Press, 2021.
[40] D.S. Blumenthal, R.J. DiClemente, R. Braithwaite, S. Smith, Community-based Participatory Health Research, Springer Publishing Company, 2013.
[41] J.G. Dévieux, R.M. Malow, R. Rosenberg, M. Jean-Gilles, D. Samuels, E. Ergon-Pérez, R. Jacobs, Cultural adaptation in translational research: field experiences, J. Urban Health 82 (2005), iii82, https://doi.org/10.1093/jurban/jti066.
[42] D. Ciplet, From energy privilege to energy justice: a framework for embedded sustainable development, Energy Res. Soc. Sci. 75 (2021), 101996, https://doi.org/10.1016/j.erss.2021.101996.
[43] A. Qazi, F. Hussain, N.A.B.D. Rahim, G. Hardaker, D. Alghazzawi, K. Shaban, K. Haruna, Towards sustainable energy: a systematic review of renewable energy sources, technologies, and public opinions, IEEE Access 7 (2019) 63837–63851, https://doi.org/10.1109/access.2019.2906402.
[44] M. Segreto, L. Principe, A. Desormeaux, M. Torre, L. Tomassetti, P. Tratzi, V. Paolini, F. Petracchini, Trends in social acceptance of renewable energy across Europe—a literature review, Int. J. Environ. Res. Public Health 17 (2020) 9161, https://doi.org/10.3390/ijerph17249161.
[45] S.R. Arnstein, A ladder of citizen participation, J. Am. Inst. Plann. 35 (1969) 216–224, https://doi.org/10.1080/01944366908977225.
[46] M.J. Burke, J.C. Stephens, Political power and renewable energy futures: a critical review, Energy Res. Soc. Sci. 35 (2018) 78–93, https://doi.org/10.1016/j.erss.2017.10.018.

[47] B.K. Sovacool, M.H. Dworkin, Energy justice: conceptual insights and practical applications, Appl. Energy 142 (2015) 435–444, https://doi.org/10.1016/j.apenergy.2015.01.002.
[48] M. Aitken, Why we still don't understand the social aspects of wind power: a critique of key assumptions within the literature, Energy Policy 38 (2010) 1834–1841, https://doi.org/10.1016/j.enpol.2009.11.060.
[49] E. Allen, H. Lyons, J.C. Stephens, Women's leadership in renewable transformation, energy justice and energy democracy: redistributing power, Energy Res. Soc. Sci. 57 (2019), 101233, https://doi.org/10.1016/j.erss.2019.101233.
[50] T.R. Peterson, J.C. Stephens, E.J. Wilson, Public perception of and engagement with emerging low-carbon energy technologies: a literature review, Mrs Energy Sustain. 2 (2015), E11, https://doi.org/10.1557/mre.2015.12.
[51] S. Batel, Research on the social acceptance of renewable energy technologies: past, present and future, Energy Res. Soc. Sci. 68 (2020), 101544, https://doi.org/10.1016/j.erss.2020.101544.
[52] M. Wolsink, Social acceptance revisited: gaps, questionable trends, and an auspicious perspective, Energy Res. Soc. Sci. 46 (2018) 287–295, https://doi.org/10.1016/j.erss.2018.07.034.
[53] R. Wüstenhagen, M. Wolsink, M.J. Bürer, Social acceptance of renewable energy innovation: an introduction to the concept, Energy Policy 35 (2007) 2683–2691, https://doi.org/10.1016/j.enpol.2006.12.001.
[54] A. Botelho, L.M.C. Pinto, L. Lourenço-Gomes, M. Valente, S. Sousa, Public perceptions of environmental friendliness of renewable energy power plants, Energy Procedia 106 (2016) 73–86, https://doi.org/10.1016/j.egypro.2016.12.106.
[55] J. Gaede, I.H. Rowlands, Visualizing social acceptance research A bibliometric review of the social acceptance literature for energy technology and fuels, Energy Res. Soc. Sci. 40 (2018) 142–158, https://doi.org/10.1016/j.erss.2017.12.006.
[56] D.L. Bessette, S.B. Mills, Farmers vs. lakers: agriculture, amenity, and community in predicting opposition to United States wind energy development, Energy Res. Soc. Sci. 72 (2021), 101873, https://doi.org/10.1016/j.erss.2020.101873.
