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Municipal Utilities and Electric Cooperatives in the United States: Interpretive Frames, Strategic Actions, and Place-Specific Transitions

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Abstract

Renewable energy and social justice advocates are organizing around the potential for community-based democratic organizations to promote more decentralized, sustainable, and just societies. Within this movement, consumer-owned electric utilities are often seen as central actors. Yet, there has been little systematic investigation into why integration of distributed energy resources (DERs) varies across these utilities. We explore this question using literature on sustainability transitions and strategic action fields. Choices about when and how to integrate DERs are shaped by new interpretations of long-standing principles, existing institutional relationships, and a utility's political power. We identify how four divergent strategies shape distinct technology configurations with differences in physical scale, concentration of political authority, and distribution of economic benefits. These differences suggest that local technology ownership may not be sufficient to motivate change in some contexts. Policy addressing political processes and ownership scale may be needed to accelerate more sustainable and just energy transitions.

Highlights

- Municipal utilities and electric cooperatives are local, democratic organizations
- Integration of distributed energy resources across these electric utilities varies
- Strategic action field theory is used to focus on agency and collective identity
- Four strategies shape technology and distributions of economic and political power
- Policy insights are provided for sustainable and just transitions

Abbreviations and Acronyms	
APPA	American Public Power Association
Co-op	Cooperative electric utility
DER	Distributed energy resource
DG	Distributed generation
G&T	Generation and transmission
IOU	Investor-owned utility
JAA	Joint action agency
Muni	Municipal utility
NRECA	National Rural Electric Cooperative Association
PV	Photovoltaic
SAF	Strategic action field

1. Introduction

Equitably transitioning the energy system to provide more affordable, reliable, and sustainable power will require new technologies and services, as well as new operating practices and new institutional relationships. In the electricity sector, distributed energy resources (DERs) provide complements and alternatives to centralized generation and long-distance transmission. These resources are characterized by a relatively small scale and their connection to the distribution system, rather than the transmission system. Some DERs have long been part of the electricity system: for example, diesel or gas-fired distributed generation (DG) and interruptible demand programs. However, in recent years, deployment of DERs, particularly community and customer-sited solar photovoltaic (PV) generation, has grown significantly around the world and in the United States, enabling visions of a future decentralized electricity system characterized by renewable energy sources, sustainable development (Alanne and Saari, 2006), greater affordability (Lovins and Lamb, 2002), demand reduction and management (Albadi and El-Saadany, 2007), community control (Szulecki, 2018), and energy justice (Jenkins et al., 2016). But these envisioned benefits are not guaranteed, and integration of DERs into the U.S. electricity system has been uneven, especially among public municipal and member-owned cooperative distribution utilities (consumer-owned munis and co-ops).[1]

The integration of DERs into existing electricity systems has complex implications, both institutionally and technologically. DERs are changing the conventional roles of electric utilities, expanding and changing the use of electric distribution systems, disrupting long-standing institutional relationships, and creating new roles for households and businesses. In this paper, we adopt a sustainability transition perspective to explore this complexity. Research has shown that electricity services are embedded in interdependent societal systems that have co-evolved through multiple relationships among technologies, institutions, routines, and cultures (Geels and Shot, 2010). Within these systems, the formal and informal rules that orient and coordinate collective action are often highly institutionalized and contribute to stability (Fuenfschilling and Truffer, 2014; Geels and Shot, 2010). Thus, understanding the agency and structures that enable and constrain systemic change in societal regimes is critically important to accelerating energy-system transition (Loorbach et al., 2017).

Transition perspectives address how issues of power and agency span different levels and scales (Avelino and Wittmayer, 2016; Coenen et al., 2012; Truffer et al., 2015). Within this literature, a focus on institutions, framing, and discourse highlights the role of conflicting institutional logics (Smink et al., 2015), institutional work in the internal dynamics of socio-technical system (Fuenfschilling and Truffer, 2016), variations in institutional arrangements across local contexts (Raven et al., 2019), the use of framing in collective action (Fuller and McCauley, 2016; Hess, 2019); and the semi-coherent nature of regimes (Fuenfschilling and Truffer, 2014; Rosenbloom et al., 2016). However, recent work suggests a need to better understand how and why change occurs through processes taking place within socio-technical systems and the roles of local contexts (Fuenfschilling and Truffer, 2016, 2014; Geels and Shot, 2010; Hansen and Coenen, 2015; Raven et al., 2019; Stephens et al., 2017). This paper builds on previous work by incorporating insights from strategic action field (SAF) theory (Fligstein and McAdam, 2012) to examine the diversity and dynamics of local collective-action processes.

[1] We recognize there are important differences between municipal utilities and electric cooperatives (see Section 3). In the U.S., these utilities are often collectively referred to as "consumer-owned utilities" (see Lazar, 2016). The municipal utilities and electric cooperatives in this study are owned by consumers and are in a region without retail choice; thus, they have an obligation serve all consumers that request service within their service area.

Through a study of consumer-owned utilities in the United States, we examine how these collective actors interpret possible responses to DERs, take strategic actions, reorient institutional relationships across scales, and arrive at a diversity of technological configurations. Consumer-owned munis and co-ops are important and understudied actors in transition dynamics of the U.S. electricity system, where investor-owned utilities (IOUs) have received significant policy and research attention. Across the U.S., more than 2,000 munis and nearly 900 co-ops manage almost a quarter of electricity sales and serve 36.6 million electricity consumers in primarily rural areas and small communities (U.S. EIA, 2017). Most munis and co-ops are distribution utilities with a strong focus on their local communities and a tradition of coordinating with other public or cooperative service providers for much of their generation and transmission services.

Munis and co-ops are not required to generate profits for shareholders. They are public or nonprofit organizations founded on shared principles of democratic accountability, local governance, and local rate regulation (see Table 1 and APPA, n.d.; NRECA, 2016). Renewable energy and social justice advocates are increasingly organizing around the potential for these community-based democratic organizations to promote more sustainable and just societies (Burke and Stephens, 2018). However, unlike the more recent expansion of renewable generation cooperatives in Europe, most munis and co-ops in the U.S. have served local communities since the first part of the 20th century when small towns and rural areas were first electrified. These utilities are embedded in centralized legacy structures and many have historically been heavily invested in fossil fuel-based electricity generation. In 2016, coal and natural gas accounted for 68% and 90% of the capacity owned by non-federal public power (serving primarily munis) and co-ops, respectively (American Public Power Association [APPA], 2018).[2]

Given their foundational principles and organizational history dating back to early electrification, munis and co-ops differ from IOUs in their regulatory oversight, business models, internal capacity, and relationships with their consumers/members. Munis and co-ops make decisions in fundamentally different ways than IOUs and to accelerate a sustainable transition, they require different pathways for navigating system change and different policy mixes.

This study contributes to the understanding of agency and change in sustainability transitions. Among U.S. consumer-owned utilities, we identify DER implementation strategies that support relatively large-scale technologies and a concentration of economic and political power, as well as strategies that support more decentralized technology configurations and a shift toward community-scale economic and political power. These findings can inform policy design and technological implementation by highlighting both the potential and limits of locally driven transformation.

Section 2 reviews the literature on sustainability transitions from a field theory perspective to develop the lens through which we study disruption of regime structures and the emergence of strategic actions. Section 3 describes our research site and methods. Section 4 introduces our findings and typology of strategies to understand the diversity of approaches for implementing DERs. Sections 5 and 6 present a discussion of findings and implications for research and practice.

