Renewable and Sustainable Energy Reviews 121 (2020) 109716

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: http://www.elsevier.com/locate/rser

# Energy decentralization in California and New York: Conflicts in the politics of shared solar and community choice

David J. Hess *, Dasom Lee

*Department of Sociology, Vanderbilt University, Nashville, TN, USA*

ARTICLE INFO

*Keywords:*
Shared solar
Community choice
California
New York
Restructuring

ABSTRACT

This study reviews the development of shared (community) solar and community choice aggregation in the U.S. states of California and New York. Both states are leaders in energy-transition policy in the U.S., but they have different trajectories for the two forms of energy decentralization. Shared solar is more advanced in New York, but community choice is more advanced in California. Using a field theory framework, the comparative review of the trajectories of energy decentralization shows how differences in restructuring and regulatory rules affect outcomes. Differences in the rules for retail competition and authority for utilities to own distributed generation assets, plus the role of civil society and the attention from elected officials, shape the intensity of conflict and outcomes. They also contribute to the development of different types of community choice in the two states. In addition to showing how institutional conditions associated with different types of restructured markets shape the opportunities for decentralized energy, the study also examines how the efforts of actors to gain support for and to legitimate their policy preferences involve reference to broad social values.

## 1. Introduction

Throughout the world, electricity systems are undergoing a change from centralized, baseload power to a new regime of decentralized energy generation and demand-management. These changes promise various benefits, among them a reduction of greenhouse-gas emissions and potentially greater system resilience and reliability [1,2]. However, the changes also involve tensions among the actors involved in the transition, and the tensions can involve underlying conflicts over the rules that govern electricity markets and over the values that legitimate policy positions. Thus, a perspective that includes the institutional context—specifically, the relationships between actors in a field and their underlying value orientations toward and definitions of desirable electricity futures—can help to clarify the challenges and opportunities of energy decentralization.

This study contributes to the analysis of the institutional context of energy decentralization at two levels. At an empirical level, the study provides a review of the development of shared solar and community-choice aggregation in two economically important states (California and New York) in the United States (U.S.). Shared solar, also known as community solar and community distributed generation, is the option for customers to purchase shares in or subscriptions to a local solar generation facility and to receive compensation such as a credit on their electricity bills. Developers argue that it can offer an affordable mechanism for the significant market of households and businesses that do not have access to a building that can be used for solar energy [3]. Community choice is the authority granted to a local government to negotiate the purchase of electricity for its constituents and to set the retail price. Advocates of community choice argue that it can provide competitive rates with respect to the utility's standard offer, and it can provide options for higher levels of renewable energy. Empirically, this study addresses the puzzle of why community choice has been more successful in California than in New York, but the opposite is the case for shared solar. Results from the comparison specify facilitating structures of market rules that can be used to guide other studies of energy decentralization in restructured markets.

At a theoretical level, the study brings together field theory and institutional logics theory from sociology to develop an analytical framework for understanding the conflicts and tensions involved in energy decentralization. The paper develops a framework for the study

*Abbreviations:* CCA, Community choice aggregation programs or organizations; ESCO, Energy service (or supply) company; NYSERA, New York State Energy Research and Development Authority; PCIA, Power charge indifference adjustment; U.S, United States.

* Corresponding authorDepartment of Sociology, Vanderbilt University, PMB 351811, Nashville, TN 37235-1811, USA.,
*E-mail addresses:* david.j.hess@vanderbilt.edu (D.J. Hess), Dasom.lee.1@vanderbilt.edu (D. Lee).

https://doi.org/10.1016/j.rser.2020.109716
Received 24 May 2019; Received in revised form 15 October 2019; Accepted 10 January 2020
Available online 21 January 2020

of the institutional dimensions of energy decentralization that focuses attention on conflicts over government rules that guide the structure of pricing and markets associated with energy decentralization. At the same time, the study also suggests an approach to institutional analysis that shows how the policy conflicts are about more than just the self-interested jockeying for position of actors in the political field. Rather, there are also underlying conflicts of values that both legitimate policy positions and orient the action of incumbents and new entrants alike.

## 2. Background and theory

### 2.1. Definitions

There is no single, authoritative definition of energy decentralization. The approach adopted here is to view it as a process of change in existing energy systems, with the focus on electricity. The electricity system is understood as a technological system, which involves the complex interaction of natural resources and the physical environment, the sociotechnical system (the organizations, actors, rules, and practices), and the associated cultural system of cognitive categories and values. Consistent with the literature on transitions in such systems, these systems can be understood to have a stable configuration of elements, or a "regime," that undergoes changes described as a "transition" [4]. Throughout the world, electricity systems are undergoing a change from a regime of centralized, baseload power to systems that can accommodate small-scale energy generation, enable "prosumer" behavior and demand management, and form islands in the event of power outages. These and related changes can provide benefits of system resilience, sustainability, efficiency, affordability, and potentially also local democratic control over energy.

Shared solar involves the purchase of a share or subscription to solar energy that is geographically close to the customer and shared with other customers. Because of structural, shading, or ownership issues, only 22–27% of housing in the U.S. is eligible for distributed generation solar, and the market for shared solar is potentially significant [5]. Additional benefits of shared solar include reducing greenhouse-gas emissions, creating local jobs, and improving public participation in energy governance [6–8]. Shared solar projects are often led by a solar developer company with support from a local and state government, and frequently the projects involve support from combinations of these actors [5,9,10].

Previous research has also identified several barriers and challenges, among them securities regulations [11,12]. Utilities are frequently not motivated to develop shared solar because of billing complexity, load management challenges, and a general preference for renewable energy that is centralized and large scale. Another challenge is to ensure that shared solar is accessible to low- and middle-income households and not just to customers in higher income brackets. Thus, regulatory and financial incentives from the government are frequently necessary, and some governments have developed special policies that establish general models that can be replicated elsewhere [13–15].

Community choice aggregation allows cities or other local government units to aggregate customers within their jurisdictions and to procure energy for them, either through contracts or through ownership of generation. In the U.S., community choice is authorized in eight states with a combined population of 100 million people. It can apply to both natural gas and electricity service, but this study will focus on electricity. Community choice programs can be administered through a program of a local government or through a formal collaboration of local governments such as a joint powers agency. The terminology varies from state to state, and this study will use the phrase "community choice aggregation" as the generic term and the acronym CCAs to refer to "community choice aggregation organizations or programs."

There is relatively little social science research on community choice to date. Policy studies have tracked some of the financial and regulatory challenges faced [16]), impacts on the grid [17], and effects on the goal of achieving greenhouse-gas emissions reduction targets [18]. Other social science research has examined the process by which a community establishes community choice [19] and the conflicts between utilities and advocates in California [20]. This study contributes to the existing literature by developing a comparative analysis of the factors that enable or constrain these two forms of decentralized energy, and it also uses the empirical material to develop a method for studying the institutional context of energy decentralization.

### 2.2. Theoretical framework and research questions

This study draws on field theory and institutional logics theory, both of which are used in sociology and the social sciences in meso-level analysis (that is, research positioned between macrosocial research oriented toward social structure and microsocial research oriented toward interactions and networks). These frameworks are particularly appropriate for research on energy decentralization that is concerned with institutional dimensions of changing energy systems.

Social fields are semi-autonomous social spaces that can be compared to games with rules, where actors engage in relations of cooperation and conflict over outcomes [21,22]. Relevant examples include a market with customers and profits at stake and a political field with policies and programs at stake. Fields are comprised of actors and their resources, the rules and mechanisms of adjudication, and the symbolic structures that orient action and are modified by action. Actors can be individuals, organizations, coalitions, or other forms of collective agency that have a goal with respect to the play of action in the field. Actors are endowed with different levels of capital or resources, which they can mobilize to attempt to achieve their ends. This study will focus on the relationship between incumbents and new entrants, which can become a conflictual "incumbent-challenger" relationship depending on the field rules. Rules that govern the play of action in the field are established and maintained through various mechanisms. In a highly regulated industrial field such as the electricity market, rules are largely established outside the economic field by state policymakers and regulators, and the attention of this study will focus on the conflicts and compromises in the political field that sets the rules for decentralized energy [23].

Field theory also recognizes that the analysis of actors should not be reduced to rational-actor models in which action and strategy are explained by relatively stable and identifiable interests. Rather, a field theoretical approach emphasizes that actors are suspended in webs of meaning and that action is oriented toward shared and contested symbolic systems. There are various strategies for the cultural analysis of fields, among them the concepts of habitus and frames used respectively by Bourdieu [21] and Fligstein and McAdam [22]. This study instead brings the analysis of fields into conversation with the concept of values associated with institutional logics to analyze the symbolic dimensions of strategic action in fields.