[57] P. Devine-Wright, Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy, Wind Energy 8 (2005) 125–139, https://doi.org/10.1002/we.124.
[58] M. Wolsink, Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support, Renew. Energy 21 (2000) 49–64, https://doi.org/10.1016/s0960-1481(99)00130-5.
[59] M. Wolsink, Distributed energy systems as common goods: socio-political acceptance of renewables in intelligent microgrids, Renew. Sust. Energ. Rev. 127 (2020), 109841, https://doi.org/10.1016/j.rser.2020.109841.
[60] M. Wolsink, Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives', Renew. Sust. Energ. Rev. 11 (2007) 1188–1207, https://doi.org/10.1016/j.rser.2005.10.005.
[61] P. Devine-Wright, Place attachment and public acceptance of renewable energy: a tidal energy case study, J. Environ. Psychol. 31 (2011) 336–343, https://doi.org/10.1016/j.jenvp.2011.07.001.
[62] P. Devine-Wright, Explaining "NIMBY" objections to a power line, Environ. Behav. 45 (2013) 761–781, https://doi.org/10.1177/0013916512440435.
[63] M. Scott, G. Powells, Towards a new social science research agenda for hydrogen transitions: social practices, energy justice, and place attachment, Energy Res. Soc. Sci. 61 (2020), 101346, https://doi.org/10.1016/j.erss.2019.101346.
[64] C. Schelly, J. Price, A. Delach, R. Thapaliya, K. Leu, Improving solar development policy and planning through stakeholder engagement: the Long Island solar roadmap project, Electr. J. 32 (2019), 106678, https://doi.org/10.1016/j.tej.2019.106678.
[65] C. Schelly, E. Prehoda, J. Price, A. Delach, R. Thapaliya, Ratepayer perspectives on mid- to large-scale solar development on Long Island, NY: lessons for reducing siting conflict through supported development types, Energies 13 (2020) 5628, https://doi.org/10.3390/en13215628.
[66] F. Goedkoop, P. Devine-Wright, Partnership or placation? The role of trust and justice in the shared ownership of renewable energy projects, Energy Res. Soc. Sci. 17 (2016) 135–146, https://doi.org/10.1016/j.erss.2016.04.021.
[67] M. Wolsink, Fair distribution of power-generating capacity: justice, microgrids and utilizing the common pool of renewable energy, in: K. Bickerstaff, G. Walker, H. Bulkeley (Eds.), Energy Justice in a Changing Climate: Social Equity and Low-Carbon Energy, 2013, pp. 116–138.
[68] J. Dwyer, D. Bidwell, Chains of trust: energy justice, public engagement, and the first offshore wind farm in the United States, Energy Res. Soc. Sci. 47 (2019) 166–176, https://doi.org/10.1016/j.erss.2018.08.019.
[69] R.J. Heffron, D. McCauley, The concept of energy justice across the disciplines, Energy Policy 105 (2017) 658–667, https://doi.org/10.1016/j.enpol.2017.03.018.
[70] M.C. LaBelle, In pursuit of energy justice, Energy Policy 107 (2017) 615–620, https://doi.org/10.1016/j.enpol.2017.03.054.
[71] B.K. Sovacool, R.V. Sidortsov, B.R. Jones, Energy Security, Equality, and Justice.pdf, Routledge, 2014.
[72] P. Newell, D. Mulvaney, The political economy of the 'just transition', Geogr. J. 179 (2013) 132–140, https://doi.org/10.1111/geoj.12008.
[73] C.E. Hoicka, K. Savic, A. Campney, Reconciliation through renewable energy? A survey of Indigenous communities, involvement, and peoples in Canada, Energy Res. Soc. Sci. 74 (2021), 101897, https://doi.org/10.1016/j.erss.2020.101897.
[74] L. Mirsky, Restorative justice practices of Native American, First Nation and other Indigenous People of North America: part two, International Institute for Restorative Practices. https://www.iirp.edu/news/restorative-justice-practices-of-native-american-first-nation-and-other-indigenous-people-of-north-america-part-two, 2004. (Accessed 18 May 2022).