2. Theoretical Framework

We apply a sustainability transition perspective to explore the complexity of deploying DERs as a means of transforming electricity systems. We are interested in how consumer-owned utilities are responding to the emergence of DERs, and therefore, we are interested in the agency of certain organizational actors and if (and how) long-standing structures that contribute to stability of these socio-technical systems are changing. We find institutional theory and strategic action field theory helpful in our research because of the significance of social structures, agency, and mechanisms of collective action in this context.

We use institutional theory to operationalize our understanding of the dynamics of socio-technical systems of consumer-owned utilities. A central approach for understanding sustainability transitions is the multi-level perspective, which utilizes several concepts from institutional theory (Fuenfschilling and Truffer, 2014; Geels and Schot, 2007). This approach views transitions as occurring through the interplay of three levels: the broader external context, referred to as the *landscape*; the configuration of highly institutionalized structures, represented by a *regime;* and sites of experimentation and radical innovation, conceptualized as *niches* (Geels, 2004). The concept of a regime refers to the social structures, such as rules, norms, or principles, that account for the stability of the system, although there are often internal tensions within these structures (Geels, 2011; Geels and Schot, 2007). Relative to regimes, niches have weakly aligned structures that are less stable, developed, and articulated (Geels and Schot, 2007). While

[2] In comparison, IOU electric capacity was 74% coal and natural gas in 2016 (APPA, 2018).

the multi-level perspective has been used to address a number of interesting questions, including studies of exogenous influences on the regime, empirical studies using this approach have been criticized for not taking into account the tensions and incoherencies *within* regimes (Markard and Truffer, 2008; Smith et al., 2005)

Fuenfschilling and Truffer (2014) advance the operationalization of the multi-level perspective by drawing on institutional theory to provide a more detailed view of structures and structuration processes (i.e., actions and structures are recursively related; see Giddens, 1984). From this perspective, socio-technical system change occurs at the level of organizational fields (Geels and Schot, 2007), and the *levels* in the multi-level perspective are differentiated by their degree of structuration (Geels, 2011). An organizational field is an arena in which organizations interact, affect one another through institutional processes, and share a common meaning system (DiMaggio and Powell, 1983; Wooten and Hoffman, 2008). The social structures that coordinate action in these fields can be regulative (e.g., standards, laws, and rules), normative (e.g., relationships, values, and norms), or cultural-cognitive (e.g., beliefs, sense-making, and guiding principles) (Scott, 2014). Variations in stability are reflected in how structures are institutionalized through the duration, scope, and scale of acceptance by collective members (Barley and Tolbert, 1997). Thus, we can assess the strength of a regime by identifying the degree of institutionalization of core structures (Fuenfschilling and Truffer, 2014).

Applying these concepts, we describe important structures and assess the structuration of the regime as an empirical question. Consumer-owned utilities operate in overlapping and nested organizational fields with different degrees of structuration. We identify the formal and informal structures that provide stability and coherence within these fields. These structures include state and local programs and policies, existing generation and transmission contracts, and long-standing rules, norms, and principles that have evolved with public and cooperative organizational forms over many decades. In our analysis, we assess the degree of institutionalization and stability of the regime by examining how consumer-owned utilities interpret these structures in response to emerging DERs and new consumers, third party suppliers, and advocates engaging in the field. This line of inquiry leads to our first research question:

> *RQ1: How do municipal utilities and electric cooperatives interpret what actions are legitimate and possible responses to emerging DERs?*

We use SAF theory to conceptualize organizational agency. Like the neo-institutionalism approach to organizational fields, SAF theory conceives of fields as structured social spaces and views actors as driven by collective interests. However, these theories differ in how they view agency operating within institutionalized fields (i.e., how they address the paradox of embedded agency) (Fligstein and McAdam, 2012; Thornton and Ocasio, 2008). Kluttz and Fligstein (2016) highlights the empirical significance of determining the primary motivation for collective action in a field and how this motivation relates to different theoretical assumptions. We highlight these distinctions here to clarify the insights from SAF theory that apply in our analysis.

Institutional field theory conceptualizes a concern for legitimacy as the primary motivation for rational actors to participate in collective action. This approach uses the ideas of institutional logics and institutional work to examine how agency affects institutions and to categorize actions as aiming to maintain or disrupt institutions (Lawrence and Suddaby, 2006; Thornton and Ocasio, 2008). Institutional logics and institutional work inform sustainability-transitions research by providing ways to understand the interplay of actors, technology, and institutions (Fuenfschilling and Truffer, 2016; Smink et al., 2015).

As an alternative answer to the paradox of embedded agency, SAF theory conceptualizes the pursuit of shared-meaning and identity as the primary motivation for collective action. This approach views actions as strategic attempts to secure the cooperation of others through either enforced hierarchy, appeals to material interests, or voluntary coalitions (Fligstein and McAdam, 2012).[3] Additionally, SAF theory provides an approach for assessing how actors in different positions in the field vary in their interpretation of events, respond to them from their own point of view, and still engage in collective action (Fligstein and McAdam, 2012). The strategic action of frame-alignment is seen

[3] Fligstein and McAdam (2012) recognizes dual motivations in SAFs: the pursuit of power and material self-interest as well as identity and cooperation. However, from this view the pursuit of collective meaning-making, identity, and belongingness is deeply rooted and often the exercise of power and conflict is bound up with this more fundamental motivation.

as fundamental to achieving collective action but also as an ongoing social accomplishment because actors always have a particular frame of reference based on their position in the field (Fligstein and McAdam, 2012; Snow and Benford, 1988).

The applications of SAF theory to sustainability transitions has primarily focused on societal-level systems (Moulton and Sandfort, 2017) and the ways incumbent energy companies resist challengers, how challengers begin to mobilize, and the importance of state facilitation (Kungl, 2015; Mey and Diesendorf, 2018; Wassermann et al., 2015). However, recent research applies this approach to the operational level and focuses on dynamics within and between SAFs. This research uses SAF theory to break down a monolithic view of the regime, highlight how actors form new interpretations, and understand conditions for 'field-disruptive agency' where rules of the regime are renegotiated and novel logics emerge (Heiskanen et al., 2018, p. 67; Moulton and Sandfort, 2017; Schmid et al., 2017).

Drawing on these theoretical distinctions, we use SAF theory to examine the actions of consumer-owned utilities. This approach provides three conceptual insights that align with our research interest. First, the view of *identity and cooperation* as a primary motivation for collective action is helpful because we are studying pubic and cooperative organizational forms that are founded on shared values and an identity based on meeting common needs through collective action (American Public Power Association, n.d.; International Cooperative Alliance, n.d.). Second, the concept of *social skills* as the primary mechanism for collective action draws attention to strategic actions and emphasizes how the diversity of these actions contributes to piecemeal change through friction between social structures and ongoing negotiation of different interpretive frames (Beckert, 2010; Fligstein and McAdam, 2012, 2011). Among the many types of social skills, such as leveraging formal authority, boundary spanning, taking opportunities, or negotiating agreements, framing is fundamental to collective action (Fligstein and McAdam, 2012, 2011). The focus on strategic action is helpful because we are interested in understanding what consumer-owned utilities actually do to either integrate or resist DERs. The concept of social skills provides a systematic way to understand observed variations in strategic actions, institutional relationships, and technological configurations, and allows us to examine processes as they unfold to inform policy and practice. Third, SAF theory explains inter-field dynamics through vertical and horizontal linkages with other fields and *nested field relationships* (Fligstein and McAdam, 2012). This allows us to explore how existing institutional relationships between distribution utilities and other system actors contribute to constraints and opportunities within the field. In the U.S., munis and co-ops have formed multi-level federated systems between distribution utilities and generation and transmission service providers. These nested institutional relationships allow munis and co-ops to negotiate local autonomy and community identity while pursuing economies of scale from collective decision-making and investment (see also Taylor, 2015). This conceptualization of organizational agency leads to our second research question:

> *RQ2: What strategic actions contribute to the variations we observe in technology configurations and institutional relationships?*

3. Methods

Munis are public organizations owned and operated by local governments, as either a municipal department or a governmental authority. Co-ops are member-owned, nonprofit organizations. Unlike IOUs, most munis and co-ops are not subject to state or federal rate regulations. Instead, the local boards of munis and co-ops determine rates. In addition, munis and co-ops are often exempt from many state energy policies or are subject to different standards and implementation requirements than IOUs. For example, in our research site (Minnesota), nearly all munis and co-ops set their own rates, but they are subject to the state's net metering provisions, the mandatory energy efficiency resource standard, and the renewable portfolio standard—all with less stringent requirements than the IOUs (North Carolina Clean Energy Technology Center, n.d.).

