Community Engagement and Equity in Renewable Energy Projects: A Literature Review

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NREL is a national laboratory of the U.S. Department of Energy
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1 Introduction

Questions about how to transition away from fossil fuels toward renewables and what types of renewable energy projects to undertake are fraught with contention (Boudet 2019; Devine-Wright 2005). New energy projects can prompt opposition even if their proponents engage with the public and affected communities (Boudet 2019; Devine-Wright 2005; Devine-Wright and Devine-Wright 2009). Examples include public opposition to nuclear energy, wind energy, and siting of bioenergy infrastructures due to concerns about safety, privacy, noise, and potential health and socioeconomic impacts (Boudet 2019; Devine-Wright 2005; Devine-Wright and Devine-Wright 2009). Therefore, many scholars and practitioners call for a nuanced understanding of the challenges and opportunities of participation and engagement in decision-making processes.

The original goal of this report was to examine the links between community engagement and energy equity in the siting of bioenergy infrastructure by developing a literature review focused on this intersection. However, after an exploratory analysis we realized that very few studies have addressed these links. This understanding motivated a reassessment of our previous goal, broadening the literature review to identify, describe, and explain:

1. The nature of and links between engagement and equity in energy transition projects.
2. The lessons learned and best practices that can inform more equitable and just renewable energy projects.

Through this analysis we aim to provide lessons learned and options to inform the U.S. Department of Energy (DOE) and proponents of renewable energy projects with knowledge on what engagement is, why and how it works (or does not work) on the ground, and how it relates to crucial societal elements of energy equity such as social acceptance, energy democracy, and equity outcomes.

Energy projects range from those involving large-scale energy infrastructure such as ethanol plants, wind farms, and utility-scale solar energy to small-scale, consumer-facing technologies such as electric vehicles, rooftop solar energy, smart metering, and appliances. This review targets large-scale renewable energy infrastructure projects that involve collective decision-making rather than choices made by individual families or businesses.

Aiming to achieve the proposed goals, we begin this report by describing our methodological approach (Section 2). After that initial section, we provide an overview of relevant methods and tools, topics, and geographical representation of the focal papers selected for analysis (Section 3). We then discuss a series of concepts of relevance to this report (Section 4) such as engagement, participation, and energy equity. We then analyze how the 51 selected papers address community engagement and equity in energy projects (Section 5). Finally, we present concluding remarks (Section 6) about lessons learned and opportunities for implementation.

2 Methodological Approach

Our original goal was to combine a systematic literature review with a meta-analysis (Littell, Corcoran, and Pillai 2008) of the relationships between community engagement and equity in the siting of bioenergy infrastructure. After developing an exploratory analysis, we realized that very few studies on community engagement and equitable technology siting have addressed bioenergy production; therefore, we decided to broaden our research, including other types of renewable energy projects such as solar and wind farms. However, an analysis of participation and engagement in context-specific energy projects involving renewable energy, equity, and justice unavoidably requires mapping a wide array of theoretical framings, methods, tools, and empirical data that are very diverse (Upham, Sovacool, and Ghosh 2022; Jellema and Mulder 2016). Hence, we developed a qualitative systematic review to map topics, methods, methodological tools, concepts, findings, and lessons learned across specific studies.

We started with a literature search using the academic databases Web of Science, BioOne, and Google Scholar. Given that scholarship on the intersection of community and stakeholder engagement with energy equity is relatively new, we focused our search on studies published over the past two decades (since 2000) utilizing the following search topics:

- Energy transition AND sociotechnical innovation AND energy equity, justice.
- Community engagement AND participation AND energy equity, procedural justice.
- Community engagement AND social and public acceptance AND energy equity.
- Recognition justice AND policy, political, social, and cultural factors.
- Energy AND distributional justice, socio-spatial distribution of energy affordability, access, security, poverty, and disadvantage.

We selected a total of 144 publications based on a review of the titles and abstracts of documents retrieved from the broad keyword search. To this initial set of papers, we added a dozen references that the authors of this paper identified through prior research. Then, after a careful review of the 156 publications, we down selected and focused our analysis on 51 papers that explore the nature of and the relationships between community engagement and energy equity in infrastructural energy projects. We refer to this set of publications as our "focal papers."

We complemented our literature review with an additional 41 papers used to guide our analysis of:

1. The methods and tools scholars and practitioners use to examine community engagement and energy equity (Section 3).
2. How key terms are defined and approached (Section 4).
3. Scholars' insights on engagement and its links to energy equity in the transition to renewables (Section 5).
4. Lessons learned to guide more equitable and just engagement processes (Section 6).

3 Prevalent Methods, Research Direction, and Geographic Representation

In this section, we identify and describe the prevalent methods, tools, research directions, and geographical areas mapped in the 51 focal papers reviewed for this analysis (see the list and the detailed tables in the Appendix). Several of these publications are defined as toolkits (1), white papers (1), and guidelines (10) for proponents to engage stakeholders or for communities to create their own engagement and project development roadmaps, principles, and metrics—for example, Drakellis (2022); Waters (2015); Lezberg, Dane, and Mullins (2010); NCSL (n.d.); and Ramanan, Beland, and Yacobi (2021) (see Table 1 and Section 5.1). Others are academic publications employing a range of frameworks, tools, and methods such as literature or systematic reviews, surveys, interviews, focus groups, comparative studies, and case studies (Table 1 and the Appendix).

Table 1. Methods of the Focal Papers

Methods	Total
Toolkit	1
Case study	6
Survey	5
Qualitative	11
Guideline	10
Literature review	19
White paper	1
Mixed methods	8

As for geographical representation, although 10 of the focal papers have an international geographic representation, many studies on community engagement and energy equity concentrate on North America (18) and Europe (13) (Table **2**). This disparity confirms scholarship pointing to international inequities (a global North and South divide) in the global production of knowledge on these issues (Tennant 2020; Romero-Lankao, Qin, and Dickinson 2012). Only 9 of the 51 focal papers specifically target bioenergy. The others focus on energy technologies (14) and renewable energy sources in general (12), as well as wind (13) and solar energy (4) (Table **3**).

Table 2. Geographic Representation of the Focal Papers

Geographic Area	Total
International	10
Europe	13
North America	18
Australia	2
Africa	2
Latin America	4
Asia	2

Table 3. Energy Categories of the Focal Papers

Energy Category	Total
Bioenergy	9
Energy technologies	14
Renewable energy	12
Solar	4
Wind	13

Regarding prevailing methods, 19 papers present literature reviews that seek to go beyond case studies to map trends in conceptual framings, methods, and empirical findings (Table 1). For example, Segreto et al. (2020) identify the key determinants of local and general social acceptance of renewable energy projects. Boudet (2019) reviews the literature on public perceptions of and responses to a wide range of energy technologies, from bioenergy infrastructure and wind and solar parks to consumer technologies such as smart appliances and controls. Upham, Sovacool, and Ghosh (2022) distill relevant equity and energy transition themes from diverse disciplinary perspectives to propose a framework for considering engagement and energy justice in industrial cluster decarbonization. Anderson et al. (2022) conduct a review of the current state of social science research in aviation biofuels with a focus on sustainability, site selection, and social acceptance, identifying significant developments and research gaps and methodological weaknesses of current approaches.