[75] L. Mirsky, Restorative justice practices of Native American, First Nation and other Indigenous People of North America: part one, International Institute for Restorative Practices. https://www.iirp.edu/news/restorative-justice-practices-of-native-american-first-nation-and-other-indigenous-people-of-north-america-part-one, 2004. (Accessed 18 May 2022).
[76] R.P. Thombs, When democracy meets energy transitions: a typology of social power and energy system scale, Energy Res. Soc. Sci. 52 (2019) 159–168, https://doi.org/10.1016/j.erss.2019.02.020.
[77] B.K. Sovacool, J. Axsen, S. Sorrell, Promoting novelty, rigor, and style in energy social science: towards codes of practice for appropriate methods and research design, Energy Res. Soc. Sci. 45 (2018) 12–42, https://doi.org/10.1016/j.erss.2018.07.007.
[78] A.D. Boyle, G. Leggat, L. Morikawa, Y. Pappas, J.C. Stephens, Green new Deal proposals: comparing emerging transformational climate policies at multiple scales, Energy Res. Soc. Sci. 81 (2021), 102259, https://doi.org/10.1016/j.erss.2021.102259.
[79] J.W. Creswell, Research Design Qualitative, Quantitative, and Mixed Methods Approaches.pdf, 4th ed., 2014.
[80] WUPPDR, Comprehensive economic development strategy, The Western Upper Peninsula Planning and Development Region Commission, 2017. https://static1.squarespace.com/static/5f5784a77a79a6713d7c703d/t/600f44a4b7a9a01f1991e757/1611613359415/CEDS16_FINAL.pdf.
[81] J.W. Long, H.L. Ballard, L.A. Fisher, J.M. Belsky, Questions that won't go away in participatory research, Soc. Nat. Resour. 29 (2016) 250–263, https://doi.org/10.1080/08941920.2015.1024368.
[82] A. Kantamneni, R. Winkler, L. Gauchia, J.M. Pearce, Emerging economic viability of grid defection in a northern climate using solar hybrid systems, Energy Policy 95 (2016) 378–389, https://doi.org/10.1016/j.enpol.2016.05.013.
[83] C. Schelly, D. Lee, E. Matz, J.M. Pearce, Applying a relationally and socially embedded decision framework to solar photovoltaic adoption: a conceptual exploration, Sustainability-Basel 13 (2021) 711, https://doi.org/10.3390/su13020711.
[84] R. Stoecker, Research Methods for Community Change: A Project-based Approach, Sage, 2005.
[85] S. Goold, Z. Rowe, K. Calhoun, T. Campbell, M. Danis, A. Hammad, C. Salman, L. Szymecko, C. Coombe, The state as community in community-based participatory research, Prog. Community Heal Partnerships Res. Educ. Action 10 (2016) 515–522, https://doi.org/10.1353/cpr.2016.0059.
[86] L. Tumiel-Berhalter, R. Watkins, C.J. Crespo, Community-based participatory research: defining community stakeholders, Metropolitan Univ. J. 16 (2005) 93–106. http://archives.pdx.edu/ds/psu/10274.
[87] E. Prehoda, R. Winkler, C. Schelly, Putting research to action: integrating collaborative governance and community-engaged research for community solar, Soc Sci. 8 (2019) 11, https://doi.org/10.3390/socsci8010011.
[88] R.M. Mourik, G. Sonetti, R.A.V. Robison, The same old story – or not? How storytelling can support inclusive local energy policy, Energy Res. Soc. Sci. 73 (2021), 101940, https://doi.org/10.1016/j.erss.2021.101940.
[89] H. Sharmil, J. Kelly, M. Bowden, C. Galletly, I. Cairney, C. Wilson, L. Hahn, D. Liu, P. Elliot, J. Else, T. Warrior, T. Wanganeen, R. Taylor, F. Wanganeen, J. Madrid, L. Warner, M. Brown, C. de Crespigny, Participatory action research-dadirri-ganma, using yarning: methodology co-design with aboriginal community members, Int. J. Equity Health 20 (2021) 160, https://doi.org/10.1186/s12939-021-01493-4.
[90] L. O'Neill, K. Thorburn, B. Riley, G. Maynard, E. Shirlow, J. Hunt, Renewable energy development on the indigenous estate: free, prior and informed consent and best practice in agreement-making in Australia, Energy Res. Soc. Sci. 81 (2021), 102252, https://doi.org/10.1016/j.erss.2021.102252.