In the U.S., most munis and co-ops are primarily distribution utilities that obtain the large majority of generation and transmission services through contractual relationships. Many distribution munis and co-ops engage in joint ownership of generation and transmission infrastructure through municipal marketing authorities (often referred to as "joint action agencies" or JAAs) or generation and transmission co-ops (G&T co-ops). Others obtain these services from federal power marketing administrations, or in some cases, IOUs. Historically, generation and transmission service contracts have included all-requirements provisions that facilitate joint financing of large centralized infrastructure projects but also limit self-generation and restrict procurement from alternative generation providers.

We recognize differences in the organizational challenges and opportunities for munis and co-ops. In particular, most munis serve fewer customers but in a greater density of customers-per-line-mile than co-ops, and often munis have more opportunities to leverage other municipal services, resources, and programs than co-ops. However, in this analysis, we do not focus on juxtaposing the differences between munis and co-ops.

In this study, we examine munis and co-ops in Minnesota, a research site that has a wide variation in muni and co-op utility ownership type, institutional relationships, utility size, consumer/member density, and share of residential consumers. Specifically, our research site encompasses the 124 munis and 47 co-ops that serve Minnesota. The diversity within this context makes this study more generalizable to other sites (see Appendix A for additional detail on the research site).

Data for this study comes from two sources: secondary descriptive data on utility generation sources and sales and interviews with consumer-owned utility managers and other related industry actors. We conducted 45 semi-structured interviews with 55 respondents between May 2016 and March 2018. Our interview participants represent the diversity of utility types, including 21 municipal utilities, three JAAs, 17 electric distribution cooperatives, three G&T co-ops, and two other industry actors. The interviews averaged 63 minutes and were recorded and professionally transcribed. Our semi-structured interview protocol asked practitioners about how they define DERs, how they frame the opportunities and challenges associated with DER, and how the drivers of change affected their organization (see Appendix B). This method is particularly useful in accommodating the widely varying experiences of respondents (Lindlof and Taylor, 2011; Tracy, 2013).

Data analysis for the interviews used an iterative coding process (Saldaña, 2009). We began with open coding guided by our research interest in DER technology implementation decisions and the social skills used to engage others in collective action. Subsequent cycles of coding resulted in 16 categories that support the themes of shared principles, dichotomies in interpretive frames, and implementation strategies (see row 1 and columns 1 and 2 of Table 2). During secondary coding, co-authors talked through differences until we reached agreement on how to categorize and thematize the codes. Based on our coding results, we developed a typology that highlights the relationships among first-order constructs that contribute to variations in strategic actions and technology configurations. Each ideal-type represents a unique combination of these constructs. Actual utility actions may be more or less similar to an identified strategy, but they are not assigned to a type (Doty and Glick, 1994). To strengthen the analysis, member validation testing was performed to see how muni and co-op managers and industry stakeholders responded to the research findings (Tracy, 2013). We conducted two listening sessions, a discussion session with organizations that provide technical assistance to munis and co-ops, and a community dialogue with muni and co-op decision-makers.

4. Findings

Our findings are presented in two parts that correspond to our two research questions. First, we identify a set of shared principles and highlight inherent tensions in how munis and co-ops interpret how to apply these principles as they respond to DERs. Next, we develop a typology explaining how munis and co-ops use distinct strategic actions as they make choices about different DER technology configurations and scales.

4.1 Tensions within the Shared Principles that Structure the Field

The munis and co-ops in our data described four shared principles that shape the implementation of DERs: concern for serving consumers/members; local authority for community benefit; self-regulation and service provision; and building capacity through nested institutional relationships. These shared principles are rooted in formally articulated priorities and principles advanced by the national organizations representing munis and co-ops in the U.S. (APPA, n.d.; NRECA, 2016). Table 1 shows the connection between the principals highlighted by our respondents in relation to the management of DERs the formal priorities and principles.

Table 1. Connections between shared principles that structure the field of municipal and cooperative utility implementation of distributed energy resources with formally articulated American Public Power Association (APPA) priorities and National Rural Electric Cooperative Association (NRECA) cooperative principles*

Shared Principles that Structure the Field	**Related APPA Priority** (quoted from APPA, n.d.)	**Related NRECA Cooperative Principle** (quoted from NRECA, 2016)
Concern for Serving Consumers / Members	**Giving back**: When customers are the utility's shareholders, serving the community is the utility's top priority.	**Concern for community**: Cooperatives work for the sustainable development of their communities through policies supported by the membership.
Local Authority for Community Benefit	**Local governance and regulation:** Community citizens have a direct voice in utility decisions and policymaking. **Affordable**: Public power utilities are not-for-profit entities that provide electricity to customers at the lowest rates.	**Members' economic participation**: Members contribute equitably to, and democratically control, the capital of their cooperative. **Democratic member control**: Cooperatives are democratic organizations controlled by their members, who actively participate in setting policies and making decisions.
Self-Regulation and Service Provision	**Local governance and regulation:** Public power utilities are owned by the community and run as a division of local government. These utilities are governed by a local city council or an elected or appointed board.	**Autonomy and independence**: Cooperatives are autonomous, self-help organizations controlled by their members.
Building Capacity through Nested Institutional Relationships	**History of public power:** In the 1950s, public power utilities within the same state or region moved toward joint ownership of power supply resources. The joint action movement has contributed to the continued success of public power.	**Cooperation among cooperatives**: By working together through local, national, regional, and international structures, cooperatives improve services, bolster local economies, and deal more effectively with social and community needs.
* Not all of the formal priorities/principles are represented, as interview respondents did not highlight some of the formal priorities/principles as relevant to the management of distributed energy resources.		

Next, we describe the dichotomous interpretations of each principle in response to DERs (columns 1 and 2 of Table 2).

Table 2. Dichotomies in Interpretations of Shared Principles and Emerging Implementation Strategies

Shared Principles that Structure the Field	Dichotomies in Interpretation*	Implementation Strategies			
		Monitoring and Planning	Reinforcing Institutional Relationships	Redefining the Distribution Utility	Community Engagement and Learning
Concern for Serving Consumers / Members	Accepting of limits to individual agency for community benefits	X	X	X	
	Responsive to individual agency				X
Local Authority for Community Benefit	Precautionary approach to protect overall affordability and reliability	X	X	X	
	Active in seeking stakeholder platforms and opportunities for creating overall value				X
Self-Regulation and Service Provision	Committed to current regulatory roles		X		
	Active in providing new energy services and enabling new business models			X	X
Building Capacity through Nested Institutional Relationships	Utilizing, adapting, and strengthening existing relationships		X		
	Active in reshaping external relationships to allow greater flexibility			X	X

*While these pairs of dichotomous interpretations may suggest that the inclusion of some principles does not add additional explanatory power, the principles each emerged in our data as important descriptive factors in understanding strategic action.