Five focal papers employ surveys as a method of data collection. These surveys aim to collect information about issues such as existing practices in community engagement; they assess individual or community-level perception of and response to renewable energy projects and energy technologies within or across case studies and often at a single point in time (Prosperi, Lombardi, and Spada 2019; Stadelmann-Steffen and Dermont 2021; Soland, Steimer, and Walter 2013; Chodkowska-Miszczuk, Martinat, and Cowell 2019), although some surveys may be repeated to capture changing perspectives over time. Some surveys also focus on community acceptance and investigate the key factors influencing community perceptions of the benefits and negative impacts of renewable energy projects (Stadelmann-Steffen and Dermont 2021; Delicado, Figueiredo, and Silva 2016).

In eight publications, scholars use mixed methods combining surveys and statistics with qualitative methods such as interviews, focus groups, and participant observation to understand why people frame projects in a certain way, how they developed these understandings, and what actions they have taken to respond to energy projects. For instance, Stadelmann-Steffen and Dermont (2021) combine a survey with a comparative experimental approach to examine how and under what conditions specific modes of participation influence the social acceptance of energy transition projects. These scholars find that communities may be more likely to support local infrastructure projects if they are economically and politically involved (see also Section 5.2).

Some scholars suggest that the use of mixed methods helps to deepen understandings of structural determinants of participation or links between engagement and outcomes, such as social acceptance or enhanced energy equity. Mixed methods are often applied to a single case study or comparative case studies of communities. Although the use of mixed methods helps create a more nuanced understanding of the social, cultural, and political aspects of energy projects, Anderson et al. (2022) identify the following factors contributing to underutilization of these methods:

1. A preference for quantitative methods, which do not capture the social, cultural, and political dimensions of equity in energy projects. The preference for quantitative data over qualitative data can therefore prevent accurate analysis of these issues at the local level.
2. An absence of social scientists in the analysis and management phases of community engagement and other issues affecting equity in energy projects. This can result in inaccurate or incomplete understandings of issues, such as specific reasons for the success or failure of energy projects.

4 Defining Key Concepts

Scholars such as Carley and Konisky (2020) find that energy transition projects are already impacting individuals, households, and communities globally in positive and negative ways. For instance, a study of transportation inequities within 36 U.S. cities found unequal access to health, livelihood, and economic benefits, as well as unequal health and energy burdens (Romero-Lankao, Wilson, and Zimny-Schmitt 2022). Therefore, scholars—social scientists in particular—are calling for consideration of the underlying politics, meanings, and uses of terms such as community engagement, participation, energy equity, and justice (Carley and Konisky 2020; Electric Power Research Institute 2021; Sovacool et al. 2016; Heffron and McCauley 2017). In this context, it is important to carefully analyze the definitions of these concepts, what these concepts mean for the understanding of the links between engagement and equity in energy transition projects, who the actors are, how the actors are involved, and for what purposes.

4.1 The Actors of Energy Transition Projects

Energy projects are enacted and contested by different actors, from proponents[1] to affected communities and the broader public (Avila-Calero 2017; Arndt et al. 2017). An actor is defined by their capacity and power to act (Avelino and Wittmayer 2016). Although actor categories are a little messier in reality, we could say that actors include individuals, sectors, organizations, jurisdictions, and networks (e.g., local or state organizations working at the local to international level). Actors are either formal or informal, for-profit or nonprofit, and public or private (Avelino and Wittmayer 2016; Avelino and Rotmans 2011). For example, ethanol companies are formal, private, and for-profit; governmental entities such as DOE are formal, public, and nonprofit; and communities are informal, public, and nonprofit. Often some private, governmental, and civil society actors have relatively larger resources and power than others to promote or affect energy projects (Chodkowska-Miszczuk, Martinat, and Cowell 2019). Therefore, scholars suggest that participation and engagement of the public and communities involved in and/or affected by energy projects is essential to achieving energy equity (Upham, Sovacool, and Ghosh 2022). A community is often treated as a relatively homogeneous population within a defined area, interacting and participating in an array of local affairs (e.g., the development of energy projects), and sharing an awareness of common life and personal bonds—for instance, experiencing a sense of shared identity or shared place (Hindmarsh 2010b).

4.2 Participation and Community Engagement

Participation relates to the involvement of the public in infrastructure siting and other renewable energy decisions and policies (Stober et al. 2021). Participation is an umbrella concept including processes of community engagement and public decision-making (Stober et al. 2021). Participatory decision-making denotes inclusion of actors such as an underserved community in an energy project as a decision maker. Direct participation refers to the level of economic and/or political involvement of a local community or municipality in an energy project. The Spectrum of Public Participation, developed by the International Association for Public Participation (IAP2), is one highly utilized model that operationalizes community engagement into five levels of increasing community impact on decision-making: (1) inform, (2) consult, (3) involve, (4)

[1] Proponents include developers, industry, farmers or other landowners, nongovernmental organizations (in the case of solar energy), utilities, and governmental agencies like DOE (in the case of pilot or demonstration projects).

collaborate, and (5) empower.[2] Although community engagement is defined in different ways and using the different levels, it often entails public participation through an ongoing, two-way or multidirectional process, ideally with an emphasis on relationships and trust building rather than instrumental decisions. The latter are processes where engagement becomes the instrument to achieve social acceptance (Hindmarsh 2010b; Stober et al. 2021).

Some scholars connect participation and engagement with social acceptance of energy projects and policies, and define participation as the active or passive approval by the public of a certain energy project or policy (Melica et al. 2018; Stadelmann-Steffen and Dermont 2021). Other scholars see participation as an essential element of procedural justice (Segreto et al. 2020) and energy democracy (see Section 5.4). Some find that public ambivalence or disapproval is one of the most substantial barriers to collaboratively achieving renewable energy targets (Boudet 2019; Segreto et al. 2020). Scholars distinguish three categories or dimensions of acceptance: sociopolitical acceptance, or acceptance at the broadest level; community acceptance of local energy projects and policies; and market acceptance or adoption of technological innovations (Prosperi, Lombardi, and Spada 2019; Stadelmann-Steffen and Dermont 2021).

4.3 Energy Equity and Justice

Equity is often conflated with "equality" (meaning sameness). Following (Kallbekken, Sælen, and Underdal (2014), equality refers to an equal treatment of equal cases (demographic groups). Equity refers to a differential treatment of demographic groups that differ significantly in important respects—for instance, in demographic and ethnic characteristics and access to resources and decision-making. Therefore, equity implies that a group with different sociodemographic characteristics and needs may need energy options tailored to their needs. For example, populations with wheelchairs may need access to different transportation modes and services than populations who are able to walk (Romero-Lankao, Wilson, and Zimny-Schmitt 2022). *Energy justice* involves removing barriers that prevent equity by developing energy projects that offer groups access to tailored resources, options, and opportunities to pursue their life goals with dignity (Carley and Konisky 2020; Jenkins 2018; Romero-Lankao and Nobler 2021).