Widely used in sociology and organization studies, institutional logics theory draws on the anthropological culture concept, which analyzes social action from the perspective of the cognitive maps and value systems (the models of and for action) that groups of people use to orient action [24,25]. The difference from the classical culture concept is that institutional logics are linked to contrasting cultural models associated with institutional sectors such as the economy, the state, religion, and science. Researchers have shown how institutional logics can become aligned with actors who have different visions of how to constitute a sociotechnical system [26]. They have also shown how one institutional logic may displace another over time [27] and how institutional logics can become combined or hybridized [28].

In this study, we focus on the values associated with different institutional logics and how they provide legitimation for conflicting policy proposals over market rules. As actors involved in energy decentralization attempt to shape the rules that govern the future prospects of different forms of energy decentralization, they must frame their policy

positions not in terms of their narrow interests such as making more profits, gaining new market opportunities, or protecting revenue streams. Rather, they must show how their preferences for rules address widely held values that are considered legitimate in the political field. There is no single, agreed-upon characterization of institutional logics; in this study, we adopt the following categories that have emerged from this project and our previous research as salient values in political conflicts:

1. Associated with the economic sector and the market, a primary value in the political field is the consumer benefit of affordability or savings.
2. Associated with the political sector and the state, there are three main legitimating values in the cases that follow. First, policies are legitimated based on the principle of providing equitable treatment of consumers, but the definitions of equity can vary. They include equitable access to solar energy and equitable sharing of costs associated with energy decentralization. The second main political value is ensuring a healthy economy that is based on job creation, innovation, and competitiveness. The third political value is democratic accountability and decision-making, which can become associated with some forms of energy decentralization.
3. Associated with the engineers and managers who run technological systems, there is also a managerial value of maintaining the functioning of the electricity system and its reliability. This value emerges when utilities and new entrants grapple with the challenges of managing distributed and renewable energy.
4. Associated with civil society organizations such as environmentalists but also with the renewable energy industries is the ecological value of environmental sustainability, which can be used to legitimate policies that accelerate decentralized, renewable energy.

As industrial actors attempt to gain advantage in the rule-making processes of the state, they must translate their values from narrow profitability goals to the legitimate and legitimating values of political conflict.

This study will employ the theoretical framework to examine the tensions in the definition of energy decentralization and the differences in the development of forms of energy decentralization. At an empirical level, it will solve the puzzle of why community choice has advanced and become so successful in California, but shared solar has not, whereas in New York, the opposite is the case. It will show that an analysis of the causal conditions of the differences in the rules of the field provides some hypotheses for a general, comparative analysis of the conditions that affect successful energy decentralization. At a theoretical level, the study will advance the general analysis of the institutional dimensions of energy decentralization by providing a field analysis of four policy fields with the following guiding research questions:

1. Who are the primary actors in each of the four policy fields?
2. What conflicts are evident over the rules of the field?
3. What values are used to legitimate policy positions in the political field?

## 3. Methods

This comparative analysis draws on over a decade of research and teaching on local and state energy policy in the U.S. The broader research program includes interviews with founders of community choice and numerous interactions with local energy advocates and sustainability practitioners. It also includes formal interviews with policy leaders for various projects involving local and decentralized energy, participation in conferences, and the quantitative analysis of various data sets. This project builds on the body of background research by providing a review of policy developments based on government documents and reports and supplemented by media reports.

To ensure up-to-date knowledge, a search was conducted using Google Scholar and ProQuest using the key words “community solar,” “community choice,” “energy decentralization,” and “energy democracy” with the relevant state name attached. Additional reviews were conducted of public statements available on the web sites of the public utilities commissions of the two states. Approximately 100 articles and documents were selected and read as the most relevant for the project, and an additional 50 articles and documents were read as the result of targeted searches after conflicts had been identified. The resulting comparison of decentralized energy focuses only on material that addresses the research questions described above.

This study compares shared solar and community choice in two states: California and New York. The states are chosen because they represent large economies that together have a GDP that would constitute the third or fourth largest economy in the world, they are leaders in energy-transition policy in the U.S., and they have made significant advances in energy decentralization. Results are presented in two sections, the first for California and the second for New York, followed by a comparative analysis in the discussion section.

## 4. Results 1: California

### 4.1. Background

California’s electricity mix for the most recent year of published data was 33.7% natural gas, 14.7% large hydropower, 10.2% solar, 9.4% wind, 9.1% nuclear, 4.4% geothermal, 4.1% coal, 2.7% small hydro, and 2.35% biomass [29]. California underwent restructuring in the electricity sector after legislation (Assembly Bill 1890) was approved in 1996. Competition on the wholesale side became embroiled in controversy because of corruption and market manipulation known as the Enron scandal, which led to the electricity crisis of 2000–2001. This crisis was enabled by restructuring in the wholesale markets. To gain acceptance for the restructuring legislation from opposing consumer organizations, there was a cap on the retail price, and the expectation was that wholesale competition would result in lower retail prices. However, wholesale competition enabled market manipulation, and the utilities could not pass on the excessive charges to customers. A financial crisis for the utilities and power outages followed, and the state government had to intervene at the expense of taxpayers. Consequently, the restructuring process was halted, and retail competition was not implemented except for non-residential customers.

Energy decentralization in California is also facilitated by a strong energy-transition policy framework. The relatively high level of air pollution in California has caused the state to be a leader in air pollution regulation and subsequently in energy-transition policy and clean technology development. The state’s Global Warming Solutions Act of 2006 (Assembly Bill 32) authorized a cap-and-trade system for carbon emissions, and the state government approved a series of increasing renewable portfolio standards beginning in 2002. The renewable- and clean-energy standards culminated in 2018 in a law (Senate Bill 100) that mandated 60% renewable energy by 2030 and 100% clean energy (which includes nuclear) by 2045. The favorable policy environment for renewable energy has contributed to the growth of distributed renewable energy in the state. Since 1996 California has had net metering provisions for distributed solar energy, which compensates solar power generation at the favorable retail rate. However, as distributed solar energy grew in the state, the utilities increasingly objected to the relatively high compensate rate.

Electricity markets are managed by the California Independent System Operator, which also conducts reliability planning analysis and is integrated with neighboring balancing areas in the Western Interconnect. The California Energy Commission coordinates energy policy among other functions, and the California Air Resources Board regulates greenhouse-gas emissions and oversees the state’s cap-and-trade program.

### 4.2. Shared solar in California

#### 4.2.1. Actors

Incumbents in the electricity field in California are investor-owned utilities, public power organizations, and electricity cooperatives. California's electricity sector is dominated by three large investor-owned utilities (Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric). The utilities are allowed to own solar generation, and they prefer to offer utility-scale solar products that they control and that pose reduced load management challenges in comparison with distributed solar [30,31]. Although California does not have retail competition, a new set of actors, community choice aggregation (CCA) organizations, has emerged to provide electricity service as an alternative to the standard offer of the utilities.

Approximately 25% of the state, including large cities such as Los Angeles and Sacramento, is served by self-governing public power agencies and cooperatives. The first large shared solar program in California was developed by the Sacramento Municipal Utilities District, the public power organization for Sacramento (the state capital). In 2008, the Sacramento organization developed the SolarShares program, which sold out to 700 commercial and residential participants within six months. The public power organization later expanded its program, and other public power organizations in the state followed with similar shared solar programs [32].

State-government policy is enacted by the legislature, which has supported shared solar, and by the governor, who can veto or sign laws. However, rule-making is largely governed by the California Public Utilities Commission, which is a state-government body whose board is appointed by the governor and confirmed by the state government senate. The territories served by the investor-owned utilities are regulated by the California Public Utilities Commission.

Solar developer companies that work with communities to establish shared solar projects are the primary new entrants in the field of shared solar policy. Support for shared solar comes from coalitions of solar developers, the state's civil-society environmental and energy-reform organizations, and local governments and community groups that want to make affordable solar available to residents who cannot own their own rooftop solar. As conflicts emerge, the investor-owned utilities have enormous resources, which the utilities mobilize to influence legislators and the Public Utilities Commission. However, legislators are also responsive to coalitions of community, local government, and civil society organizations.

#### 4.2.2. Conflicts over market rules

Although the successful sale of shares in Sacramento and other public utilities demonstrated popular support for shared solar, the investor-owned utilities did not develop similar programs, and communities that wanted to develop shared solar found that they needed more policy support. Since 2009 and 2010, the investor-owned utilities have been allowed to own distributed solar energy, and as of 2019 they had developed over 1000 MW capacity of solar energy [33]. The market rule that allows the utilities to own solar energy helps to explain their lack of enthusiasm for other ownership structures for solar.

To help motivate the development of shared solar, the state legislature approved the Green Tariff Shared Renewables program in Senate Bill 43 of 2013. The Enhanced Community Renewables portion of the law enabled the customer to pay a solar developer for a share that met 25–100% of the customer's demand, and in turn the customer received a rebate on the monthly bill [34]. Although the state legislature approved the 2013 law in support of shared solar, the law did not mandate a clearly defined payment structure. Net metering reimburses customers at the highly favorable retail rate for net generation of electricity (sent from the distributed-energy site such as a home or business to the grid). Virtual net metering (an extension to multi-meter properties) had been approved in 2008 in Assembly Bill 68, but the Public Utilities Commission did not extend the payment structure to shared solar.