Concern for Serving Consumers/Members. The relationships between consumer-owned utilities and their consumers/members are based on a shared understanding of serving their community. Municipal utilities prioritize the idea of "giving back," (APPA, n.d.). In many municipalities, affordable electricity supports economic development and, in some municipalities, surplus utility revenue is used to fund general government purposes. Similarly, co-ops follow a principle of "concern for community" (NRECA, 2016) and invest surplus revenue back in the co-op or distributed it to members.

In our interviews, we found different interpretations of how to express concern for community when deciding how to respond to DERs. Some munis and co-ops are *accepting of limits to individual agency for community benefits*. A co-op highlighted the importance of community and articulated a common consumer-owned utility objection to DG: "Are we focused on doing something in the marketplace that has positive synergy for everyone, or are we focused on our own individual payback?" (Respondent 410). In contrast, several respondents discussed their obligation to be *responsive to individual agency*. For example: "Public power utilities were created to try to benefit the community…If all of a sudden, it's in somebody's best interest to put PV on their roof or something like that, who are we to try to stand in the way of that?" (Respondent 102).

In some contexts, utilities invoke their concern for serving consumers/members in choosing to resist or not actively promote customer-sited generation. Yet, others invoke the same principle, interpreted differently, in selecting other technology configurations, such as community-shared solar to serve individuals interested in clean energy.

Local Authority for Community Benefit. The roles and responsibilities of consumer-owned utilities are shaped by rules that establish independent rate regulation and local authority. Munis and co-ops are governed directly or indirectly by elected officials. In principle, "community citizens have a direct voice in [municipal] utility decisions and policymaking" and "cooperatives are democratic organizations controlled by their members, who actively participate in setting policies and making decisions" (APPA, n.d.; NRECA, 2016).

We found that some munis and co-ops frequently took a *precautionary approach to protect overall affordability and reliability*. Utilities taking this approach often seek to maintain the status quo of existing rate structures and generation sources. For example, a muni explained:

> "Not too many of my consumers are walking in the door at this point and saying, 'Would you please do more solar?' They're not. What customer's going walk in and say, 'Please double my bill'" (Respondent 301).

This utility's interpretation of its obligations highlights how local authority is derived from the community and how local democratic control can constrain the implementation of DERs in communities that are primarily focused on affordable and reliable power.

However, other utilities in our data set emphasize how their local authority provides an ability to be innovative in adopting new technologies, planning for the future, redistributing costs and benefits, or experimenting with new program designs. These utilities frequently *seek stakeholder platforms and opportunities for creating overall community value.* For example, a co-op explained that because it has local authority, "we can be very nimble and act when we see something good to do, we can just go and do it. That's why we've led in all this [advanced metering infrastructure and DG]," (Respondent 402).

DERs create new challenges and opportunities for munis and co-ops as they balance potential financial, reliability, and inequity risks with opportunities to proactively engage with stakeholders to create value for the community.

Self-Regulation and Service Provision. Consumer-owned utilities are both local rate-regulators and distribution services providers. This dual role is an important distinction from an IOU business model in which a state PUC functions as the regulator with responsibilities to the public and the utility functions as the electric service provider with responsibilities to shareholders. Because munis and co-ops assume both rate-regulation and service-provision roles, they have responsibility to the procedural and distributional fairness of their regulatory processes and the consumers/members that they serve. Consumers/members provide necessary capital through their participation, and rather than allocating voting rights by share of investment, each local citizen or co-op member has an equal vote regardless of how much electricity they consume (APPA, n.d.; NRECA, 2016).

Our data highlights a tension between these two roles. Many munis and co-ops reflect a commitment to *current regulatory roles* and actively work to protect consumers/members. For example, in discussing interactions with consumers/members and customer-sited solar vendors, a co-op stated, "I try to be a consumer advocate in that case," (Respondent 410). Similarly, many munis and co-ops express strong views about their regulatory commitment to distributional fairness. As one distribution utility stated, "We have an obligation to minimize cost shifting between our members…I'm not maximizing shareholder value, the point is to limit cost redistribution among the membership" (Field Note, 4/7/2018).

In contrast, in other contexts munis and co-ops are *active in providing new energy services and enabling new business models.* These utilities are seeking to provide a wide range of DER services and modes of delivery to satisfy different consumer/member interests. A co-op highlighted their customer service focus by stating: "We're member-owned so unless members can understand it, feel good about it, connect with it, it's not enough to do it…" (Respondent 406).

Thus, munis and co-ops are concerned from a local-regulator perspective with fairness across their communities and are concerned from a service-provider perspective with responding to new business opportunities.

Building Capacity Through Nested Institutional Relationships. As relatively small utilities, munis and co-ops often face organizational resource and capacity constraints and rely on inter-organizational collaboration to achieve locally determined priorities while also benefiting from economies of scale and sharing of resources. Rather than the traditional vertical business model of an IOU, munis and co-ops have federated structures supported by the principles of "joint action" and "cooperation among cooperatives" (APPA, n.d.; NRECA, 2016).

Most munis and co-ops primarily distribute retail electricity and obtain power and other services through JAAs, G&T co-ops, federal power marketing administrations, or IOUs. These arrangements allow small distribution utilities to rely on energy services providers for access to centralized generation (including utility-scale renewables), information and management platforms, joint power marketing, transmission, and other services. The governance of these organizations is linked, with board members of distribution utilities also serving as board members of JAAs and G&T co-ops, co-ownership of assets, and complex contract structures that span multiple decades.

Most of our interview respondents discussed how they are reconsidering their institutional relationships and contracts as they make decisions about DERs. However, they are taking different actions. Many munis and co-ops are *utilizing, adapting, and strengthening existing relationships* with energy services providers, government agencies, and other distribution utilities. The continued importance and interdependence of these relationships was reflected by many munis and co-ops and is illustrated by the following statement about the relationship between a distribution co-op and a G&T co-op, "We don't want to back away from our partner. We own them. We need them, at least for now," (Respondent 402).

In contrast, other munis and co-ops are *active in reshaping external relationships to allow greater flexibility.* These munis and co-ops are negotiating more flexibility in their generation contracts so they can self-supply with DG or obtain generation from other power providers. The following quote exemplifies this perspective:

> "We need to think about doing business a little bit differently as well. Maybe not having such a long-term contract in place, maybe having a little bit more flexibility to adapt to the community's demands or the community's vision of where they think their utility provider should be." (Respondent 320)

This statement and others illustrate that in some contexts, distribution utilities are engaging in new ways of obtaining generation and new business models.

The deployment of DERs can disrupt nested institutional relationships. Some munis and co-ops are reinforcing institutional relationships and allowing DER implementation decisions to be driven by traditional energy services providers (i.e., JAAs and G&T co-ops). In contrast, others are expanding their responsibilities to include generation and exploring new relationships with other utilities, residents, and businesses.

4.2 DER Implementation Strategies

This section introduces a typology that builds on the principles and tensions identified in Section 4.1 to understand the diversity of DER implementation strategies across consumer-owned utilities (Table 2). While munis and co-ops operate under a set of shared principles, their decision-making is shaped by how they interpret how to apply these principles in practice. We see different combinations of interpretations as shaping four strategies across differently situated consumer-owned utilities:

1) Monitoring and Planning,
2) Reinforcing Traditional Relationships,
3) Redefining the Distribution Utility, or
4) Community Engagement and Learning.

Utilities adopt different strategic actions at different times and may simultaneously pursue different strategies with different DERs.