The concept of energy justice has interconnected threads that run through the fields of social, energy, climate, and environmental justice (McCauley and Heffron 2018; Jenkins 2018; Carley and Konisky 2020). Originating in the United States in the 1970s, environmental justice focuses on the distribution of environmental hazards and access to energy resources; it includes equal protection from burdens, meaningful involvement in decisions, and fair treatment in access to energy benefits (Baker, DeVar, and Prakash 2019; Agyeman et al. 2016). Climate justice concepts became prominent in the 1990s, with an emphasis mostly on mitigating and adapting to climate change in ways that support those more adversely impacted and distribute the related burdens and benefits fairly (Petersen and Ducros 2022; Ikeme 2003; Shi et al. 2016; Romero-Lankao and Nobler 2021).

Jenkins (2018) argues that energy justice can serve as a conceptual tool analyzing the legacies of past policies and practices on energy inequities, and integrating often discrete justice concerns

[2] For more detail on the IAP2 public participation model, see https://cdn.ymaws.com/www.iap2.org/resource/resmgr/pillars/Spectrum_8.5x11_Print.pdf.

that include distributive, procedural, and recognitional injustice. It can also function as an analytical tool to examine the respective values and causal factors of energy inequities, and as a decision-making tool to inform policies to target energy inequity problems (Sovacool et al. 2017). We use energy justice here because, in its three functions, it allows for a combination of social science, engineering, and natural science tools and methods. It offers ways of teasing out energy concerns from the broader array of concerns addressed by the environmental, climate, and justice mobilization. Lastly but not least important, energy justice can target each phase of the energy system cycle, from resource mining through waste management (Jenkins 2018; Sovacool, Kim, and Yang 2021).

4.4 Just Energy Transitions

Recent research in the United States and other countries worldwide indicates that a successful energy transition will entail projects seeking changes in sociotechnical energy systems and in systems of policy and governance aimed at moving a national and regional economy away from fossil fuels and toward renewable energy (Arndt et al. 2017; Geels, Berkhout, and van Vuuren 2016; Geels et al. 2017; Romero-Lankao et al. 2021). In recent years, the concept of a just transition has been added as a necessary condition (Jenkins, Sovacool, and McCauley 2018; Romero-Lankao, Rosner, and Lockshin 2022).

A *just* energy transition incorporates at least the following three tenets and considerations of justice in the transition to renewable energy (Arndt et al. 2017; McCauley and Heffron 2018; Carley and Konisky 2020):

1. **Distributional justice**: The distribution of benefits and negative impacts and burdens from large-scale energy projects and technologies across populations.
2. **Procedural justice**: The formulation of laws, policies, and procedures that are fair, equitable, and inclusive of the needs and priorities of disadvantaged communities and of all those who choose to participate.
3. **Recognition justice**: The identification of the significance and impact of past and current structural inequities of energy project execution, such as redlining (historical outlining of minority areas as high risk for loans), other predatory lending practices, and infrastructure siting and investments.

Some scholars have suggested considering additional justice tenets. **Restorative justice**, for instance, focuses on creating policies and solutions to remedy the legacies of historic injustices affecting regions, nations, citizens, and nature (Heffron and McCauley 2017; Heffron and Heffron 2021; Healey 2013). **Cosmopolitan justice** acknowledges Global South understandings of energy justice and applies energy justice principles to all humans, from the Global South and North, as well as nonhumans (Healy, Stephens, and Malin 2019). We have focused our literature review on three primary justice tenets: procedural, distributional, and recognition justice (Jenkins 2018).

5 Findings

We found that a majority of the 51 focal papers that sought to examine equity in energy projects as it relates to participation and acceptance targeted two of these tenets: procedural (38 papers) and distributional justice (27 papers). Only eight papers targeted the tenet of recognition justice (see Figure 1 and Table A-2). The analyzed papers found that two-way, ongoing, and long-term engagement is always a crucial component of procedural justice in energy projects (Upham, Sovacool, and Ghosh 2022; Segreto et al. 2020; Hindmarsh 2010b). For instance, Segreto et al. (2020) found an association among proper community engagement, trust, and a greater social acceptance of renewable energy projects. By contrast, large-scale wind projects in the Mexican Tehuantepec Isthmus faced strong opposition from local peasant and Indigenous communities, who asserted that the proponents neither engaged with them properly nor recognized their Indigenous rights and autonomous governance (Mejía-Montero et al. 2021; Avila-Calero 2017).

Regarding distributional justice, scholars such as Prosperi, Lombardi, and Spada (2019) found that local acceptance of small-scale energy systems related to concerns with the economic, environmental, and social benefits and risks of the technology. Other scholars found that the prospect of economic benefits, such as new jobs and lower taxes, increased support for solar energy projects (Stadelmann-Steffen and Dermont 2021). However, if these potential future gains were considered concomitantly with short-term costs, support for the projects sharply decreased.