In general, utilities in the U.S. oppose net metering and have lobbied in California and other states to have it replaced with a successor program to net metering called "value of solar." Rather than basing the compensation on the retail price as in net metering, the value-of-solar approach bases the reimbursement on a complex assessment of the benefits of solar to the grid. In the application of the pricing rule to shared solar in California, the value of shared solar was defined narrowly and resulted in "a renewables credit lower than in many other jurisdictions" [32] (p. 4). Part of the calculation of the value of solar included the "power charge indifference adjustment" (PCIA), which is charged to shared solar customers to protect other customers from marginal cost increases incurred by the load loss caused by the solar generation. The value of solar was estimated so that customers were asked to pay a price premium over their standard electricity bill in order to join a shared solar project, and some estimates were made at 3 cents per kilowatt-hour [35].

Various other rules created unfavorable market conditions for shared solar. Developers complained that the program had complex bill credits and other burdensome regulatory requirements [32]. For example, developers were not allowed to market their programs until the contract received regulatory approval, but then they only had sixty days to show sufficient customer interest [36]. Developers were also frustrated by the long, multiyear process of rulemaking that the Public Utilities Commission took to implement the legislature's goals. As Bernadette del Chiaro, the executive director of the California Solar and Energy Storage Association, commented with respect to the utilities, "Their track record is one of obstructing self-generation by customers of all types, and it's been policymakers that have stepped in and said you have to accept this. You don't have to be rocket scientists to understand that the way they are structured, in terms of profit motive, does not leave a lot of room for their customers self-generating" [37].

Because of the unattractive payment structure, the slow rule-making process, and the onerous rules, the shared solar market in California did not develop rapidly. It was not until 2016 that the first request for proposals from developers went out. Although there were a few bids, all were rejected because of failure to meet regulatory guidelines, and a report by the utilities commission indicated that the three investor-owned utilities had no subscribers for the enhanced community renewables program as of 2017 [33]. Even two years later, only three projects were under construction for a total of 7 MW [38]. This outcome gave California the reputation of having a highly developed solar sector due to net metering for individual and business customers but a failed market for shared solar. Progress was somewhat more favorable for a related program that provided additional credits for shared solar that served disadvantaged communities.

With respect to the problem of developing scalable shared solar in California, the Solar Energy Industries Association and a consumer group suggested several changes to the rules [36,39]. If the value-of-solar approach were to be maintained, the solar industry argued that crediting solar customers with the full value of solar to the grid rather than only the value from generation would result in a more favorable pricing proposition to customers. Thus, the pricing rule was the central barrier to the development of shared solar in California; however, other problems, as noted above, also made it difficult for this type of energy decentralization to emerge successfully.

#### 4.2.3. Legitimating values

In the political field, the utilities defended their position on the pricing policy mainly by referencing the equity value of avoiding cost burdens to nonparticipating ratepayers, which is a provision in the guiding legislation. In contrast, the advocates of shared solar drew attention to the other aspect of an equity benefit for consumers: access to solar for customers who cannot put it on their own roofs due to lack of ownership, funding, or sunlight. Another value at play was environmental sustainability: whereas the advocates of shared solar noted the environmental benefits of building more solar, the utilities argued that

solar energy is more efficient when built in large, central facilities. Moreover, supporters of shared solar also viewed the conflicts over rules through the lens of the political value of democratic decision-making processes. They viewed the state's utilities commission as biased toward and influenced by utility perspectives. Although the developers and other shared solar advocates participated in the rule-making process, they were also skeptical that their proposed changes would be enacted because of regulatory capture [36].

### 4.3. Community choice in California

#### 4.3.1. Actors

The primary incumbents in the political field for rules for community choice are the investor-owned utilities (described above). Public power organizations and electricity cooperatives are not important players in this field because community choice involves a shift in customers from investor-owned utilities, not from those in public power jurisdictions. New entrants in the field of policy for community choice are CCAs and the companies that provide consulting services to them. The consulting organizations are private-sector companies, sometimes also active in the retail competition markets in other states, that provide services to the community choice agencies.

The growth of CCAs in California has been substantial. After a slow start, by 2015 multiple cities and towns across the state were initiating community-choice programs, and by early 2019, there were approximately 20 programs in effect, with many more in progress. An estimated 85% of the electricity in the state could be provided by CCAs and direct-service providers by the year 2025 [40]. With the growth of CCAs has also come growth in the capacity to engage in political activity in the state government. For example, in 2016, they formed a trade association, CalCCA, to represent their interests.

To understand CCA in California, it is important to distinguish between different types, which have been categorized as 1.0, 2.0, and 3.0. Although the types emerged sequentially in California, they are not phases that all CCAs pass through; in other words, a new CCA can launch in the 2.0 or 3.0 mode without first existing in the 1.0 mode, and other states (e.g., New Hampshire) can authorize CCAs in line with the 2.0 model. Community choice 1.0 is found in most other states with community choice but also found among some CCA organizations in California. In the 1.0 model, the CCA assigns its responsibilities for energy contracts and management of electricity to another company, such as an energy service company (ESCO). In turn, the management company purchases the electricity from distant providers, and the CCA organization does not develop the managerial capacity for independent, local control that includes local renewable energy. This model of CCA works as long as the standard offer of the utility remains higher than the price that the CCA can offer; however, as occurred in Illinois, when the utilities renegotiated their contracts, the CCA prices were no longer competitive. As a result, many communities reverted to the utility offer.

In California, CCAs can be load-bearing entities like public power organizations, and some have developed what has become known as the 2.0 model. Paul Fenn, a founder of community choice and co-author of the original CCA laws in Massachusetts and California, and Samuel Golding, a distributed energy and utility management consultant who transitioned to designing CCA agencies, described community choice 2.0 as a type of CCA that addresses the risks of the 1.0 model and is linked to local distributed energy development, local democratic control over energy decision-making, and greater managerial control [41]. CCA 2.0 evolved in California on a trial-and-error basis as different programs gradually developed expertise and staff, shared their knowledge, and found companies that could provide a broad spectrum of contracted services as are offered to public power organizations [42]. In the process, CCAs have developed a range of decentralized energy innovations, including support for local distributed energy initiatives, energy-efficiency programs, electric vehicle charging, and demand response. These developments can include support for shared solar.

The 2.0 model of community choice in California led to the increasing sophistication of CCAs as they acquired staff and expertise that have brought dozens of managerial functions under local control [43]. Thus, the CCAs in California have tended to develop into full government agencies with dedicated staff, even when they delegate some managerial functions to outside contractors. The development of local organizational capacity included managing risk and contracts; analyzing and forecasting data (including with smart meter data); setting rates; and engaging with regulators, government officials, and the public. As this model of community choice developed in California, Golding introduced the term "3.0" to describe the emerging collaboration of multiple CCAs for various initiatives. This additional development included the potential to develop a regional joint powers agency to support groups of CCAs, similar to consortium organizations for public power organizations, that would provide a "shared back office" for expertise and management [43–45].

As in the case of shared solar, the state legislature and the Public Utilities Commission are the main government actors that set the rules for CCA. However, local governments play an important role because they authorize community choice programs, and they defend the programs in the legislature and before the Public Utilities Commission when there are challenges from the utilities. Civil society organizations have also played an important role in the coalitions that have defended community choice, especially in ballot initiatives and in bills under consideration in the state legislature [20].

#### 4.3.2. Conflicts over rules in the political field

California's original 1996 restructuring law authorized community choice, but the law allowed only the opt-in type. In other words, CCAs would have to recruit customers individually to join, a condition that made customer acquisition prohibitively costly. In the wake of the wholesale restructuring crisis and electricity black-outs in 2000–2001 that led to the financial crisis for the utilities, the state government decided not to move ahead with restructuring of the retail market. The change created an opportunity for consumer groups, some local governments, and other civil society organizations to gain support in the legislature for community choice authorization, and in 2002 the state government approved the community choice law with an opt-out provision (Assembly Bill 117). The original authorizing law and subsequent laws (e.g., Senate Bill 790 of 2011 and Senate Bill 350 of 2015) provided additional protections for the community choice organizations from both the Public Utilities Commission and the investor-owned utilities.

Of the four cases analyzed in this study (shared solar and community choice in the two states), the development of community choice in California has involved the most heated and protracted conflict with the utilities. Two decades of battles occurred in various venues in the state's political field: in the state legislature, before the Public Utilities Commission, in local governments, and in statewide and local ballot initiatives. The history of conflicts and associated frames and values is described elsewhere and will not be discussed in detail here [20]. In general, the utilities have attempted to change the rules for CCA in ways that make it financially difficult or impossible for it to flourish in the state.