Monitoring and Planning. Many munis and some co-ops engage in a strategy of monitoring industry-level changes, planning for DER integration, and making strategic infrastructure investments with constrained resources. In negotiating competing interests, utilities using this strategy accept limits to individual agency for community benefits and take a precautionary approach to protect overall affordability and reliability. This strategy frames DERs, and in particular DG, as a potential problem that will require additional resources, and also has the potential to create benefits for the wealthy at the expense of others in the community.

Among munis and co-ops taking these actions, many prioritize other system investments like automated billing systems, advanced metering infrastructure, distribution system upgrades, or outage management systems over DER deployment (Respondents 301, 306, 307, 311, 318, 321). These utilities highlight the challenges and uncertainties that DERs create for their business models and infrastructure. For example, a small muni described their approach to DERs by stating: "As far as innovation, we purposely stay off of the bleeding edge" (Respondent 306).

Munis and co-ops that focus on a monitoring and planning strategy are reacting to uncertainties and risks, investing in more traditional infrastructure, often lack the capacity for practice innovation, and are not experiencing significant pressure from consumers/members for change or new offerings.

Reinforcing Institutional Relationships. A different strategy is used when munis and co-ops rely heavily on institutional relationships to confront change. Like the monitoring and planning strategy, this strategy is accepting of limits to individual agency and takes a precautionary approach. However, utilities that engage this strategy also take actions to reinforce their regulatory roles and adapt and strengthen existing relationships. In contrast to utilities that take a monitoring and planning strategy, these utilities are often experiencing business or community pressure for change.

This strategy involves frames about fairness, acting as a consumer advocate, and maintaining existing relationships (Respondents 309, 404, 410, 411, 412, 415, 416). In discussing their concern for serving consumers/members, many of these utilities stress the need to implement DERs in a manner that is "fair for all concerned" (Respondent 412). They question the legitimacy of seeking an individual payback for rooftops solar investment and are less focused on potential lost revenue than on the potential for net metering to shift costs to other consumers/members. Some have imposed or are considering grid access charges or other fees (Respondent 404, 415).

In addition, munis and co-ops using this strategy discuss their obligation as local regulators to protect consumers/members and control service provision within their jurisdiction. They take actions to protect safety, reliability, and affordability impacts, or are specifically concerned that third-party installers without ties to the community may lack the necessary incentive or local understanding to properly inform the consumer/member about costs and risks of DERs (Respondent 309, 410, 411, 412, 415, 416).

Finally, munis and co-ops using this strategy see important benefits from adapting existing institutional relationships to incorporate new technologies and business model opportunities. The utilities in this context describe their existing relationships in positive terms, explaining that, "I'm happy with that arrangement…they are very innovative" (Respondent 309), and "the relationship is going well and they're forward thinking" (Respondent 410). Furthermore, they often describe the anticipated energy transition to low-carbon resources as "a glide path" (Respondent 412) and "an evolution" (Respondent 404).

Munis and co-ops taking these strategic actions envision their institutional relationships remaining largely intact in the future. They more readily accept the limitations of power supply contracts and are responding to pressure for change in ways that protect the existing distribution of benefits and costs. In particular, this strategy involves fees, policies, and local ordinances intended to limit impacts of DERs on non-participants and encourage compliance with aesthetic and safety requirements.

Redefining the Distribution Utility. A third strategy involves actions to proactively develop new initiatives and take more control, redefining the distribution utility role. Similar to other strategies, this strategy is accepting of limits to individual agency and takes a precautionary approach. But, the utilities using this strategy actively provide new energy services, enable new business models, and reshape external relationships (Respondents 320, 401, 406, 409, 414).

Munis and co-ops using this strategy generally seek to fully allocate program costs to participants and limit redistribution of costs and benefits. However, many utilities using this approach have members that are interested in a 'cleaner grid' and utilities are implementing infrastructure improvements and diverse programs to meet the desires of different sub-groups. Rather than focusing on their role in protecting consumers/members, these munis and co-ops focus on building relationships with third party developers to expand services and share risk (Respondents 406). Finally, these munis and co-ops are negotiating flexibility in their energy services contracts to pursue a range of DG offerings, that in some cases compete with customer-sited solar (Respondents 320, 401, 406, 409, 411, 414). For example, a co-op described how they view their responsibility to their members:

> "We really see ourselves as looking at what our members want. That's why we have the community solar array out there. We did some surveying. We saw that there was a level of interest." (Respondent 409)

This statement highlights a decision to proactively learn about and respond to member interests and also references the view that owning and managing generation is an appropriate role for a distribution utility. This utility chose to deploy distribution level technology rather than creating a program with their G&T co-op. Other munis and co-ops describe their actions as proactive, responsive, and flexible. These utilities state that, "We want to be the provider of energy services of the future," and we have an interest in working to "develop things that we think make sense, and then offer them," (Respondents 401, 414).

The munis and co-ops that use this strategy have sufficient capacity to develop a range of DER products (e.g., community shared solar with different rate structures, green pricing, customer-sited DG incentives) and have enough interest from their consumers/members to establish reimbursement schemes so that those who are participating are paying the full costs of the programs. These utilities often have been able to negotiate additional flexibility within their energy services contracts to provide community ownership of generation while still retaining many benefits of nested institutional relationships.

Community Engagement and Learning. A fourth strategy is centered on actively engaging and empowering community member decisions in how energy will be supplied and used. In negotiating competing interests, these utilities are responsive to individual agency and are actively seeking stakeholder platforms and opportunities for creating overall value, providing new energy services, enabling new business models, and reshaping external relationships.

This strategy frames DERs as an opportunity to advance broad community goals for clean energy, economic development, or civic engagement. Some munis and co-ops view DERs as a way to redistribute benefits and costs of energy across their community (Respondents 312, 313, 314, 315, 402, 403, 408). Among these utilities, many describe how individuals, civil society stakeholders, or local political actors have a commitment to clean energy and are facilitating DER deployment. Others discuss the importance of attracting businesses or clean energy jobs, while some explain they have restructured to empower consumers/members that are motivated primarily by the tax benefits associated with distributed solar (Respondents 313, 314, 403, 408). These munis and co-ops talk about an active role for community engagement. For example, a small muni explained, "Our biggest opportunities have to do with the amount of people that are really committed and active in this place" (Respondent 314). This comment reflects relatively direct political drivers shaping consumer-owned utility decision-making.

Another utility developed a unique solar rebate design to create benefits across the community. By requiring customer-sited solar to be sized to match energy use, the rebate creates benefits for members, while reducing concerns about back feeding onto transmission lines. This rebate highlights innovation in program design. A different utility is engaging in joint solar demonstration projects with public entities, while others are building relationships with third party trade allies and providing utility sponsored solar education (Respondents 314, 315, 403). These examples highlight strategic action based on a broad view of community interest and the opening of processes to joint practice innovation and learning. Importantly, these munis and co-ops are reconsidering the convention that community solar participants pay the full cost of the investment and are exploring aligning DG reimbursement schemes to create community value, rather than relying on subscription mechanisms that divide winners and losers (Respondent 314, 403, 408). This different framing of DER benefits and costs highlights and challenges the dominant ideal that the existing distribution of benefits and burdens is fair.

This strategy positions some munis and co-ops as leaders in social and economic practices (e.g. experimenting with financing models, rate structures, economic development strategies, and communication approaches). Utilities engaged in these strategic actions are reshaping their institutional relationships in diverse ways and redefining the benefits associated with community-scale DER deployment. Some have terminated or sought changes to the contracts they hold with energy services providers, while others are working to reshape the practices and goals of joint-ownership to include DER options. Still others have promoted a particular technology configuration for the benefit of local economics (e.g., customer-sited DG) to the exclusion of other technology configurations (e.g., community solar).