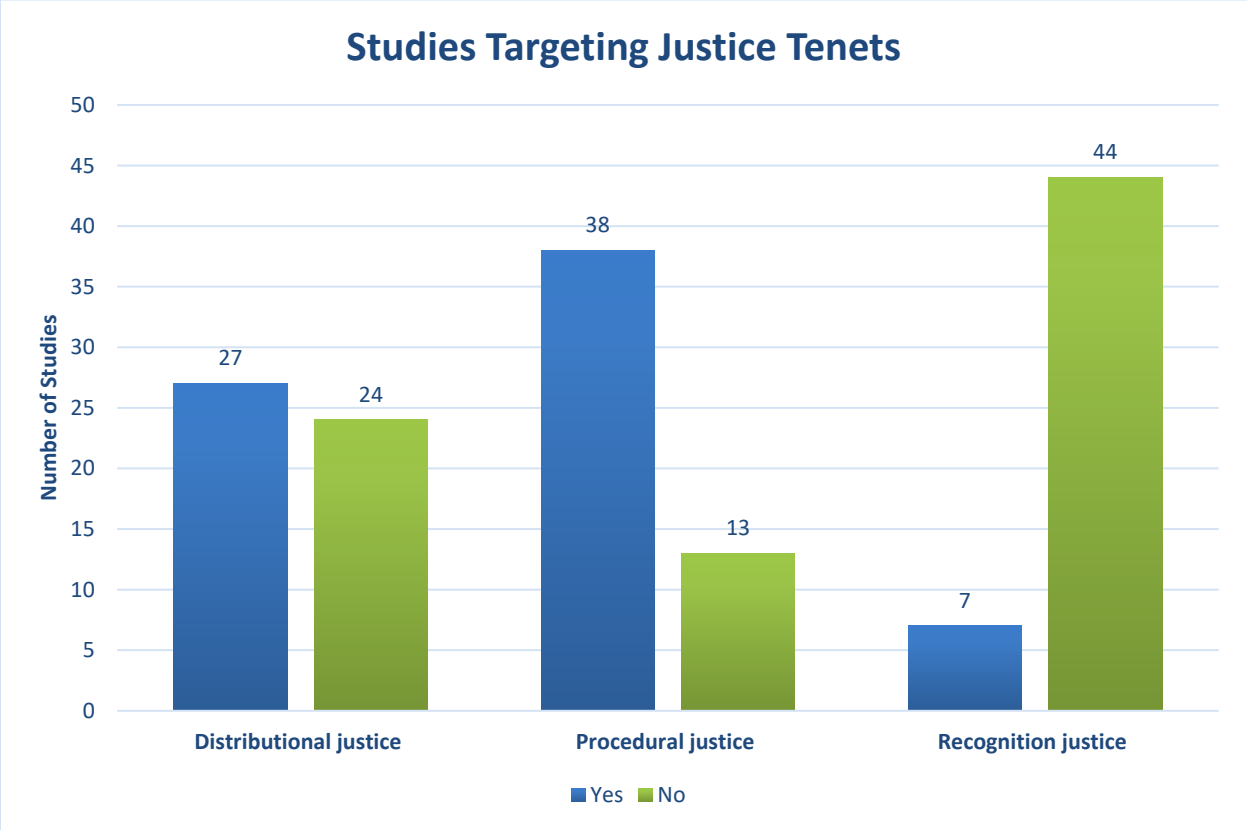

Figure 1. Studies targeting justice tenets

In what follows, drawing primarily on the review, we map the main research directions in the relevant literature, with a particular focus on community engagement and equity in energy projects. These directions, summarized in Table 4, include (1) best and existing practices in community engagement (18 papers) discussed in Section 5.1; (2) social acceptance of energy projects (20 papers) discussed in Section 5.2; (3) engagement, energy democracy, and transitions (15 papers) discussed in Section 5.3; and (4) regional development[3] and inequities in energy transition projects (7 papers) discussed in Section 5.4. These directions entail a variety of perspectives targeting analytic elements (what is) (e.g., Segreto et al. [2020]; Hindmarsh [2010a]) and normative elements (what ought to be) of engagement and energy equity issues (e.g., Drakellis [2022]; Waters [2015]; Nathan et al. [2021]; First Solar [n.d.]). Table A-1 provides a detailed list of indicators used to analyze the 51 papers.

Table 4. Research Directions of the Focal Papers

Research Direction	Total
Best practices	18
Social acceptance	20
Energy democracy/energy transitions	15
Regional development	7

Collectively, these studies used validated frameworks to understand why and how engagement works on the ground and how it relates with social acceptance, energy democracy, and distributional outcomes. However, other scholars use critical approaches to examine the regional development context in which energy projects operate (Lawhon and Murphy 2012; Kulcsar, Selfa, and Bain 2016), or to examine the pro-growth and techno-centric biases and carbon dependency of energy transition projects within dominant approaches to regional development planning (Walker and Baxter 2017; Hindmarsh 2010b; Dunlap 2018; Mejía-Montero, Alonso-Serna, and Altamirano-Allende 2020).

5.1 Guidelines and Best Practices in Community Engagement

Some publications offered guidelines and best practices to effectively engage policy actors and communities in energy projects (Drakellis 2022; Waters 2015; First Solar n.d.; New York State Department of Environmental Conservation 2009; Lezberg, Dane, and Mullins 2010; Ross and Day 2022; Ziegler and Forbes 2010) (see Table 4 and Table A-1). However, except for studies analyzing and drawing lessons from how engagement works on the ground, these guidelines remained mostly descriptive or normative, rather than explicitly making use of a theory or an empirically tested methodology (see Table 4 and Table A-1).

In one of the most robust guidelines, Lezberg, Dane, and Mullins (2010) provided a series of decision-making matrices to guide communities affected by bioenergy projects at all life cycle stages, from extraction to waste management. According to these authors, renewable energy projects can provide a means for communities to grow their local economies, reduce their carbon

[3] Regional development is the label for the efforts to develop certain areas of a country *to encourage industrial and economic development*. From the Organisation for Economic Co-operation and Development (OECD), "What is Regional Development?" http://www.oecd.org/regional/regionaldevelopment.htm.

footprints, maintain their working lands, and become more energy independent and secure. But renewable energy projects can also adversely impact existing businesses, the environment, quality of life, and the livelihoods of local communities (Lezberg, Dane, and Mullins 2010). The authors assert that by working through a series of questions and steps, energy actors can have a sense of what could work for their own communities, what issues might arise for constituencies, what areas warrant further study or detailed analysis, and how benefits and costs would be distributed locally and regionally.

Several research initiatives have documented good practices for community stakeholder engagement. For example, multiple mechanisms were applied to collect stakeholder input in a large Iowa landscape design project for bioenergy (Dale et al. 2018), and a clear process has been documented for engaging stakeholders to develop more sustainable land management plans (Dale et al. 2019). Kliskey et al. (2021) explore good practices for stakeholder engagement involving researchers and communities across an international set of projects based on a common conceptual framework:

- Situational understanding of the context and problem.
- Creation of a culture for engagement.
- Focus on power-sharing (co-ownership, co-generation of knowledge and outcomes).
- Technical process of integration.
- Monitoring processes of reflective and reflexive experiences, and formative evaluation (see also Mueller et al. [2020]).

Engagement depends on factors such as proponents' goals, risk perception of technology, the actors involved, and the situation in which it operates (Boudet 2019). Therefore, Solar Market Pathways (n.d.) suggested that four phases are needed for successful engagement processes:

- In Phase 1, it is crucial for proponents to understand why they are engaging, with whom they plan to engage, and with what intended outcome or result (e.g., improve local access to renewables, create jobs, reduce health impacts).
- In Phase 2, it is essential that proponents are systematic and rigorous in identifying actors beyond the best known or easiest to handle. Project proponents need to iteratively create a map of relevant actors and get feedback from residents on the list.
- In Phase 3, proponents need to select the engagement techniques and examine why they suit certain actors and situations, engagement points in the process, the message(s), and the potential approaches to soliciting and using residents' input. The power/interest grid is a tool to analyze stakeholder interests and positions.[4]
- Phase 4 involves updating and adapting the engagement approach based on whether engagement efforts are working. This phase also considers how best to report back to actors with progress and updates, how to manage expectations, and how to update the stakeholder analysis to reflect new information and changing circumstances.

[4] The power/interest grid entails placing stakeholders on a four-quadrant grid to help classify them according to their degree of influence and interest in the energy project. The result is four classifications of stakeholders: promoter with high influence and high interest, latent with high influence and low interest, defender with low influence and high interest, and apathetic with low influence and low interest (https://ctb.ku.edu/en/table-of-contents/participation/encouraging-involvement/identify-stakeholders/main).

Other studies focused on infrastructure development discussed different stages of engagement (Jellema and Mulder 2016; Drakellis 2022; Waters 2015; Arnstein 1969). The **development stage** is the first and most significant stage for building relationships and trust. Strategies include early engagement with community groups and community assessments via drop-in events accessible to community members, site visits, follow-up meetings, local focus groups, and a drop-in space to share views. During the **construction stage**, a point of contact or community liaison can hear concerns and take action to address them, ensure safety, and minimize adverse unintended consequences. Finally, during the project's **operation stage**, proponents can foster long-term engagement with communities through locally based efforts and activities including launch and follow-up parties, tours, site visits, art competitions for school kids, monitoring, research and educational programs, and information updates on the project's effects on the community.