Toward the end of the 2010s, the most prominent conflict involved the PCIA, which in the context of community choice is an exit fee charged to utilities for taking customers out of the bundled services of the utilities. The utilities argued that the exodus of customers from bundled services caused a potentially significant loss of revenue to cover existing assets and generation contracts, whereas community-choice advocates argued that utilities had overinvested in generation contracts partially because they wanted to create barriers to the growth of CCAs. In October 2018, the commission issued a ruling on the PCIA (D.18-10-19) and initiated a second phase of the proceeding. Contention over the ruling involved the issue of allowing the utilities to include legacy-owned generation and generation over 10 years in age as part of the calculation [46]. CCA advocates favored an alternative proposal that

did not have these features, but the commission ruled in favor of the proposal supported by the utilities. CalCCA, the trade association for the CCA organizations, filed for a rehearing and noted, "The decision will in some cases result in PCIA rates that prevent CCAs from serving their customers at the same total generation rates that an IOU can charge its customers. The PCIA rates may also cause CCAs to suspend or cancel the launch of service to new customers" [47].

The regulatory uncertainty caused by the changes in the PCIA rules also contributed to the motivation for CCAs to develop more functions associated with the 2.0 model. The regulatory risks posed additional challenges that could be addressed by bringing managerial expertise into the CCA organizations. Moreover, as the CCAs developed distributed energy resources under the 2.0 model, they have been able to exercise greater control over the electricity supply and thus reduce risk [44].

In summary, during the two-decade period when CCAs developed in California, there were many conflicts over market rules, but by the late 2010s arguably the central conflict involved the PCIA and the extent to which the new rulings could make it financially difficult for CCAs to offer electricity at rates competitive with the utilities. Like shared solar, the primary issue is not gaining legislative approval for the authorization of decentralized energy but the market rules that govern its financial viability and risks. The uncertainty regarding market rules contributed to risk, which in turn drove the need to develop CCA 2.0 and 3.0 features in the California CCAs [44].

#### 4.3.3. Legitimating values

In the political field, the utilities justified their positions largely on the two values: the managerial value of maintaining financial and technological stability and the political value of the need for equitable treatment of consumers. To this point, they have supported the formation of a coalition of civil society organizations that advocated in favor of the expansion of the PCIA charge to CCAs. For example, the organization Californians for Energy Choice issued a statement claiming that the Public Utilities Commission's decision "will put an end to the illegal and unfair cost shifts" [48]. This development helped to legitimize the equity goal by finding civil society organizations, some of which were linked to the utilities, that supported their framing of the justification for the PCIA charge based on the value of social equity. The use of the equity value helped to neutralize the power of the CCA advocates' use of arguments associated with the consumer benefit value of providing more affordable energy through competition with the utilities.

There is also a second value conflict: between the 1.0 and 2.0 models. As a counterpart to the political value of equity used by the utilities to defend the PCIA, both the 1.0 and 2.0 models of CCA share the value of providing consumers with the benefit of affordable electricity that is comparable to the utility price or less expensive than it. However, the 1.0 model is defined in terms of a narrow affordability benefit of price savings for consumers, whereas the 2.0 (and 3.0) models include a wider spectrum of values that are similar to those guiding the public-service orientation of public power. These values include local economic development of decentralized energy and local job creation, the energy transition to low-carbon electricity, and more democratic accountability for energy policy decisions. On this last point, CCA agencies in California are hosting hundreds of meetings each year with community stakeholders, a process that increases transparency and democratic accountability [44].

However, the 2.0 model of community choice is not just about addressing the economic value of consumer affordability, the political values of equitable access and democratic accountability, and the environmental value of improved sustainability. The 2.0 model is also a response to the risks generated both by participation in a restructured electricity system and by the regulatory uncertainties that have emerged in conflicts over market rules such as the PCIA. In the framework of institutional logics, the 2.0 model also provides a new orientation to the managerial value of technical reliability and functionality in comparison with the utilities' traditional approach, which is based on stable, baseload power. In an era in which the grid is undergoing not only decentralization but a variety of other changes associated with modernization, the 2.0 agencies are "representative of the diversity of their constituencies, aware of local challenges and opportunities, open to new ideas, and consequently multi-disciplinary, democratic and nimble in their approach to problem solving" [44]. Thus, the agencies provide a new model of energy governance that is rooted in the diverse constituencies of communities. This model can offer improvements in decision-making processes and new ways of conceptualizing energy governance in an era of grid modernization and energy decentralization.

### 4.4. Summary: California

In summary, the market rules established by the legislature authorized community choice and shared solar, but the implementation of the market rules by the Public Utilities Commission undermined both. Although the utilities view both shared solar and community choice as threats to their guiding values of maintaining not only profits but also reliable and affordable electricity, to date the utilities have been more effective in blocking the development of shared solar than community choice. This is partly because community choice coalitions have been able to maintain supportive guidance from the legislature and have won support from voters in statewide and local ballot initiatives. The guidance weakened the capacity of the Public Utilities Commission to develop rules that cripple the development of CCA as it has done for shared solar. However, as the ruling in 2018 on the PCIA indicated, it is possible that the Public Utilities Commission could also issue rules that substantially undermine the momentum of CCA growth in the state. In both cases, the market conditions are highly dependent on pricing policies established by the state's commission, which has tended to favor the utility perspectives and is generally regarded as a captured agency. Regulatory risks, coupled with other risks associated with participation in a restructured market system, have motivated the development of 2.0 features in California's CCAs.

## 5. Results 2: New York

### 5.1. Background

For the most recent year of published data, the electricity generation mix for the state of New York was 35.3% natural gas; 25.9% nuclear; 16.9% hydropower; 16.2% net imported energy such as from Hydro-Quebec (mostly hydropower); 2.5% wind; and the remainder a mixture of coal, petroleum, and other renewables [49]. In New York, restructuring laws and rules implemented during the 1990s resulted in both retail and wholesale competition. Restructuring in New York created a favorable market for the growth of ESCOs, which offer retail services. The New York Independent System Operator manages wholesale auctions and the bulk electricity grid, and the New York Energy Research and Development Authority (NYSERDA) oversees many of the energy-transition programs among other functions.

With respect to energy-transition policies, Governor George Pataki (1995–2006) led the development of the country's first cap-and-trade system for greenhouse-gas emissions. In 2005, New York and six other states signed the memorandum of understanding that led to the Regional Greenhouse Gas Initiative. The program had international implications because it established a mechanism for government revenue generation from auctions. The state initiated its renewable portfolio standard in 2004, and modifications in 2016 established a clean energy standard with a requirement that load-serving entities provide 50% of the electricity from renewables by 2030. The state developed a goal of reducing greenhouse-gas emissions by 80% below 1990 levels by 2050. Depending on the role of nuclear energy in future decades, the state could reach 100% zero- or low-carbon electricity before 2050.

The state has also developed supportive policies for solar energy,

including the initial policy of net metering in 1996. In 2012 Governor Cuomo (2011-) announced the NY-Sun Initiative, which brought together existing solar programs and dedicated a planned $1 billion in solar-energy investment, with financial support from the New York Green Bank and other sources. The New York State government also attempted to make solar energy available to low-income and disadvantaged neighborhoods through two different programs: Affordable Solar and Affordable Solar Predevelopment and Technical Assistance [50].

In 2012, Hurricane Sandy revealed the resilience vulnerabilities of the centralized, baseload model of the utility grid in the state. In 2014, Governor Andrew Cuomo developed the Reforming the Energy Vision (REV) program, which included grid modernization, energy decentralization, and decarbonization. The governor developed this policy in response to his assessment after Hurricane Sandy that the grid was outmoded and lacked innovation. His appointment of Richard Kauffmann, who had a background on Wall Street, also reflected the governor's view that it would help to bring the innovative spirit of the state's vibrant financial sector to the electricity industry [51]. Thus, there was strong policy guidance from the governor's office not only for decarbonization policy but also for grid modernization that included energy decentralization.

### 5.2. Shared solar

#### 5.2.1. Actors

Incumbent organizations in the electricity sector in New York are the investor-owned utilities and public power entities. Central Hudson Gas & Electric, Consolidated Edison, and National Grid are three of the large investor-owned utilities, and they are regulated by the Public Service Commission. There are some public power organizations in the state and a statewide public power authority, the New York Power Authority (NYPA), which provides electricity generation. Because electricity markets have been open to retail competition since 1998, the ESCOs are also classified here as incumbents. The New York Power Authority, a public power organization, is involved in the K-solar initiative, which helps to install solar panels on school buildings.

The state's Public Service Commission is appointed by the governor with the consent of the state government's senate. In general, the executive branch has played a greater role in governing electricity policy than the legislature. Governors Pataki and Cuomo were both actively engaged in energy-transition policy as described above, and revenues from the cap-and-trade program and from other sources have supported a range of executive-branch programs, which are often administered by NYSERDA.