5. Discussion

This analysis of consumer-owned utility integration of DERs encompasses three aspects: identification of the shared public power and cooperative principles (i.e., rules, norms, and beliefs that structure the field); description of the tensions in interpreting how to apply these highly institutionalized principles in settings with new technologies and new actors; and development of a typology of that highlights how different interpretations contribute to variations in strategic actions and technology configurations.

First, DERs creates uncertainties in how to interpret public power and cooperative principles. Until recently, a majority of consumer-owned utilities guided by these principles chose to pursue similar strategies and technology configurations, namely co-investment in large, centralized generation. However, the emergence of affordable DERs and rising concerns about climate change have complicated the choices for munis and co-ops. Actors that traditionally had aligned interests, shared principles, and collective identities motivating the collective action crucial for serving rural areas and small communities, now have increasingly varied desires for reducing energy costs and emissions.

Second, within this context, munis and co-ops interpret shared principles in different ways. We see this across:

- The informal norms about how munis and co-ops view relationships with individuals (i.e., consumers/members);
- Their latitude to act at the community level within formal rules and formal public participation structures;
- The conflicts inherent in their institutional purpose of self-regulation; and
- Decisions about whether and how to enter into agreements and form external cooperative relationships.

Third, munis and co-ops use different social skills to engage others and reify orientations to particular technology configurations. These strategic actions vary based on the utility's interpretations of principles and their political and economic power relative to the local community and other institutional actors Specifically, we identified four strategies that reflect unique combinations of interpretations and actions: 1) monitoring and planning, 2) reinforcing institutional relationships, 3) redefining the distribution utility, and 4) community engagement and learning.

Strategies that limit individual agency often include a precautionary approach to protecting affordability and reliability. For example, most consumer-owned utilities in our study view limitations on customer-sited DG as necessary to maintain the existing distribution of benefits and burdens (i.e., to avoid perceived cross subsidization) and ultimately to protect affordable and reliable electricity. Conversely, strategies more responsive to individual agency tend to seek overall community value. For example, we see a small number of utility actions to pursue community engagement and learning strategies as a way of exploring how individual agency could promote collective benefits (rows 1-4 on Table 2).

Furthermore, how utilities implement their dual institutional purpose of self-regulation and service provision is aligned with how they engage in institutional relationships. For example, utilities that are reinforcing their current roles often are also strengthening existing institutional relationships; whereas, utilities that are actively enabling innovation are also reshaping external relationships (rows 5-8 on Table 2).

Across consumer-owned utilities, these divergent strategies shape technology configurations with differences in the scales at which physical infrastructure is deployed, political actors exert authority, and economic benefits are derived. Economies of scale create pressure to pursue utility-scale generation at the service provider level (i.e., JAA or G&T co-op). The strategy of monitoring and planning and the strategy of reinforcing institutional relationships passively or actively support technologies at this larger scale. These two strategies also shift economic and political power further from the community, to a scale that involves actors across multiple communities in the negotiation of sustainability, affordability, reliability, and fairness.

In contrast, a strategy of redefining the distribution utility role most readily supports community-scale projects (e.g., community-shared solar), often in ways intended to limit projects at the consumer scale (e.g. rooftop solar PV). This set of strategic actions shifts economic and political power toward the community. Finally, the utility strategy of community engagement and learning is related to the most diverse technology configurations. This set of strategic actions focuses on shifting political and economic power to the community and is supportive of many technology configurations shaped by community context.

Because interpretations of what is legitimate and possible are shaped by and competing to motivate collective action, change is occurring piecemeal with different strategies leading to distinct technology configurations, institutional relationships, and distributions of political and economic power.

6. Conclusion

When new technologies like DERs emerge, collective actors, such as the munis and co-ops we study, interpret and respond based on their own perspectives and circumstances. They renegotiate the semi-coherent structures of the regime, with novel shared meanings and collective action strategies potentially emerging. Munis and co-ops continuously work to balance tensions across the rules, norms, and principles that shape and are shaped by their actions. This research highlights the ongoing and emergent nature of collective action and provides insight into the observed variations in technology configurations deployed by munis and co-ops. These actors are situated within federated systems of shared services, shared obligations, and the negotiation of fairness within and across different scales and timeframes. By examining how decisions are unfolding in practice, this study demonstrates how collective actors that depend on interorganizational relationships and cooperation scale-up innovations in different ways than other business models.

This paper contributes to sustainability transitions literature by extending an organizational field approach to the context consumer-owned utilities in the United States. Additionally, by introducing the concept of social skills from SAF theory, this study shows how agency can be linked to particular strategic actions and can contribute to an understanding of uncertainty, shifting relationships, and variations in responses within a field. This provides an alternative perspective to agency and draws attention to the importance of identity and cooperation within certain local contexts.

This study informs policy design and technology implementation practices by highlighting the potential and limits of local, democratic energy transformation. While many consumer-owned utilities are exploring new DER technologies, practices, and relationships, others are not. Whether it is because they lack community or organizational support for change, the ability to form strong institutional relationships, or capacity to take on new investments or risks, they are not actively pursuing the full range of DERs. This suggests that local technology ownership may not be sufficient to motivate change in some contexts. Policy or transition support tailored to local contexts and addressing political processes, ownership scale, terms of financing, and interorganizational collaborations may be needed to accelerate more sustainable and just energy transitions.

Munis and co-ops are critical electricity-system actors that require different pathways for transformation. This study raises important future research questions about how sustainability transitions occur in these socio-technical systems. While the diversity of local contexts within our research site makes this study more generalizable to other locations, this study also provides a basis for further research in other contexts and incorporating other actors. Additional explorations that could provide important insights include research in other regulatory contexts, comparing and contrasting muni and co-op transition processes, and practice innovations as they relate to scale, interorganizational collaboration, and cross-scale interdependencies. Finally, the study reveals the importance of several structures that warrant further research to deepen and empirically ground the energy democracy literature, specifically research on consumer-owned utility participatory governance, interactions with organized competitive electricity markets, the formal and informal obligations between distribution and generation and transmission utilities, and newly forming federated relationships.

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Appendix A. Research Site

Our research site encompasses the 124 munis and 47 co-ops in Minnesota (Figure A1). Minnesota is mostly rural, with a single large metro area. Munis and co-ops serve more than 85% of the geographic area (Minnesota Rural Electric Cooperative Association, n.d.) and distribute 39% of retail electricity sales (14% and 25%, respectively)(Figure A2). In Minnesota, there are six JAAs and six G&T co-ops (Bull, 2002).

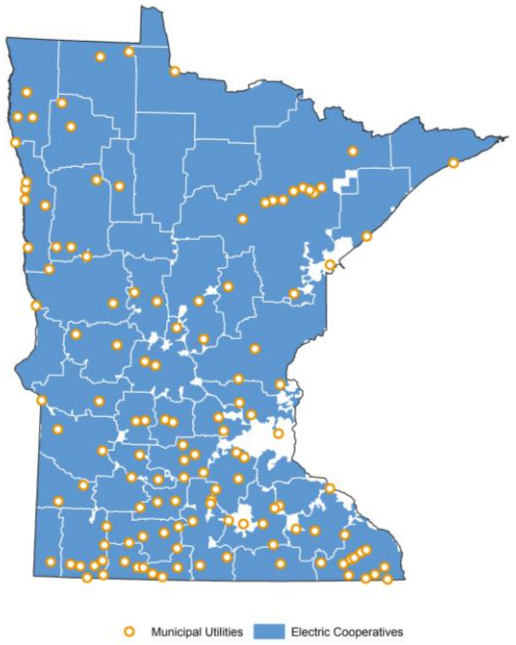

Figure A1. Minnesota Municipal and Cooperative Utility Service Area. In Minnesota, there are 124 municipal utilities (orange points) and 47 cooperative utilities (blue service areas). Minnesota's three investor-owned utilities serve the remaining area (unshaded). This area may also be unshaded because of lakes or other natural boundaries. (Data complied from Minnesota Geospatial Commons, 2015).