Nearly all the papers examining how engagement works discussed the need to define the community, actor, and who to engage, which will vary depending on the nature of the proposed project, the characteristics of the site, the local area, and the features of the community (a point we will come to again in Section 5.2; see Table 4 and Table A-1). For example, Waters (2015) suggests categorizing community stakeholders according to those who support and can be potential beneficiaries of the energy project, those who are neutral, and those who oppose the energy project.

Some studies suggested understanding the promoter's motivation and methods for engagement, including the rationale (Stadelmann-Steffen and Dermont 2021; Chodkowska-Miszczuk, Martinat, and Cowell 2019; Stober et al. 2021). Regarding the rationale, engagement can be conducted *instrumentally* as a means to a particular end (e.g., achieving project acceptance). Proponents can undertake engagement based on a *normative approach* to engagement as the right thing to do, or from a *substantive view* seeking to achieve wider benefits beyond the particular project.

Scholarship has found that proponents often merely desire to secure social approval of an energy project (instrumental rationale). However, this approach has been criticized from an energy and social justice perspective as extractive, performative, and top-down, thus often resulting in backlash, opposition, and resentment—e.g., Tehuantepec, Mexico (Stadelmann-Steffen and Dermont 2021; Chodkowska-Miszczuk, Martinat, and Cowell 2019; Stober et al. 2021). In rarer cases, proponents are guided by a normative rationale and stress the community's right to participate in decision-making as a requirement for both equity in the distribution of costs and benefits and for fairness in the procedures used to make decisions in energy projects. It is even less common for proponents to be guided by a substantive rationale and to recognize that communities possess local knowledge and self-determination that can play a significant role in improving decisions (Stadelmann-Steffen and Dermont 2021; Chodkowska-Miszczuk, Martinat, and Cowell 2019; Stober et al. 2021).

As for engagement styles, several guidelines suggested the use of two-way approaches to participation and engagement to help inform project siting and development decisions, and to build trust and buy-in from involved actors and communities (Segreto et al. 2020; Aitken, Haggett, and Rudolph 2016). They also recommended targeting methods within the spectrum of public participation styles to opt for the kind of engagement proponents want to pursue

(Drakellis 2022; Waters 2015; First Solar n.d.). In its most basic form, participation means that the community is informed about an energy project. At the next level, project developers seek to obtain feedback from the communities. The influence of the community broadens if the proponents of an energy project seek to integrate a community's concerns and inputs. The most advanced level of participation entails a situation in which a community's self-determination is honored, and the community gets to exert political influence and change features and details of the final project.

Regarding the rationale for and styles of engagement, scholars found that, in most cases, proponents of renewable energy projects are still guided by an instrumental rationale and engage in one-way engagement processes (Segreto et al. 2020; Hindmarsh 2010a; Devine-Wright and Devine-Wright 2009; Upham, Sovacool, and Ghosh 2022). For instance, an assessment of 24 renewable projects in Europe found that in more than half, the proponents pursued an instrumental rationale for participation, while only six were guided by a substantive rationale for participation (Stober et al. 2021). In most cases, proponents considered participation in its most basic level, where community input did not have any substantial impact on decisions. Stober et al. (2021) suggested that to increase social acceptance of complex environmental governance such as those related to the energy transition, a shift from the instrumental to the substantive rationale in participatory planning might be a promising strategy. This means moving from engagement as a means to achieve acceptance to engagement as either the right thing to do or a crucial backbone of more inclusive and equitable energy projects.

5.2 Social Acceptance of Energy Projects

We found a large body of scholarship developed around the features, determinants, and outcomes of social acceptance (Boudet 2019; Devine-Wright 2005; Segreto et al. 2020; Prosperi, Lombardi, and Spada 2019; Stadelmann-Steffen and Dermont 2021; Soland, Steimer, and Walter 2013; Magnani 2012; Leiren et al. 2020; Lennon, Dunphy, and Sanvicente 2019; Chodkowska-Miszczuk, Martinat, and Cowell 2019; Antwi and Ley 2021; Jobert, Laborgne, and Mimler 2007; Hazboun et al. 2019). These scholars targeted the factors influencing community perception of and response to energy transition projects and technologies. They also identified tools that can support decision-making and help to anticipate potential public reactions and associated risks.

Studies analyzed in this section pointed to a series of factors determining community acceptance of energy projects. These include procedural justice components (such as early, two-way, and ongoing engagement), distributional justice elements related to project benefits and negative impacts, technology risk perception, and attributes of potentially affected communities (e.g., Boudet [2019]). For instance, in their literature review, Segreto et al. (2020) confirmed that a correlation exists between procedurally just engagement, community trust in proponents, and a greater social acceptance rate of renewable energy projects. These studies also found that perceived benefits of projects that increase social acceptance include contributing to the economic development of the local community, fostering workforce development, and attaining energy self-sufficiency (see, for instance, Prosperi, Lombardi, and Spada [2019]; Delicado, Figueiredo, and Silva [2016]).

Quantitative studies suggested that less-accepting communities are characterized by so-called "Cerrell indicators," which were first suggested by a 40-year-old report recommending that politically suppressed and underserved communities be targeted for incinerator siting (Cerrell

Associates 1984). Cerrell indicators of lower community acceptance include the presence of youth and higher education levels, higher levels of material resources, greater preexisting organizational and friendship networks, more intense grievances, and more negative perspectives on energy projects. In contrast, communities more likely to accept energy projects tend to be small and rural; they are also likely to receive some economic benefits from the projects (Walsh, Warland, and Smith 1993). However, the use of these indicators is an example of injustice being integrated into science. These kind of approaches tend to see science as a neutral, objective practice, thus forgetting the significance of cultural and political determinants of acceptance such as power dynamics and actors' capacity to enact local mobilization for and against energy projects (Chodkowska-Miszczuk, Martinat, and Cowell 2019; Walsh, Warland, and Smith 1993).

Acceptance of energy projects is also determined by the means proponents use to engage with communities. Examples include integration of meetings into communities' daily routines and the inclusion of local knowledge and communities' priorities, needs, cultures, ways of life, and physical environments into energy plans rather than merely using knowledge from experts and consultants to predesign energy projects (e.g., Kallis et al. [2021] study of renewable energy projects in island communities).

Building on Slovic (1987), Boudet (2019) emphasized that acceptance factors are deeply intertwined with public and community risk perceptions of social, economic, and environmental risks and benefits. Lack of social acceptance for an energy project is related to risk perception factors such as lack of control, potential for destructive consequences, inequitable distribution of costs and benefits, and uncertainties. Nuclear power, carbon geoengineering, and hydrogen are examples of energy technologies that score poorly on public perceptions of these risk types (Geels and Verhees 2011; Dokshin 2016; Jerolmack and Walker 2018; Walsh, Warland, and Smith 1993).