New entrants in the shared solar field in New York are the solar developers and advocacy organizations that support them. Supporters of shared solar include the governor, solar developers, some local governments, and a highly mobilized civil society. In 2014, the governor launched the "Community Solar Initiative" as part of the New York Sun Initiative. Although many advocacy organizations first focused on the equity value of energy access and affordability, they subsequently merged this goal with environmental sustainability as new state government funding sources became available for energy-efficiency and solarization programs [51]. Advocacy organizations were generally supportive of Governor Cuomo's initiatives such as REV, but they also put pressure on the state government in their "Make REV R.E.A.L." campaign, which called on the state government's program to highlight the policy goals of renewable, equitable, accountable, and local (spelling "R.E.A.L."). This campaign drew together environmental sustainability organizations with environmental justice, neighborhood, and energy access organizations under the broad frame of energy democracy, which connects sustainable energy goals with those of social equity and democratic accountability [52]. For example, the Alliance for a Green Economy brought together 38 organizations to demand that energy-transition policy goals in the state that addressed the values of "energy democracy, environmental sustainability, affordability, consumer protection, and economic and racial justice" [53].

#### 5.2.2. Conflicts over market rules

In New York, shared solar (generally called "community distributed generation" in official documents) was authorized under existing law through a ruling of the Public Service Commission in 2015 [54]. The commission also authorized shared solar based on a net metering price structure, an important pricing provision that was missing in California's rules. The Solar for All program of the state agency NYSERDA also provided grants for shared solar for low-income households. Another important ruling was the decision to restrict utility ownership of distributed generation, with some limited exceptions [55].

Conflicts between the utilities and solar developers became visible during the proceeding for the 2015 ruling. For example, The Joint Utilities Group, which represented the investor-owned utilities in the state, opposed the community net metering provision [56]. Their principle argument was similar to the one described in California, namely that the cost of the net metering payments would be borne by non-participating customers, thus preventing equitable access to electricity and causing a cost burden on the utilities and non-participating customer. Solar developers considered the inclusion of net metering in the New York ruling (for arrays up to 2 MW) to be crucial for the success of shared solar in the state. The utilities also made other proposals to the Public Service Commission to reduce the effects of shared solar on their goal of maintaining steady revenue and limited risk. These proposals included a three-year sunset of the program and no assignment of responsibility of the utilities to credit the customer's bill for the solar. However, the commission rejected the proposals [54]. Sean Garren of the solar advocacy group Vote Solar noted, "The electric utilities were not excited about this expansion. They threw the book at it in obstacles, delays, and cuts" [56].

After the 2015 authorization, developers showed great interest in shared solar, and the communities were flooded with proposals. However, the explosion of proposals also caused a backlash in some communities, which declared moratoria on the proposals until they had sorted out issues such as zoning, fees, and community acceptance [57]. Furthermore, the net metering payment structure was temporary, and the Public Services Commission was developing a successor value-of-solar framework called the "value of distributed energy resources" (VDER). In 2017, the Public Service Commission issued an order that shifted shared solar and solar for large institutional customers to the new VDER pricing structure [58]. Solar developers and the coalition of environmentalists and community groups viewed the decision as a threat to the nascent projects, and they provided detailed arguments against the proposal [59]. Their view was that the retail price represented fair market compensation for the value of solar energy that distributed generation sites provided to the grid. However, the commission went ahead with the change in the pricing structure.

Citizens for Local Power and the Energy Democracy Alliance labelled the new pricing scheme "Darth VDER" after the villain from the movie "Star Wars," and they called on the state to allow shared solar customers to have the option to remain on net metering and to test the new tariff on an opt-in basis [60,61]. One group called on the governor to transfer the jurisdiction over shared solar from the Public Services Commission to the New York Power Authority, the state public power agency [61]. A coalition of solar developers and advocacy organizations noted how the new pricing policy had resulted in the cancellation of 175 solar projects and nearly $1 billion in investment loss [62]. They argued that VDER was negatively affecting the job market, economic development, and climate change: "We support adopting a more precise valuation of renewable energy; however, the current VDER policy does not fully and accurately value the many avoided costs and public benefits of solar, wind, hydro, and other local renewable resources, and it must do so for that approach to be used" [62].

The push-back on the value-of-solar pricing scheme in New York is

parallel to that in California; however, in New York the Public Service Commission responded to the complaints. After the uproar from the solar industry and shared solar advocacy groups, in 2019 the Public Service Commission responded with a revised policy that stabilized pricing, created a community credit for customers, and extended net metering to projects under 750 kW in capacity [63]. The changes earned praise from the Coalition for Community Solar Access, Vote Solar, Alliance for Clean Energy New York, and the Solar Energy Industries Association [64,65]. Despite the VDER transition, shared solar development has proceeded in New York, with a steady growth of projects on-line or under construction through 2019.

In summary, shared solar in New York is considered a success story. By 2019, there were approximately 250 projects underway or completed (New York State Energy Research and Development Authority 2019). The scorecard of the Interstate Renewable Energy Council Interstate Renewable Energy Council [66]; which evaluates shared renewables policies in state governments on 18 metrics, gave New York a grade of A-in contrast with the nearly failing grade of D for California's Enhanced Community Renewables program. New York had the second highest grade in the country.

#### 5.2.3. Legitimating values

In the political field, the utilities defended their position of opposition to net metering with reference to the value of equitable treatment of consumers. As one utility representative commented, "It is important that these policies be fair to all our customers" [56]. However, the subsequent value-of-solar structure, which the utilities favored, provoked opposition from the solar developers and shared solar advocates. As indicated above, their arguments focused mainly on the conflict with the political value of economic development and investment opportunities and to the ecological value of meeting the state's sustainable energy goals. Framing shared solar in terms of these two values showed the alignment of their position with Governor Cuomo's Reforming the Energy Vision program, which emphasized sustainability, innovation, and grid modernization. The governor's support for and attention to energy decentralization, including shared solar, and the support of this position from his appointees on the Public Service Commission, were important factors in promoting market rules that enabled shared solar to develop in the state. To some degree the value of democratic decision-making also appeared in the conflict over "Darth VDER," especially when shared solar advocates suggested that authority over shared solar be transferred to the state's public power agency. The proposal reflected a lack of confidence in the neutrality of the Public Service Commission on this issue, but the commission then adjusted its position.

### 5.3. Community choice

#### 5.3.1. Actors

As in the shared solar case, the investor-owned utilities, public power organizations, and ESCOs are the incumbents in New York. New entrants in the community choice field are the CCA programs formed by local governments. The relationship between incumbents and new entrants in this space is less conflictual than in California, and hence the designation "challenger-incumbent" relationship may be inappropriate. ESCOs have played a leading role in implementing community choice programs. With the alignment of the ESCOs and CCA development, CCA advocates had powerful, established allies who could help build political support for CCA authorization.

The state's first CCA was launched in 2016 in Westchester County, an affluent suburban county north of New York City. The local towns and cities formed Sustainable Westchester, a nonprofit organization that has supported a range of local sustainability programs including shared solar development. It also managed Westchester Power as the CCA program for the county. Sustainable Westchester's CCA program, Westchester Power, awarded contracts to two ESCOs along the lines of the 1.0 model. As of 2019, the Public Service Commission had approved community choice programs beyond Westchester Power, and more than 100 communities had expressed interest [67]. However, during this initial period, New York did not have CCAs organized along the lines of the 2.0 model.

#### 5.3.2. Conflicts over market rules

Community choice was authorized in 2016 through a ruling of the New York Public Service Commission [68]. The ruling clarified existing law under the governor's Reforming the Energy Vision program described above. As in California, community choice was authorized on an opt-out basis. The 2016 ruling also allowed CCAs to develop energy-efficiency programs and distributed-energy resources.

In New York, the investor-owned utilities unsuccessfully argued for an opt-in approach to community choice, which is widely known to present prohibitive costs to launching a program [68]. The utilities also argued in favor of fees for different types of data provided to CCA administrators, whereas CCA advocacy groups and ESCOs argued that there should be no charges for aggregated data. On this issue, the commission sided with the utilities and agreed that they could charge reasonable fees, subject to approval by the commission, for the transfer of data. CCA advocates also wanted a rule that would allow the CCA agency to include large commercial and industrial customers not served by an ESCO to be included on an opt-out basis. The rule would help CCA agencies to maintain competitive prices; however, the commission decided to allow only small commercial and industrial customers to be included on an opt-out basis.

In a competitive retail environment, the cost savings to customers who participate in CCAs is likely to be minimal, and CCAs must offer other services that are attractive to customers. The New York CCAs could offer energy-efficiency programs and distributed renewable energy that would allow them to develop programs and managerial expertise in the direction of the 2.0 model, as some advocates have recommended for New York [69]. In California and Massachusetts, CCAs have access to the state government's system benefits charge, which allows the agencies to offer energy-efficiency and distributed energy programs as a benefit of remaining enrolled in the CCA. However, in New York the CCAs do not have access to the funds and are not allowed to charge fees for such programs [67]. The situation was still developing rapidly in 2019, and market rules to enable CCAs to develop renewable-energy and energy-efficiency programs were not yet in place. The Public Service Commission did approve a CCA proposal that included integration with a shared solar program also managed by an ESCO [70].