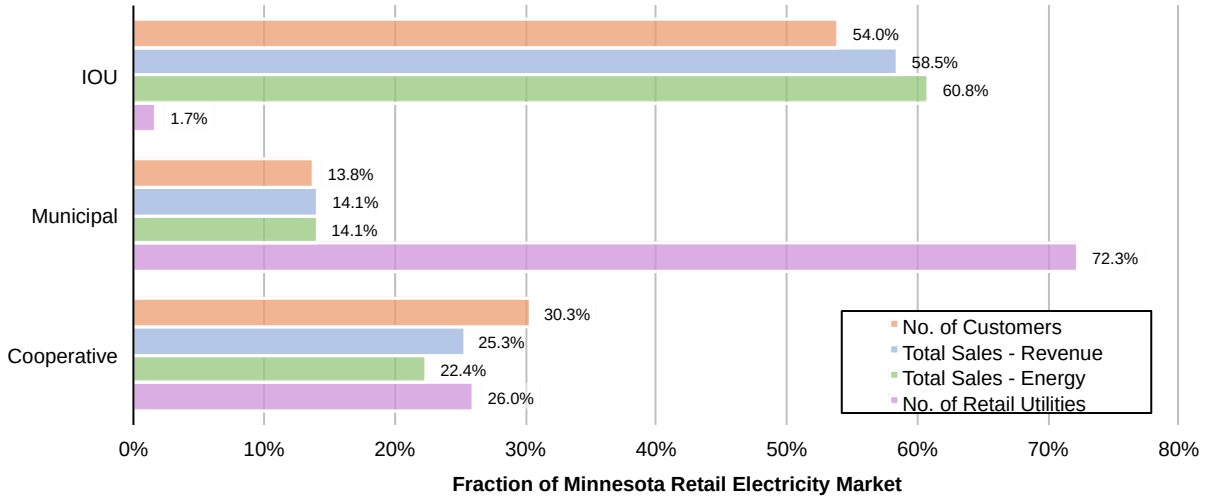

Figure A2. Minnesota's Electric Utility Landscape. Share of total customers/members served, revenue, energy sales, and number of retail utilities. Data excludes one cooperative that did not report for Minnesota. (Data compiled from the U.S. Energy Information Administration's forms EIA-861 and EIA-861S and the Minnesota Legislative Energy Commission, 2016).

From 2013-2017, while sector averages for Minnesota's munis and co-ops show decreasing retail sales of energy and increasing revenue, these trends do not hold for all munis and co-ops. Changes to energy sales, revenue, number of customers, and peak demand help explain why munis and co-ops have different levels of internal capacity (e.g. staffing levels and ability to finance projects) (see Chan et al., 2019).

In Minnesota, munis and co-ops have deployed a range of DERs over decades. These utilities have a history of load management dating back to the 1940s (Grimley, 2019), they often coordinate with their energy services providers to meet the state energy efficiency mandate, and over the past decade many have expanded distributed solar and wind generation.

In the analysis of DG, we focus on the relatively recent deployment of distributed wind and solar because this is the most prominent theme in respondent comments. Cumulative installed wind and solar in Minnesota distribution munis and co-ops was more than 25 MW in 2017 (Figure A3). These DERs are being deployed through diverse technology configurations. For example, more than 10 MW of solar is deployed by residential customers/members, representing the largest share of solar installed capacity in munis and co-ops (Figure A4). However, community-shared solar is a prominent technology in Minnesota with programs available through 19 co-ops and 14 munis, and several more are in planning stages (Figures A5).[4]

[4] Community-shared solar is a prominent technology configuration for munis and co-ops nationally (see National Rural Electric Cooperative Association [NRECA], 2018.).

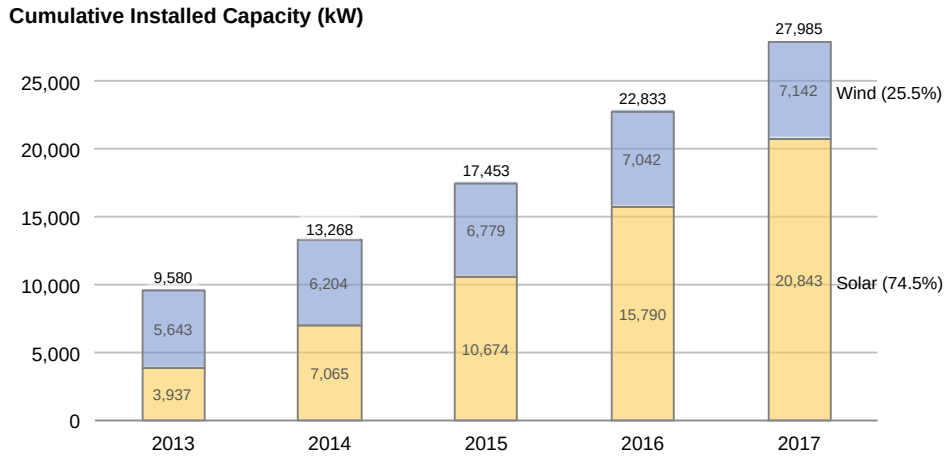

Figure A3. Cumulative Installed Wind and Solar in Minnesota Distribution Munis and Co-ops. Not inclusive of generation deployed by joint action agencies or generation and transmission cooperatives. (Data complied form the Minnesota Public Utilities Commission, 2018).

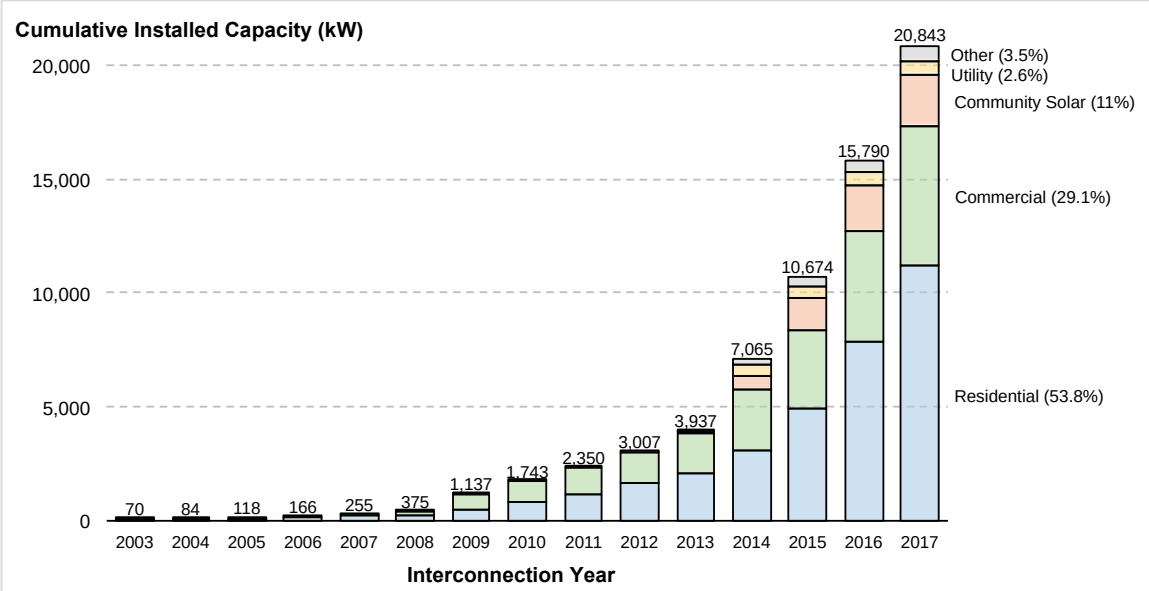

Figure A4. Cumulative Installed Solar by Ownership/Customer Type in Minnesota Distribution Munis and Co-ops. Not inclusive of solar deployed by joint action agencies and generation and transmission cooperatives). (Data complied from the Minnesota Public Utilities Commission, 2018).