These studies also identified lack of trust in proponents, government officials, or industry as a barrier to participation and community engagement. This lack of trust typically resulted from a long history of procedural factors such as not appropriately enacting participatory processes, excluding the community from decision-making (Mejía-Montero et al. 2021; Segreto et al. 2020; Kallis et al. 2021). In their analysis of 17 cases of energy development in island communities, Kallis et al. (2021) probed the broader power relationships within island communities and between island and mainland actors, as well as the power dynamics and contextual and cultural processes affecting engagement. They discovered that these dynamics resulted from hierarchical organizational structures and historical interactions between private, governmental, and community organizations.

Some scholars argued that engaging in participatory methods is not, in and of itself, a guarantee that justice will be enacted or perceived to be enacted. Part of the reason is that dominant, institutionalized approaches tend to be instrumental and focus on techno-centric solutions, including centralized, large-scale energy systems disconnected from local realities. Furthermore, proponents tend to present large-scale energy projects as the price to pay for sociotechnical innovation and progress (Walker and Baxter 2017; Dunlap 2018; Mejía-Montero, Alonso-Serna, and Altamirano-Allende 2020). When the proponents of such projects engage in public participation processes, their tendency is toward instrumental rationale.

5.3 Engagement, Energy Democracy, and Energy Transitions

Two scholarly traditions approach public participation and engagement in energy projects as policy processes: energy transition management and energy democracy. Transition management frameworks are embedded in sociotechnical transition perspectives, particularly the multilevel perspective (Geels and Schot 2007a, 2007b; Geels 2011) defining energy transitions as transformations in sociotechnical systems and systems of policy facilitated by governmental officials through so-called "transition management" (Markard, Raven, and Truffer 2012; Loorbach, Frantzeskaki, and Avelino 2017).

Transition management frameworks seek to substantially improve the outcomes of transitions away from fossil fuel use (Loorbach, Frantzeskaki, and Avelino 2017; Loorbach and Rotmans 2010; Wittmayer et al. 2016). These approaches, however, are not sensitive to geographical or political context; for instance, to how transition management may play out differently in rural and urban areas, or the Southeast or Western United States (Romero-Lankao and Gnatz 2013). They have been criticized for focusing on decision-making by elite groups such as corporate and state leaders and scientists, thus omitting how power and politics constrain transition management (Lawhon and Murphy 2012).

To address the aforementioned challenges, scholars such as Loorbach (2010) ground transition management on an idea and ideal of operationalizing energy equity by developing participatory transitions "pilots" (Laurent, Pontille, and Pontille 2018). Other scholars have created the recently emerging field of energy democracy, seeking to enhance community involvement in decision-making and energy ownership, along with increasing rights and ownership of small energy producers. This involvement seeks to achieve various goals: broadening the rights of smaller producers of renewable energy such as renewable electricity producers, widening the ownership base of renewable energy systems, and enhancing community involvement in decision-making and energy ownership (Van Veelen and Van Der Horst 2018; Burke and Stephens 2017; Ambole et al. 2021). Given these varied goals, energy transition projects and dynamics reflect political struggles around the social, economic, and political relations embedded in energy (Van Veelen and Van Der Horst 2018). Therefore, energy transition projects often challenge the enactment of democratic values, defined as the norms, beliefs, and practices guiding how actors prioritize and relate to renewable energy projects (Wolsink 2006). For instance, values revolve around whether decision-making should be top-down, led by the policy makers and experts, or bottom-up and more inclusive of the knowledge of the broader public and underserved communities. If the latter, community engagement becomes a key element of energy democracy, whereby communities and the broader public need access and input to decision-making so energy projects can reflect their needs and priorities (Delina 2018).

5.4 Regional Development and Inequity in Energy Transition Projects

Seven studies examined socio-spatial inequities in energy transition projects in the context of regional development (defined in footnote 3; see Table 4 and Table A-1). Some scholars examined the distribution of burdens and benefits between rural and urban communities associated with renewable development (Buechler and Martínez-Molina 2021; Forget and Bos 2022). Others analyzed the unequal impacts of renewable energy projects (such as wind and bioenergy) on rural communities (Huesca-Pérez, Sheinbaum-Pardo, and Köppel 2016; Mejía-Montero et al. 2021). Two cross-cutting themes across these studies are extraction (particularly

from rural communities) and instrumental rationale. Both relate to how energy projects have often aimed to extract profits from specific places, and the places and people bear the brunt of effects, particularly ill effects.

The case of U.S. corn ethanol production, which began to expand rapidly in 2003 in response to several market factors, has been documented and widely studied. A couple of social science studies targeting bioenergy projects found that during the 2000s, investments in biofuels sought to address the "trilemma" of revitalizing stagnant and declining rural communities, mitigating climate change, and promoting energy security in an era when "peak oil" production and use fell short of initial goals (Selfa et al. 2011; Kulcsar, Selfa, and Bain 2016). These scholars question whether proponents of early biofuel projects properly engaged with rural communities and if, rather than fulfilling their promise to address the trilemma, biofuel developments related to U.S. corn ethanol production have perpetuated energy, environmental, and social inequalities. These concerns could be addressed as the bioeconomy seeks to build from new biomass resources such as dedicated perennial grasses and short-rotation woody crops.

For instance, Selfa et al. (2011) applied mixed methods and a sociology of networks approach to analyze local community perceptions of benefits and burdens of the ethanol industry in the Midwestern United States. In the United States and Brazil, biofuels production has had robust state involvement in infrastructure investment, and it is organized into regions such as Kansas and Iowa that are part of a globally integrated network. Power in the biofuel network is within the international economic and political actors whose decisions drive the community-level impacts of transition projects such as ethanol plants. Selfa et al. (2011) found that although the studied communities acknowledged that ethanol plants added new jobs to their local economy, the new jobs were not perceived to be well paid. These rural communities were concerned by the ethanol plant closures in neighboring towns and felt buffeted by international and national policies that had been made within the circuits of global economic and political flows, but with clear impacts in the rural communities. The authors highlighted the social vulnerabilities that place-bound communities in national biofuels regions have experienced.

To examine how environmental problems are framed as non-problematic and economic privileges are normalized in rural areas, Kulcsar, Selfa, and Bain (2016) used Freudenberg's theory of privileged access and privileged narratives. In this conceptualization, dominant interests use "indirect forms of power" together with public complacency to create privileged access and narratives that often contribute to inequalities and foster injustice. According to these authors, the widespread acceptance that distribution of benefits and negative impacts of biofuels and other transition projects is as fair as should be expected, is socially constructed through two processes. First, some actors have privileged access to resources, decisions, and the use of nature, while the public at large bears the associated burdens. Then, through the privileging of some narratives over others, such inequities become "taken for granted" or normalized, thus explaining why these inequities are rarely challenged or questioned. In such privileged narratives, for instance, biofuel development is portrayed as economically necessary, providing jobs and income for local communities or as a crucial economic product, or to help reduce greenhouse gases. Such arguments become privileged narrative features and much more difficult to question.