In summary, conflicts between the CCAs and the utilities in New York have been much lower than in California. Various factors explain the difference: community choice rules are relatively new in New York, there is strong support from the governor for energy decentralization, CCAs are formed in a pre-existing market of retail competition in partnership with ESCOs, and under most circumstances utilities cannot own distributed generation. By forming partnerships with the ESCOs, CCA programs in New York have powerful allies in the state political field. However, to date these partnerships also tend to limit CCAs in New York to the 1.0 model.

#### 5.3.3. Legitimating values

Because the shift of customers to CCAs occurs in a market with pre-existing retail competition, the value conflict over the consumer benefit of equitable treatment is not as salient in New York. However, as in California, the second conflict between a 1.0 model and an approximation of the 2.0 model of CCA, is emerging in New York. The growth of interest in the 2.0 model is based partly on recognition of the weakness of justifying CCA on the narrow value of consumer price savings, which is difficult to maintain in states with retail competition and presents a potential existential risk to CCAs that are configured under the 1.0 model. Arguments in favor of support for new rules for CCAs that would encourage them to evolve toward a 2.0 model are based on several

additional values: a contribution to the sustainability of the electricity system either through ESCO contracts or through local distributed energy, local economic development through the creation of energy efficiency and renewable energy programs, and greater local democratic control over energy decisions [67].

### 5.4. Summary: New York

In summary, a favorable pricing structure has facilitated the development of the shared solar industry in New York. Moreover, with some exceptions the utilities are prohibited from owning distributed generation, a provision that weakened their motivation to block shared solar development. Although the utilities did not welcome shared solar, they were not in a position to resist the change and to stop the crucial initial provision of payment under the net metering framework. The subsequent value of solar (VDER) definition of the rate of compensation could thwart the industry's development, as occurred in California with the unfavorable definition of the value-of-solar tariff, but the push-back from the coalition of supporters for shared solar, together with the governor's support for shared solar, created some room for shared solar to proceed within the net metering payment structure.

Although community choice has had much less time to mature in New York than in California, to date its development has tended to follow that of other states with retail competition, which have employed a 1.0 model. This model makes the CCAs in New York vulnerable to collapse when prices change because the primary justification for CCA is the consumer benefit of reduced costs. The rules for community choice in the state also limit the potential for communities to launch CCAs in the 2.0 model. Provisions that would facilitate the development of 2.0 have become the primary site of conflict in the state.

## 6. Discussion

This 2 × 2 comparison of community choice and shared solar in two U.S. states provides an analysis of conflicts of actors in the political field of state government rule-making (See Table 1.). For shared solar in California, utilities have not supported its development, and the Public Utilities Commission has established unfavorable pricing conditions. In contrast, although there was evidence of some utility opposition in New York at least during the initial ruling, the net metering pricing structure was favorable to shared solar development. However, net metering was reduced after the value-of-solar framework was adopted. Although the field of political conflict over rule-making is quite different, the conflict over rules is similar, and the legitimating value conflict is quite similar.

Why did shared solar receive more favorable treatment in New York? The solar developers had several advantages that they did not have in California. First, there are restrictions on the ability of the utilities to own distributed generation, which creates less direct competition. Second, Governor Cuomo embraced the political goal of transitioning the electricity system to a decentralized, innovation-oriented, and more sustainable regime, and he has influenced the Public Services Commission to implement the REV plan. Third, a strong and highly mobilized coalition of civil society organizations has maintained pressure on the Public Service Commission and the governor to support participatory rule-making processes and the policies that align with the values of equitable solar access, local job creation, local democratic control, and more sustainable energy [51]. Their goals thus converged with and overlapped with those of the governor. Fourth, because the energy mix of New York State has a much lower percentage of solar energy than in California, the perceived threats to grid reliability and the financial viability of the utilities were less salient. (These issues are described here as "perceived" because they can be resolved with policy that supports innovation such as storage and demand management.) Given this combination of factors, the state's Public Service Commission responded differently to the conflict between the utilities and the shared solar advocates than the California commission did.

The situation is different for community choice in the two states. For community choice in California, there is an intense and longstanding conflict between the utilities and community-choice organizations. The legislature has generally supported community choice, but the California Public Utilities Commission has tended to make decisions that were aligned with the positions of the utilities. Nevertheless, community choice received enough protection from the legislature that it has continued to grow in the state. As CCAs have become institutionalized, local governments and the CCAs themselves have been increasingly able to monitor and mobilize against unfavorable rulings from the Public Utilities Commission. Because of the particular history of California's restructuring process that led to the Enron scandal and the electricity crisis of 2000 and 2001, the state did not enact retail competition, and it did not completely separate utilities from ownership of generation. In this situation, the development of community choice results in direct defection of customers from the utilities. Thus, the underlying structure of the California market created conditions for strong competition between utilities and the CCAs. The structure of the market rules, and the threat of negative changes in the rules, also created conditions for a second value conflict beyond the one between the utilities and the CCAs; this second conflict occurs within CCAs between the limited 1.0 model and the 2.0 and 3.0 models.

In contrast, in New York, the development of community choice occurred within the framework of the already institutionalized system of retail competition, and CCAs included a contract with an ESCO. Thus, there is little change in the underlying system of retail competition, and the conflict between utilities and community-choice organizations is reduced. However, the ESCOs manage the supply contracts, and the CCAs do not have access to state funds for energy efficiency and renewable energy. Thus, the form of community choice to date is restricted to the 1.0 model, and a conflict has emerged over rules that would enable CCAs to evolve toward the 2.0 model or even to launch in a 2.0 mode.

These comparisons suggest some patterns that may be of general

**Table 1**
Summary of the 2 × 2 Comparative Analysis.

| | New York | California |
|---|---|---|
| **Shared Solar** | | |
| Actors | Some utility opposition | Strong utility opposition |
| Outcomes of rule-making conflicts | Initially favorable conditions with some retrenchment | Unfavorable conditions |
| Legitimating values in the political field | Equity (fair cost burdens) vs. equity (accessibility), economic development, sustainability, democratic decision-making | Equity (fair cost burdens) vs. equity (accessibility), economic development, sustainability, democratic decision-making |
| **Community Choice** | | |
| Actors | Limited conflict | Extensive and longstanding opposition |
| Outcomes of rule-making conflicts | Supportive but only for 1.0. | Protection from legislature; unfavorable conditions from state utilities commission |
| Legitimating values in the political field | Consumer price savings vs. economic development, sustainability, and democratic decision-making | System stability and equity (fair cost burdens) vs. consumer price savings, economic development, sustainability, democratic decision-making, risk management |

interest to practitioners, policymakers, and researchers who are interested in energy decentralization in other areas of the world. Although this study is limited to two types of energy decentralization in one country where there is partial restructuring of markets, the following generalizations emerge from this study that could be tested as hypotheses in the study of other countries and other types of energy decentralization:

1. Retail competition may reduce the opposition of the utilities to community choice programs, but it may also facilitate the limitation of those programs to a 1.0 model.
2. Full divestiture of the utilities from generation assets, including distributed generation, may reduce the opposition of the utilities to a wide range of distributed renewable energy programs, including shared solar.
3. Regulatory rule-making commissions will tend to undergo capture by utilities or at least alignment with the utilities' perception that emphasizes the risks and challenges of energy decentralization. Where capture or alignment occurs, advocates of energy decentralization will need to find other champions in the government who can exert pressure on the commissions, such as a sympathetic and visionary leader of the executive branch.
4. The legitimation of energy decentralization with more than the marketplace value of consumer price benefits, and instead with political and ecological values (equity, sustainability, economic development, local democratic accountability, and innovation), will help advocates of energy decentralization to recruit support and to counter potential political opposition from industry incumbents.
5. Energy decentralization can provide new models of energy governance, such as the 2.0 model of community choice, that may be especially adapted to the opportunities and risks of grid modernization and may offer new ways of meeting the managerial value of technical functioning and reliability.

## 7. Conclusion

As indicated in the previous section, this study has provided a comparative review of the different trajectories of two types of energy decentralization in two U.S. states. In doing so, the study solves the puzzle of why the two types developed differently, and it does so by demonstrating the importance of attention to institutional context in the analysis of decentralized energy systems. Moreover, the study uses the comparative case studies to suggest some general conditions within the context of restructured electricity markets that may enable decentralized energy to flourish and that, to the contrary, may also hobble its development.

In addition, the study provides a method for analyzing the institutional dimensions of energy decentralization. The combination of field theory and institutional logics theory with comparative analysis provides several benefits. First, it draws attention to a method that situates relationships between incumbents and new entrants in the underlying structural characteristics of the industrial field (i.e., whether or not it has retail competition or divestment of generation), which in turn shape the level of intensity of the conflict between economic actors over the rule-setting processes in the political field. Second, the framework shows how in the political field the actors must translate their self-interested concerns into broader values of consumer affordability, equity, democratic accountability, economic development, ecological sustainability, and system reliability. More than just a language that hides self-interested motivations, the values are points of reference in rhetorical efforts to convince others, and they provide guidelines for organizational development, such as the differences between 1.0, 2.0, and 3.0 models of community choice.