[91] M. Walker, B. Fredericks, K. Mills, D. Anderson, "Yarning" as a method for community-based health research with indigenous women: the indigenous women's wellness research program, Health Care Women Int. 35 (2014) 1216–1226, https://doi.org/10.1080/07399332.2013.815754.
[92] S. Barlo, W.(Bill) E. Boyd, M. Hughes, S. Wilson, A. Pelizzon, Yarning as protected space: relational accountability in research, Altern. Int. J. Indig. Peoples 17 (2021) 40–48, https://doi.org/10.1177/1177180120986151.
[93] EIA, Michigan quick facts, Michigan State Energy Profile. https://www.eia.gov/state/print.php?sid=MI, 2021. (Accessed 2 May 2022).
[94] J. Malewitz, Q&A: demystifying sky-high electricity rates in Michigan's Upper Peninsula, Bridge Michigan. https://www.bridgemi.com/michigan-environment-watch/qa-demystifying-sky-high-electricity-rates-michigans-upper-peninsula, 2019. (Accessed 2 May 2022).
[95] K. Matheny, Power bills are whoppers for some in Michigan's U.P, Detroit Free Press, 2016. https://www.freep.com/story/news/local/michigan/2016/09/07/power-outrage-electric-bills-upper-peninsula/89593302/. (Accessed 2 May 2022).
[96] A. Stone, T. Reames, Combating energy poverty in the U.S. https://kleinmanenergy.upenn.edu/podcast/combating-energy-poverty-in-the-u-s/. (Accessed 2 May 2022).
[97] Upper Peninsula Forest Land, Northern Michigan land brokers. https://northernmichiganlandbrokers.com/page/upper-peninsula-forestland/. (Accessed 10 January 2023).
[98] G. He, J. Lin, F. Sifuentes, X. Liu, N. Abhyankar, A. Phadke, Rapid cost decrease of renewables and storage accelerates the decarbonization of China's power system, Nat. Commun. 11 (2020) 2486, https://doi.org/10.1038/s41467-020-16184-x.
[99] D. Bogdanov, M. Ram, A. Aghahosseini, A. Gulagi, A.S. Oyewo, M. Child, U. Caldera, K. Sadovskaia, J. Farfan, L.D.S.N.S. Barbosa, M. Fasihi, S. Khalili,

T. Traber, C. Breyer, Low-cost renewable electricity as the key driver of the global energy transition towards sustainability, Energy 227 (2021), 120467, https://doi.org/10.1016/j.energy.2021.120467.
[100] IRENA, IRENA power generation costs 2020, International Renewable Energy Agency, 2021. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/Jun/IRENA_Power_Generation_Costs_2020.pdf?rev=c9e8dfcd1b2048e2b4d30fef671a5b84.
[101] Lazard, Levelized cost of energy, levelized cost of storage, and levelized cost of hydrogen, Lazard, 2021. https://www.lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen/. (Accessed 16 October 2022).
[102] IEA, World Energy Outlook 2021, World Energy Outlook, 2021, https://doi.org/10.1787/14fcb638-en.
[103] DOE, Levelized Cost of Energy (LCOE), Office of Indian Energy, n.d. https://www.energy.gov/sites/prod/files/2015/08/f25/LCOE.pdf.
[104] R.J. Brulle, The climate lobby: a sectoral analysis of lobbying spending on climate change in the USA, 2000 to 2016, Clim. Chang. 149 (2018) 289–303, https://doi.org/10.1007/s10584-018-2241-z.
[105] K. Kirk, Fossil fuel political giving outdistances renewables 13 to one, Yale Climate Connections. https://yaleclimateconnections.org/2020/01/fossil-fuel-political-giving-outdistances-renewables-13-to-one/, 2020. (Accessed 29 November 2020).
[106] R. Galvin, N. Healy, The green new Deal in the United States: what it is and how to pay for it, Energy Res. Soc. Sci. 67 (2020), 101529, https://doi.org/10.1016/j.erss.2020.101529.