Other scholars have analyzed urban-rural and intraregional energy inequities around energy projects (Forget and Bos 2022; Huesca-Pérez, Sheinbaum-Pardo, and Köppel 2016; Mejía-Montero et al. 2021). For instance, Huesca-Pérez, Sheinbaum-Pardo, and Köppel (2016) and Mejía-Montero et al. (2021) analyzed the social-environmental impacts of wind development on Indigenous communities in Tehuantepec, Mexico. In their early agreements, proponents of wind development promised financial incentives and infrastructure to transmit rural electricity to urban areas. However, proponents failed to properly engage with local Indigenous and peasant communities in their initial efforts, and therefore faced strong opposition. On a procedural ground, these communities felt excluded from decision-making. In terms of recognition justice, proponents of wind energy did not acknowledge their Indigenous rights to land and natural resources and to autonomous governance. Both procedural and recognition injustices created long-lasting intra- and inter-community conflicts that will impact the region for years to come (Mejía-Montero et al. 2021).

Forget and Bos (2022) examined ways the extractive industry around lithium and solar energy production exacerbates historic and current inequities in rural areas of the Andes. Rural economic development relies on and deals with the environmental and socioeconomic impacts of extractive industries serving the needs of urban communities, nationally and internationally, where the benefits are typically accrued.

Shoeib, Renski, and Infield (2022) found that renewables such as wind energy can bring co-benefits to rural communities, such as income, with very few environmental or infrastructural impacts. However, metropolitan areas benefit more from the various positive outcomes, such as higher per-capita and farm income, higher employment, and reduced poverty rates. The reason for this is that urban areas, with their economies of scale, can capture more of the development multiplier impacts, such as more extensive employment and retail base, while for rural areas, wind farms are not enough to counteract the “long-term trends of population out-migration and brain drain” (Shoeib, Renski, and Infield 2022).

6 Concluding Remarks

More and more voices are suggesting that proponents of energy transition technologies, infrastructure, and programs need to engage with affected communities and the broader public. However, if not properly done, such engagement can result in opposition, reinforce existing inequities, and even create new ones. And there is little agreement on how stakeholder engagement should be conducted, much less adequate funding to enable full stakeholder participation in all aspects of planning and approval. Nor is there agreement on mechanisms for stakeholders to influence decisions regarding technological options and siting of renewable energy projects.

We used a systematic literature review to examine the associations between engagement and equity in large-scale energy transition projects to draw lessons to inform current and future renewable energy projects and technologies. Our goal was to inform DOE and proponents of renewable energy projects from a solid analysis of what engagement is, why and how it works (or does not work) on the ground, and how it relates to crucial societal elements of energy equity such as social acceptance, energy democracy, and improved equity outcomes. Our literature review included publications offering guidelines on how engagement ought to be conducted and others examining what existing engagement looks like.

This analytic approach confirms that energy transition projects can produce benefits such as job creation and mitigation of greenhouse gases, particulate matter emissions, and other atmospheric pollutants. Some actors perceive that new jobs for renewable energy are of lower quality than jobs associated with the traditional fossil fuel industry or are simply inaccessible to those who would need tailored training to have the appropriate skill sets. New energy projects may also lead to a series of profound recognition and procedural inequities, such as:

- Lack of recognition of farmers' realities and livelihood or business needs as well as Indigenous peoples' voices and historical rights to land, natural resources, and autonomous governance, all of which create long-lasting intra- and inter-community conflicts.
- Disparities between urban and rural communities regarding who is more likely to benefit (urban) and who is more likely to bear the costs (rural) of renewable development projects.

Therefore, it is fundamental that DOE and other proponents of energy transition projects such as the siting of bioenergy and other renewable infrastructures, as well as scholars studying these issues, examine the underlying socioeconomic, cultural, and political context in which energy projects are sited, designed, and operated.

Proponents could benefit from analyzing and addressing the array of factors intersecting, in context-specific ways, to influence the acceptance of energy projects. These factors include not only indicators (such as age, educational attainment, material resources, or preexisting organizational and social networks), but also the following:

- Procedural justice components, such as (a lack of) early and ongoing two-way engagement.

- Distributional justice concerns related to how benefits and negative impacts are and could be better shared or perceived.
- Tools to understand and navigate the power dynamics, policy, and capacity of community actors to enact local mobilization for and against energy projects.
- Understanding of (lack of) trust of proponents or government officials related to a history of inappropriate engagement, community exclusion from decision-making, and inappropriate industry monitoring and implementation.
- Public risk perceptions of social, economic, and environmental risks and benefits associated with the energy project—e.g., lack of control, potential for destructive consequences, inequitable distribution of costs and benefits, mitigative measures, and uncertainties.

Based on these findings, scholars contend that community engagement efforts thus far have only occasionally resulted in more equitable energy outcomes or the perception of equitable outcomes among communities. The proponents of energy projects need to overcome the tendency to use instrumental approaches and favor techno-centric approaches such as centralized, large-scale energy systems and top-down decision-making processes disconnected from the experienced realities of local communities. Furthermore, proponents need to also overcome the tendency to present large-scale energy projects as the price to pay for sociotechnical innovation and progress—and to understand that often, when the proponents of these projects engage in public participation processes, the tendency is toward using engagement as a means to achieve acceptance, also known as instrumental rationale.

It is therefore fundamental for DOE to understand that community engagement in projects that support energy transition is context-specific in many ways. Energy projects range from those involving large-scale energy infrastructure to those involving consumer-facing technologies. Communities are not monolithic but varied in their understandings, priorities, interests, needs, and lived experiences. This understanding can be enhanced by engagement approaches aimed at reflecting diverse perspectives of energy projects, based on the assumption of not "one," but many framings and understandings that should guide goals such as economic development and equity in bioenergy projects.

Justice for all remains an aspirational goal, but efforts to promote just energy transitions aim to make a positive contribution by shifting risks and burdens to those who are more able to manage them and improving the distribution of net benefits among groups that have been harmed or disadvantaged under prior energy regimes.

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Appendix

List of Reviewed Focal Papers

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Table A-1. Criteria Used in Literature Review

Reference	Type of Document	Geographic Area	Energy Category	Direction
Ambole et al. (2021)	Literature review	Africa	Renewable energy	Energy democracy
Anderson et al. (2022)	Literature review	International	Bioenergy	Social acceptance
Hammond and Ley (2021)	Literature review	Africa	Renewable energy	Social acceptance
Avila-Calero (2017)	Case study	Latin America	Wind	Regional development and just energy transitions
Baxter et al. (2020)	Literature review/case studies	International	Wind	Social acceptance
Bessette and Crawford (2022)	Literature review	North America	Wind	Social acceptance
Boudet (2019)	Literature review	International	Energy technologies in general	Social acceptance
Buechler and Martínez-Molina (2021)	Qualitative	North America	Renewable energy	Regional development and just energy transitions
Burke and Stephens (2017)	Literature review	North America	Energy technologies in general	Regional development and just energy transitions
Carley and Konisky (2020)	Literature review	International	Energy technologies in general	Energy democracy
Chodkowska-Miszczuk, Martinat, and Cowell (2019)	Mixed methods	Europe	Bioenergy	Social acceptance
Damgaard, McCauley, and Long (2017)	Mixed methods	Asia	Bioenergy	Regional development and just energy transitions
Delicado, Figueiredo, and Silva (2016)	Qualitative	Europe	Wind and solar	Social acceptance
Delina (2018)	Qualitative	Asia	Renewable energy	Energy democracy
Devine-Wright (2005)	Literature review	International	Wind	Social acceptance