This combination of attention to the relations of competition or conflict that occur in the political field over market rules and attention to the values of the actors provides a balanced approach to the analysis of the institutional dimensions of energy decentralization and other aspects of energy politics and energy transitions. It can help the researcher to maintain a method for the analysis of the institutional dimensions of energy policy that does not reduce the complexities of the economics, design, and politics of energy decentralization to a game of self-interested actors or to technological exigencies. By combining this framework with a comparative perspective, it can also help to identify causal processes that may be of general interest to a wide range of problems and processes involving energy decentralization.

## Funding sources

This project was partially supported by the U.S. National Science Foundation, OISE-1743772, Partnerships for International Science and Engineering (PIRE) Program: "Science of Design for Societal-Scale Cyber-Physical Systems." Any opinions, findings, conclusions, or recommendations expressed here do not necessarily reflect the views of the National Science Foundation.

## Acknowledgements

We thank Samuel Golding of Community Choice Partners, Inc., for comments on community choice in California. Any mistakes or errors of interpretation are our responsibility.

## References

[1] Bohn D. Decentralised energy systems: state of the art and potentials. Int J Energy Technol Policy 2005;3:1–11.
[2] Karger CR, Hennings W. Sustainability evaluation of decentralised energy production. Renew Sustain Energy Rev 2009;13:583–93.
[3] Feldman D, Brockway AM, Ulrich E, Margolis R. Shared Solar. Current landscape, market potential, and the impact of federal securities regulation. Golden, CO: National Renewable Energy Laboratory Golden; 2015. No. NREL/TP-6A20-63892.
[4] Geels F. Regime resistance against low-carbon energy transitions: introducing politics and power into the multi-level perspective. Theory Cult Soc 2014;31(5):21–40.
[5] Coughlin J, Grove J, Irvine L, Jacobs JF, Phillips SJ, Moynihan L, Wiedman J. Guide to community solar: utility, private, and non-profit project development. US Department of Energy; 2011. https://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?article=1040&context=renew_pubs;. [Accessed 26 September 2019].
[6] Augustine P, McGavisk E. The next big thing in renewable energy: shared solar. Electr J 2016;29(4):36–42.
[7] Peters M, Fudge S, High-Pippert A, Carragher V, Hoffman SM. Community solar initiatives in the United States of America: comparisons with–and lessons for–the UK and other European countries. Energy Policy 2018;121:355–64.
[8] Prehoda E, Winkler R, Schelly C. Putting research to action: integrating collaborative governance and community-engaged research for community solar. Soc Sci 2019;8(11):1–24.
[9] Creamer E, Eadson W, van Veelen B, Pinker A, Tingey M, Braunholtz-Speight T. Community energy: entanglements of community, state, and private sector. Geogr Compass 2018;12(7):1–16.
[10] Mah DNY. Community solar energy initiatives in urban energy transitions: a comparative study of Foshan, China and Seoul, South Korea. Energy Res Soc Sci 2019;50:129–42.
[11] Booth S. Here comes the sun: how securities regulations cause a shadow on the growth of community solar in the United States. UCLA Law Rev 2013;61:760–811.
[12] Mey F, Diesendorf M, MacGill I. Can local government play a greater role for community renewable energy? A case study from Australia. Energy Res Soc Sci 2016;21:33–43.
[13] Chan G, Evans I, Grimley M, Ihde B, Mazumder P. Design choices and equity implications of community shared solar. Electr J 2017;30(9):7–41.
[14] Chan G, Grimley M, Ihde B, Evans I. The political economy of community solar: lessons from Minnesota. In: Riding the energy cycles, 35th USAEE/IAEE north American conference, nov 12-15. International Association for Energy Economics; 2017. https://www.usaee.org/usaee2017/submissions/OnlineProceedings/The%20Political%20Economy%20of%20Community%20Solar_draft170904%20USAEEE.pdf. [Accessed 26 September 2019].
[15] Funkhouser E, Blackburn G, Magee C, Rai V. Business model innovations for deploying distributed generation: the emerging landscape of community solar in the US. Energy Res Soc Sci 2015;10:90–101.
[16] Gattaciecca J, DeShazo JR, Trumbull K. The promise and challenges of community choice aggregation in California. Los Angeles: UCLA Luskin Center for Innovation; 2017. https://innovation.luskin.ucla.edu/sites/default/files/The%20Promises%20and%20Challenges%20of%20Community%20Choice%20Aggregation%20in%20CA.pdf. [Accessed 26 September 2019].
[17] DeShazo JR, Gattaciecca J, Trumbull K. The growth in community choice aggregation: impacts to California's grid. Los Angeles: UCLA Luskin Center for