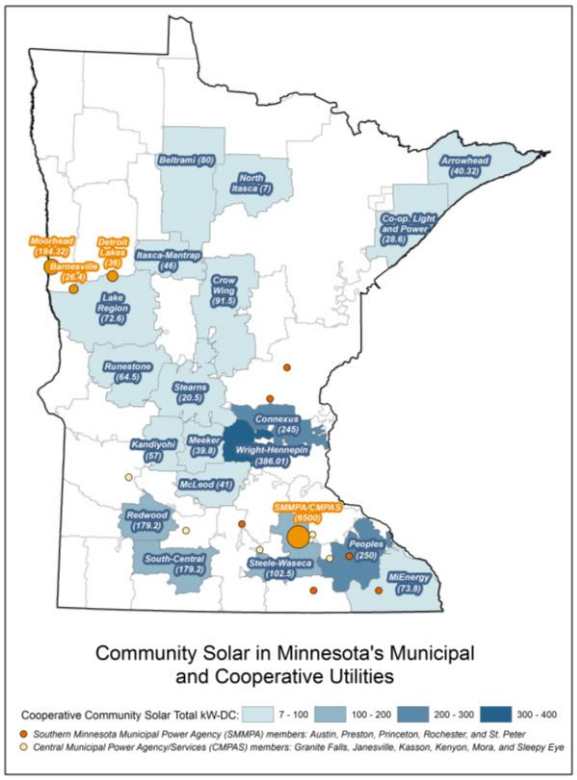

Figure A5. Location of Community Shared Solar in Munis and Co-ops. Utilities offering community shared solar subscriptions are named with total capacity available for subscription (in kilowatt-DC). (Data complied from Minnesota Public Utilities commission dockets, utility websites, FERC Form 556 filings, and the Minnesota Geospatial Commons, 2015).

Not shown in these figures is the breakdown across distribution utilities, the relative breakdown of munis and co-ops within these totals, or the installed DG through relationships with JAAs and G&T co-ops. At the distribution level, co-ops have installed more wind and solar than munis, accounting for 83% of wind and 95% of solar capacity. This is largely driven by residential and commercial installations. In contrast, at the community-scale (including projects formed through relationships with JAAs and G&T co-ops), munis account for 79% of installed community-shared solar. Finally, the distribution of installed wind and solar generation is highly uneven across munis and co-ops. Only 48% of distribution munis or co-ops report having customer-sited wind or solar generation on their systems or access to community-shared solar (compiled from Chan et al., 2019; Minnesota Public Utilities Commission, 2018).

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Appendix B. Interview Protocol

Research Questions

1. What do utilities consider to be 'DER'?
2. What are opportunities and barriers are perceived by rural utilities? Which of these are most important?
3. How are decisions made regarding DER technology/program deployment, and/or why did a particular outcome arise in a particular utility?

Opening Script: Thank you for meeting with me today. I am a Graduate Researcher at the Humphrey School the University of Minnesota, and have been working with Prof. Gabe Chan and an interdisciplinary team studying energy policy, technology deployment, business models and rural economic development. The primary goal of our research is to investigate the unique opportunities and challenges utilities like yours face in deploying distributed energy resources (DER). We are speaking with a wide range of consumer owned utilities and stakeholders across the state. The insights we gain will be synthesized into materials that we plan to share broadly with all stakeholders wanting to gain a better understanding of the unique circumstances facing Munis and Coops.

Our questions are really a conversational guide to help us understand your experience with distributed energy resources.

If it's still ok with you, I would like to turn the recorder on now.

Interview Structure

Section Goal: Gain Background Information, General DER Information

1. Could you briefly describe your experience at UTILITY / involvement with UTILITY?
    a. How long have you been working with _____?

As I mentioned, our goal is to understand how your utility considers, plans for, and interacts with distributed energy resources.

2. How do you define distributed energy resources?
    a. Are there any other new technologies or programs that your utility has recently deployed or is considering?

3. What has your experience been with these distributed energy technologies or programs?
    a. It sounds like you've had a [*positive experience]*; can you tell me more about what works well in the process? Is there anything that you would change?
    b. It sounds like you've had a [*negative experience]*; what were some of the challenges or what would you change in the process?
    c. It sounds like distributed energy resource are not a significant issue for your utility, why do you think that is?

4. Who, within your utility and in the stakeholder community, was involved in the decision making process?
    a. Who took the lead in initiating the project [or opposing the project]?

5. What was the role of your Board in this process?
    a. How do people enter into these or other leadership positions?

6. Have new distributed energy resources [or, NAME SPECIFIC TECHNOLOGIES OR PROGRAMS USED] affected your relationship with your [G&T or JAA/dependent utilities]?
    a. How would you describe the [G&T or JAA/dependent utilities] influence in decisionmaking?
    b. What are some common disagreements?

7. How has being a Muni or Coop influenced your ability to pursue innovations?
    a. Could you tell me about where you learned about these technologies or programs?
    b. What were the major hurdles you faced in this project? How did you attempt to overcome them?

Section Goal: Prompt a Discussion of Benefits, Challenges Related to DER Based on Open-Ended Questions. Anticipate at Least Some of the Following Challenges: Rate Impact/Cross-Subsidization, Financing/Costs, Contractual Limitations, "Lack of Membership Interest", and Will Follow-Up Based on Issues Raised

8. What do you see as the key opportunities that distributed energy resources provide, or could provide to your utility operations?
    a. Are there particular technologies or programs that present greater opportunities for your membership than others?
    b. Are there particular technologies or programs that present greater operational opportunities to your system?
    c. What about your system characteristics or utility circumstances lead to the benefits you mention?

9. What challenges has your utility faced in deploying distributed energy technologies or programs?
    a. Are there particular technologies or programs that present a greater challenge to your membership than others?
    b. Are there particular technologies or programs that present a greater operational challenge to your system?
    c. What about your system characteristics or utility circumstances lead to the challenges you mention?

10. Community solar programs have become an option in (some places) Minnesota. What are your perceptions of community solar programs?
    a. How do you think community solar programs compare to other DER resource options?
    b. (If they have a program) Could you share your experience creating a community solar program/project?
    c. (If they have a program) How do community solar programs affect your different customer groups?

Section Goal: Understand the Drivers of Change, Membership Engagement/Information

11. What issues do your members bring to you?
    a. What are the primary concerns of your members?

12. How have the new distributed energy technologies or programs that you have deployed [OR ARE PLANNING] affected your members?
    a. Are members differently affected by these changes?
    b. Are there differences in this respect between DERs and community solar [if they have one]?

Section Goal: Get an Overall Sense of Attitude, Perceptions, Etc. for Changes in the Industry.

13. What do you think your utility will look like in 20 years? Feel free to answer how you'd like it to look, or how it will actually look, or anywhere in between.

14. Are there any state or federal policy changes that you would recommend to open up more opportunities or reduce the challenges you face in integrating DER?

Concluding Questions

15. Is there anything that you think is important that I haven't asked about?

16. If you wanted to communicate one or two pieces of information with the academic or regulatory or legislative world what would that be?

17. Who else should we be speaking with to better understand the benefits and challenges associated with DER?