Reference	Type of Document	Geographic Area	Energy Category	Direction
Drakellis (2022)	Guideline	North America	Renewable energy	Best practices
First Solar (n.d.)	Guideline	Oceania	Solar	Best practices
Forget and Bos (2022)	Qualitative/ literature review	Latin America	Energy technologies in general	Regional development and just energy transitions
Hazboun et al. (2019)	Qualitative	North America	Renewable energy	Social acceptance
Hindmarsh (2010)	Case study	Oceania	Wind	Best practices
Huesca-Pérez, Sheinbaum-Pardo, and Köppel (2016)	Literature review, case study	Latin America	Wind	Regional development and just energy transitions
Jellema and Mulder (2016)	Literature review and guidance	Europe	Renewable energy	Best practices
Jobert, Laborgne, and Mimler (2007)	Literature review/ qualitative	Europe	Wind	Social acceptance
Kallis et al. (2021)	Literature review	International	Energy technologies in general	Best practices
Kulcsar, Selfa, and Bain (2016)	Mixed methods	North America	Bioenergy	Best practices
Leiren et al. (2020)	Qualitative	Europe	Wind	Best practices
Lennon, Dunphy, and Sanvicente (2019)	Mixed methods	Europe	Renewable energy	Social acceptance and energy democracy
Levenda and Disano (2021)	Literature review	International	Energy technologies in general	Social acceptance
Lezberg and Mullins (2010)	Toolkit	North America	Bioenergy	Best practices
Magnani (2012)	Case study	Europe	Bioenergy	Social acceptance
Martiskainen and Speciale (2018)	Qualitative	North America	Energy technologies in general	Energy democracy
Mejía-Montero et al. (2021)	Case study	Latin America	Wind	Regional development and just energy transitions
Nathan et al. (2021)	Guideline	North America	Energy technologies in general	Best practices
NCSL (n.d.)	White paper	North America	Energy technologies in general	Best practices
NYSDEC (2009)	Guideline	North America	Wind	Best practices

Reference	Type of Document	Geographic Area	Energy Category	Direction
Prosperi, Lombardi, and Spada (2019)	Qualitative	Europe	Bioenergy	Social acceptance
Ramanan (2021)	Guideline	North America	Solar	Best practices
Ross and Day (2022)	Guideline	North America	Energy technologies in general	Best practices
Segreto et al. (2020)	Literature review	International	Renewable energy	Best practices
Selfa et al. (2011)	Mixed methods	North America	Bioenergy	Best practices
Shoeib, Renski, and Infield (2022)	Mixed methods	North America	Wind	Regional development and just energy transitions
Soland, Steimer, and Walter (2013)	Qualitative	Europe	Bioenergy	Social acceptance
Solar Market Pathways (n.d.)	Guideline	North America	Energy technologies in general	Best practices
Stadelmann-Steffen and Dermont (2021)	Qualitative	Europe	Renewable energy	Social acceptance
Stober et al. (2021)	Literature review	Europe	Renewable energy	Social acceptance
Upham, Sovacool, and Ghosh (2022)	Literature review	Europe	Energy technologies in general	Social acceptance, energy democracy, and energy transitions
Van Veelen and Van Der (2018)	Literature review	International	Renewable energy	Energy democracy
Walker and Baxter (2017)	Mixed methods	North America	Wind	Social acceptance
Walsh, Warland, and Smith (1993)	Mixed methods	North America	Energy technologies in general	Social acceptance
Waters (2015)	Guideline	Europe	Solar	Best practices
Ziegler and Forbes (2010)	Guideline	International	Energy technologies in general	Best practices

Table A-2. Studies Targeting Energy Justice Tenets

Reference	Is distributional justice targeted?	Is procedural justice targeted?	Is recognition justice targeted?
Ambole et al. (2021)	Yes	Yes	No
Anderson et al. (2022)	No	Yes	No
Hammond and Ley (2021)	No	Yes	No
Avila-Calero (2017)	Yes	Yes	Yes
Baxter et al. (2020)	Yes	Yes	No
Bessette and Crawford (2022)	Yes	Yes	No
Boudet (2019)	Yes	Yes	No
Buechler and Martínez-Molina (2021)	Yes	No	Yes
Burke and Stephens (2017)	Yes	Yes	No
Carley and Konisky (2020)	Yes	Yes	Yes
Chodkowska-Miszczuk, Martinat, and Cowell (2019)	Yes	No	No
Damgaard, McCauley, and Long (2017)	Yes	Yes	No
Delicado, Figueiredo, and Silva (2016)	Yes	No	No
Delina (2018)	No	Yes	No
Devine-Wright (2005)	No	Yes	No
Drakellis (2022)	Yes	Yes	No
First Solar (n.d.)	No	Yes	No
Forget and Bos (2022)	Yes	Yes	Yes
Hazboun et al. (2019)	No	No	No
Hindmarsh (2010)	No	Yes	No
Huesca-Pérez, Sheinbaum-Pardo, and Köppel (2016)	Yes	No	Yes
Jellema and Mulder (2016)	No	No	No
Jobert, Laborgne, and Mimler (2007)	No	Yes	Yes
Kallis et al. (2021)	No	Yes	No
Kulcsar, Selfa, and Bain (2016)	Yes	Yes	No
Leiren et al. (2020)	Yes	Yes	No
Lennon, Dunphy, and Sanvicente (2019)	Yes	Yes	No
Levenda and Disano (2021)	Yes	Yes	Yes
Lezberg and Mullins (2010)	Yes	Yes	No
Magnani (2012)	No	Yes	No
Martiskainen and Speciale (2018)	Yes	Yes	No

Reference	Is distributional justice targeted?	Is procedural justice targeted?	Is recognition justice targeted?
Mejía-Montero et al. (2021)	Yes	Yes	Yes
Nathan et al. (2021)	No	No	No
NCSL (n.d.)	No	No	No
NYSDEC (2009)	No	No	No
Prosperi, Lombardi, and Spada (2019)	No	Yes	No
Ramanan (2021)	Yes	Yes	No
Ross and Day (2022)	No	Yes	No
Segreto et al. (2020)	Yes	Yes	No
Selfa et al. (2011)	Yes	No	No
Shoeib, Renski, and Infield (2022)	Yes	No	No
Soland, Steimer, and Walter (2013)	No	Yes	No
Solar Market Pathways (n.d.)	No	No	No
Stadelmann-Steffen and Dermont (2021)	No	Yes	No
Stober et al. (2021)	No	Yes	No
Upham, Sovacool, and Ghosh (2022)	Yes	Yes	No
Van Veelen and Van Der (2018)	Yes	Yes	No
Walker and Baxter (2017)	No	Yes	No
Walsh, Warland, and Smith (1993)	No	Yes	No
Waters (2015)	No	Yes	No
Ziegler and Forbes (2010)	Yes	Yes	No