Innovation; 2018. https://innovation.luskin.ucla.edu/wp-content/uploads/2019/03/The_Growth_in_Community_Choice_Aggregation.pdf. [Accessed 26 September 2019].
[18] Kennedy SF. "Greening" the mix through community choice. Los Angeles: UCLA Luskin School of Public Affairs; 2017. https://www.ioes.ucla.edu/wp-content/uploads/Community-Choice-Aggregation_final-June-2017.pdf. [Accessed 10 May 2019].
[19] Ruppert-Winkel C, Hussain W, Hauber J. Understanding the regional process of energy transition in Marin County, California: applying a three-phase-model based on case studies from Germany. Energy Res Soc Sci 2016;14:33–45.
[20] Hess DJ. Coalitions, framing, and the politics of energy transitions: local democracy and community choice in California. Energy Res Soc Sci 2019;50:38–50.
[21] Bourdieu P. The social structures of the Economy. Cambridge: Polity Press; 2005.
[22] Fligstein N, McAdam D. A theory of fields. Oxford: Oxford University Press; 2012.
[23] Breslau D. Designing a market-like entity: economics in the politics of market formation. Soc Stud Sci 2019;43(6):829–51.
[24] Geertz C. The Interpretation of cultures. New York: Basic Books; 1973.
[25] Thornton PH, Ocasio W, Lounsbury M. The institutional logics perspective: a new approach to culture, structures and process. Oxford, U.K.: Oxford University Press; 2012.
[26] Fuenfschilling L, Truffer B. The interplay of institutions, actors and technologies in socio-technical systems: an analysis of transformations in the Australian urban water sector. Technol Forecast Soc Chang 2016;103:298–312.
[27] Lounsbury M. A tale of two cities: competing logics and practice variation in the professionalizing of mutual funds. Acad Manag J 2007;50(2):289–307.
[28] York JG, Hargrave TJ, Pacheco DF. Converging winds: logic hybridization in the Colorado wind energy field. Acad Manag J 2016;59(2):579–610.
[29] California Energy Commission. Total system electric generation. 2018. https://www.energy.ca.gov/almanac/electricity_data/total_system_power.html. [Accessed 26 September 2019].
[30] Field K. $1 billion program aims to put solar on low income multifamily housing in California. Clean Technica; 2018. Aug. 31, https://cleantechnica.com/2018/08/31/1-billion-program-aims-to-put-solar-on-low-income-multifamily-housing-in-california/. [Accessed 26 September 2019].
[31] Field K. SCE proposes 5 new green energy programs to replace aging GTSR program. Cleantechnica; 2018. Oct. 8, https://cleantechnica.com/2018/10/08/sce-proposes-5-new-green-energy-programs-to-replace-aging-gtsr-program/. [Accessed 24 September 2019].
[32] Corfee K, Powers J, Romano A. Community solar: California's shared renewables at a crossroads. Oct, https://www.communitysolarvalueproject.com/uploads/2/7/0/3/27034867/201710_california_community_solar_paper.pdf. [Accessed 26 September 2019].
[33] California Public Utilities Commission. Investor-owned utility solar photovoltaic programs. https://www.cpuc.ca.gov/RPS_SPVP/. [Accessed 24 September 2019].
[34] California Public Utilities Commission. Green tariff/shared renewables program. http://www.cpuc.ca.gov/general.aspx?id=12181. [Accessed 26 September 2019].
[35] Orion B. A rough start, possible reforms for California's community solar program. GreenTech Media; 2017. Apr. 18, https://www.greentechmedia.com/articles/read/A-Rough-Start-Possible-Reforms-for-Californias-Community-Solar-Program. [Accessed 24 September 2019].
[36] Trabish H. A tale of 2 states: Massachusetts and California provide different lessons on growing community solar. Utility Dive. Nov. 20, https://www.utilitydive.com/news/a-tale-of-2-states-massachusetts-and-california-provide-different-lessons/511598/. [Accessed 26 September 2019].
[37] Morris JD. California fires add fuel to the push for more solar energy. San Francisco Chronicle, Jan. 4, https://www.govtech.com/fs/infrastructure/California-Fires-Add-Fuel-to-the-Push-for-More-Solar-Energy.html. [Accessed 26 September 2019].
[38] Stark K. Inside California's community solar experiment. Greentech Media; 2019. Mar. 18, https://www.greentechmedia.com/articles/read/inside-californias-community-solar-experiment#gs.2qhtol. [Accessed 26 September 2019].
[39] Smithwood B. To Expand clean energy access to all Californians, it's time to expand net metering. Green Tech Media; 2018. Dec. 13, https://www.greentechmedia.com/articles/read/its-time-to-expand-california-net-metering#gs.2tztbn. [Accessed 26 September 2019].
[40] California Public Utilities Commission. Consumer and retail choice, the role of the utility, and an evolving regulatory framework, Staff White Paper. http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/News_and_Updates/Retail%20Choice%20White%20Paper%205%208%2017.pdf. [Accessed 26 September 2019].
[41] Fenn P, Golding S. Community Choice 2.0. Strategies for distributed energy resources in CCA environments. https://web.archive.org/web/20141130084424/http://localpower.com/whitepaperCopyright2011byLocalPowerInc.pdf. [Accessed 26 September 2019].
[42] Golding S. Advanced energy risk management services for South Bay Clean Power: questions & answers with five portfolio managers. Community Choice Partners, Inc.; 2017. https://app.box.com/s/sy9126fv2c89me64fsbu58osojcpu3as. [Accessed 26 September 2019].
[43] Golding S. Comments on the draft "Green Book": the theory and practice of community choice in California. Community Choice Partners, Inc.; 2018. Jun. 11, https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/Community%20Choice%20Partners_DraftGreenBookComments.pdf. [Accessed 26 September 2019].
[44] Golding S. Understanding the community choice revolution in California. Community Choice Partners, Inc; 2018. https://www.linkedin.com/pulse/understanding-community-choice-energy-revolution-samuel-golding. [Accessed 26 September 2019].
[45] Golding S. CCE 2.0 & 3.0 Tutorial workshop agenda. Community Choice Partners, Inc; 2018. https://app.box.com/s/vxxb2xywpycq2daeypwtffwa8nohu98i. [Accessed 26 September 2019].
[46] California Public Utilities Commission. Alternate proposed decision modifying the California power charge indifference adjustment. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M232/K140/232140817.PDF. [Accessed 25 September 2019].
[47] CalCCA. California CCAs seek rehearing of CPUC's inequitable 'exit fee' decision. Nov. 18, https://cal-cca.org/california-ccas-seek-rehearing-of-cpucs-inequitable-exit-fee-decision/. [Accessed 25 September 2019].
[48] Californians for Energy Choice. Press release: diverse coalition applauds CPUC unanimous vote to help ensure all electricity customers contribute equitably to state's clean energy goals. https://equitablechoice.com/press-release-diverse-coalition-applauds-cpuc-unanimous-vote-help-ensure-electricity-customers-contribute-equitably-states-clean-energy-goals/. [Accessed 25 September 2019].
[49] NYSERDA. Patterns and trends New York energy profiles: 2002-2016. Final Report. 2019. https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Patterns-and-Trends. [Accessed 26 September 2019].
[50] NY-SUN. Affordable solar predevelopment and technical assistance. https://www.nyserda.ny.gov/All%20Programs/Programs/NY%20Sun/Communities%20and%20Local%20Governments/Predevelopment%20and%20Technical%20Assistance. [Accessed 26 September 2019].
[51] Hess DJ. Energy democracy and social movements: a multi-coalition perspective on the politics of sustainability transitions. Energy Res Soc Sci 2018;40:177–89.
[52] Burke MJ, Stephens JC. Energy democracy: goals and policy instruments for sociotechnical transitions. Energy Res Soc Sci 2017;33:35–48.
[53] New York Energy Democracy Alliance. New York energy democracy alliance, formation, organization, and moving our agenda. A Report from Our First 18 Months, http://energydemocracyny.org/wpcontent/uploads/EDA_Phase_1_report_final.pdf. [Accessed 26 September 2019].
[54] State of New York Public Service Commission. Order establishing a community distributed generation program and making other findings. CASE 15-E-0082. Jul. 17, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b76520435-25ED-4B84-8477-6433CE88DA86%7d. [Accessed 25 September 2019].
[55] State of New York Public Service Commission. Order adopting regulatory framework and implementation plan: case 14-M-0101. Feb. 15, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B0B599D87-445B-4197-9815-24C27623A6A0%7D. [Accessed 25 September 2019].
[56] Trabish H. Inside New York's aggressive new community shared renewables program. Utility Dive. Jul. 30, https://www.utilitydive.com/news/inside-new-yorks-aggressive-new-community-shared-renewables-program/402896/. [Accessed 26 September 2019].
[57] McDermott M, Orr S. Soak up the sun: solar farms posed to proliferate in NY State. Rochester Democrat & Chronicle; 2018. Jul. 18, https://www.democratandchronicle.com/story/news/2018/07/18/solar-farms-coming-rochester/775756002/. [Accessed 26 September 2019].
[58] State of New York Public Service Commission. Order on net metering energy transition, phase one of value of distributed energy resources, and related matters, Cases 15-E-0751 and 15-E-0082. Mar. 9, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b5B69628E-2928-44A9-B83E-65CEA7326428%7d. [Accessed 10 May 2019].
[59] Solar Energy Industries Association. Re: case 15-E-0751 Regarding the VDER phase 1 implementation plans of the joint utilities. 2017. https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=E9C9A9BA-662C-4632-9B0E-211BE8CDEB7D [accessed 26 September 2019].
[60] Metzger J. PSC issues order changing the way solar customers are compensated for their power. Citizens for Local Power. 2017. Mar. 15, https://citizensforlocalpower.org/news-and-events/2017/3/15/psc-issues-order-changing-the-way-solar-ownerscustomers-are-compensated-for-their-power. [Accessed 26 September 2019].
[61] Citizens for Local Power. Governor Cuomo, stop Darth VDER from killing solar in New York. Sep. 25, https://citizensforlocalpower.org/news-and-events/2018/9/25/governor-cuomo-stop-darth-vder-from-killing-solar-in-new-york. [Accessed 26 September 2019].
[62] Distributed Sun LLC. A growing crisis: the critical deployment of clean, local energy in New York. 2018. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=9550B77F-7DA7-4228-8AF1-50392C86317D [accessed 26 September 2019].
[63] State of New York Public Service Commission. Order regarding value stack compensation. Case 15-E-0751. Apr. 18, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b5B69628E-2928-44A9-B83E-65CEA7326428%7d. [Accessed 25 September 2019].
[64] Misbrenner K. New York PSC expands access to solar through revised VDER tariff. Solar Power World. https://www.solarpowerworldonline.com/2019/04/new-york-psc-revised-vder-tariff/. [Accessed 10 May 2019].
[65] Walton R. New York updates distributed solar tariff, clearing way for 1 GW of new generation. Utility Dive. Apr. 23, https://www.utilitydive.com/news/new-york-updates-distributed-solar-tariff-clearing-path-for-1-gw-of-new-ge/553229/. [Accessed 26 September 2019].

[66] Interstate Renewable Energy Council. Scorecard: IREC's national shared renewables scorecard. https://sharedrenewablesscorecard.org/. [Accessed 26 September 2019].
[67] Clean Energy Advisory Council. Community choice aggregation policy recommendations report. In: Jan. 16. Community choice aggregation (CCA) subgroup of the voluntary investment in other market development (VIOMD) working group for the clean energy advisory Council (CEAC) steering committee. New York State Public Service Commission; 2018. https://drive.google.com/file/d/1CNScCXD5_MoWYi5rwLSiLYioI2cDQztu/edit. [Accessed 26 September 2019].
[68] State of New York Public Service Commission. Order authorizing framework for community choice opt-out program. Case 14-M-0224. Apr. 24, https://drive.google.com/file/d/0B9GmQi_T33q4TzZNOWd0X3RRQ0E/view. [Accessed 25 September 2019].
[69] Citizens for Local Power. CCA in New York leaves room for improvement. https://citizensforlocalpower.org/cca. [Accessed 26 September 2019].
[70] State of New York Public Service Commission. PSC approves 4th community choice aggregation plan for upstate New York, Expanding Options for Clean, Affordable Energy. Mar. 15, http://www3.dps.ny.gov/pscweb/WebFileRoom.nsf/ArticlesByCategory/C20F8D21578D011485258251005ED900/$File/pr18015.pdf?OpenElement. [Accessed 26 September 2019].

**David J. Hess** is the James Thornton Fant Chair in Sustainability Studies and Professor of Sociology at Vanderbilt University, where he is also the Associate Director of the Vanderbilt Institute for Energy and Environment and the Director of the Program in Environmental and Sustainability Studies (www.davidjhess.net).

**Dasom Lee** holds a bachelor's degree in sociology from London School of Economics and a master's degree in economics from Kyoto University, and she is currently a Ph.D. candidate in sociology at Vanderbilt. Her dissertation research is on corporate social and environmental responsibility.