[107] H.R.5376 - Inflation Reduction Act of 2022, US Government Publishing Office. https://www.congress.gov/bill/117th-congress/house-bill/5376/text. (Accessed 23 May 2022).
[108] D. Hasemyer, With bare knuckles and big dollars, exxon fights climate probe to a legal stalemate, inside climate news. https://insideclimatenews.org/news/05062017/exxon-climate-change-fraud-investigation-eric-schneiderman-rex-tillerson-exxonmobil, 2017. (Accessed 29 November 2020).
[109] S.E. Kim, J. Urpelainen, J. Yang, Electric utilities and American climate policy: lobbying by expected winners and losers, J. Public Policy 36 (2016) 251–275, https://doi.org/10.1017/s0143814x15000033.
[110] H. Weinberger, The kids who sued the U.S. over climate change and lost aren't giving up, Crosscut, 2020. https://crosscut.com/2020/01/kids-who-sued-us-over-climate-change-and-lost-arent-giving. (Accessed 3 December 2020).
[111] DOJ, United States, enbridge reach $177 million settlement after 2010 oil spills in Michigan and Illinois, Justice News. https://www.justice.gov/opa/pr/united-states-enbridge-reach-177-million-settlement-after-2010-oil-spills-michigan-and, 2016. (Accessed 3 December 2020).
[112] OECD, The political economy of environmentally harmful subsidies, in: Environmentally Harmful Subsidies: Challenges for Reform, OECD Publishing, 2006, pp. 111–125, https://doi.org/10.1787/9789264012059-5-en.
[113] J. Cook, D. Nuccitelli, S.A. Green, M. Richardson, B. Winkler, R. Painting, R. Way, P. Jacobs, A. Skuce, Quantifying the consensus on anthropogenic global warming in the scientific literature, Environ. Res. Lett. 8 (2013), 024024, https://doi.org/10.1088/1748-9326/8/2/024024.
[114] G. Supran, N. Oreskes, Addendum to assessing ExxonMobils climate change communications (19772014) Supran and Oreskes (2017 Environ. Res. Lett. 12 084019), Environ. Res. Lett. 15 (2020), 119401, https://doi.org/10.1088/1748-9326/ab89d5.
[115] S. of M. EGLE, Keweenaw Bay Indian Community takes historic step toward developing water quality standards that contribute to community wellbeing, Department of Environment, Great Lakes, and Energy, 2021. https://www.michigan.gov/egle/newsroom/mi-environment/2021/06/10/keweenaw-bay-indian-community-takes-historic-step-toward-developing-water-quality-standards-that-co. (Accessed 16 April 2022).
[116] K. Sherren, J.R. Parkins, T. Owen, M. Terashima, Does noticing energy infrastructure influence public support for energy development? Evidence from a national survey in Canada, Energy Res. Soc. Sci. 51 (2019) 176–186, https://doi.org/10.1016/j.erss.2019.01.014.
[117] T.M. Hanna, Reclaiming democratic control: the role of public ownership in resisting corporate domination, J. World-Syst. Res. 25 (2019) 42–48, https://doi.org/10.5195/jwsr.2019.901.
[118] L. Necefer, G. Wong-Parodi, P. Jaramillo, M.J. Small, Energy development and Native Americans: values and beliefs about energy from the Navajo Nation, Energy Res. Soc. Sci. 7 (2015) 1–11, https://doi.org/10.1016/j.erss.2015.02.007.
[119] C. Schelly, D. Bessette, K. Brosemer, V. Gagnon, K.L. Arola, A. Fiss, J.M. Pearce, K. E. Halvorsen, Energy policy for energy sovereignty: can policy tools enhance energy sovereignty? Sol. Energy 205 (2020) 109–112, https://doi.org/10.1016/j.solener.2020.05.056.
[120] Inflation Reduction Act of 2022, Loan Programs Office. https://www.energy.gov/lpo/inflation-reduction-act-2022. (Accessed 16 September 2022).
[121] T.W. House, FACT SHEET: president biden takes executive actions to tackle the climate crisis at home and abroad, create jobs, and restore scientific integrity across federal government. https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/27/fact-sheet-president-biden-takes-executive-actions-to-tackle-the-climate-crisis-at-home-and-abroad-create-jobs-and-restore-scientific-integrity-across-federal-government/, 2021.