Utility-scale Solar in New York State:

An exploration of public response, policy, and justice

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ABSTRACT

UTILITY-SCALE SOLAR IN NEW YORK STATE: AN EXPLORATION OF PUBLIC RESPONSE, POLICY, AND JUSTICE

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Global climate change threatens lives, livelihoods, and ecological systems across the globe, necessitating drastic transformation to energy production and consumption patterns. One of the side-effects of clean energy policies is increasing land development pressure in primarily rural places from utility-scale solar (USS) energy production facilities. USS facilities are not an unequivocal public good, and their social and political dimensions remain poorly documented and understood. This study uses mixed methods to better understand public attitudes and opposition to USS in upstate New York and critically examine the distributive and procedural justice of state energy policies. The results of a mail survey of upstate residents (n=575) reveal support for utility scale solar is significantly lower than support for community or rooftop solar. For many, USS represents an industrial activity that negatively impacts the rural landscape. Support for USS is often relational, in that many residents question the need for utility-scale development in rural landscapes when the same technology could be deployed on rooftops or other already developed spaces. A sub-sample of survey respondents (n = 421) live in counties with substantial proposed USS development in northern and western New York. We find that 42% of those residents oppose USS installations in or near their local communities. This opposition is shaped by perceived energy colonialism – the idea that rural areas are unfairly treated as internal colonies of urban demand centers to support the energy transition. Most notably, perceived distributive and procedural injustice, along with place attachment have the strongest effect on opposition, while socio-demographics, political ideology, and climate change belief were insignificant. Next, drawing on qualitative data from policy documents, observations of public meetings, and interviews with key informants, I identify procedural and distributive justice concerns are shaped by three state policy structures: the preemption of local land use authority, long-term contract awards, and changes to tax regulations. This study highlights tension between energy justice principles and large-scale renewable energy development; policies to support a more just transition need to engage more collaborative decision-making processes and safeguard community economic benefits from USS development. Finally, the limitations of this work, as well as implications for future research are discussed.

BIOGRAPHICAL SKETCH

Roberta (Robi) Nilson was born and raised in the western foothills of the Cascades in Washington State. She attended Washington State University and completed a Bachelor of Science in Environmental Science in 2012. She served in the U.S. Peace Corps as an environmental education volunteer in Nicaragua from 2012 to 2014. She returned to complete a Master of Public Policy at Oregon State University from 2015 to 2017. She worked as a seasonal park ranger with the National Park Service for four summers, and as a research analyst with the Center for Research on Lifelong STEM Learning for one year prior to beginning her doctoral studies at Cornell University in 2018.

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Table of Contents

I. Introduction

Undoubtedly, global climate change threatens lives, livelihoods, and ecological systems across the globe. Generating electricity from solar energy is increasingly popular, and thus highly pertinent to climate and energy policy discussions. The growth of the solar industry is attributed to increased public demand, state policy support for renewable energy (such as Renewable Portfolio Standards or RPS), decreased market costs, and federal tax incentives (Ardani et al. 2021; Mulvaney 2019). In the U.S., solar only satisfied about 3% of electricity demand in 2020. Under existing state and federal clean energy policies – policies already in place as of June 2020—the installed solar capacity is expected to increase by a factor of seven by 2050 (Ardani et al. 2021). If the U.S. goes further in adapting more aggressive decarbonization policies that many scientists believe are necessary to mitigate climate change, substantially more solar is likely to be developed.

Solar energy can be deployed either as a distributed energy resource or at a utility-scale. Distributed solar primarily utilizes photovoltaic solar panels and are often deployed on rooftops or in community projects. These systems are distinguished as "distributed" because they are developed within a local electricity distribution network. This contrasts to utility-scale facilities which are directly connected to the high-voltage transmission grid, otherwise known as "grid-connected". Utility-scale facilities commonly utilize either photovoltaic solar panels or concentrating solar power (CSP) technology. The former, photovoltaic facilities are becoming increasingly more prevalent, and are the core focus of this research. At the end of 2020, photovoltaic utility-scale solar (here-in after 'USS') accounted for about 60 percent of installed solar capacity in the U.S., with 37 percent in distributed photovoltaics and only about 3 percent in utility CSP (Ardani et al. 2021).

Is USS a "public good"?

There is often an underlying assumption or characterization of large-scale renewable energy facilities, and particularly USS energy facilities, as a "public good" or within the "public interest" based on their potential to reduce climate impacts. For example, Karlsson-Vinkhuyzen et al. note: "An energy system that has low or no carbon intensity would be a public good for all humanity because it would give the non-excludable and non-rival benefit of a less dangerous degree of climate change (2012:13)." The idea is that a transition to energy production systems that emit less greenhouse gases would amount better global circumstances. This perspective underlies the characterization (e.g. representation) of the development of large-scale renewable energy facilities as a "public good landscape change (Sherren 2021)." This representation impacts policy implementation as well. A Judge of the Superior Court of New York recently noted, "[F]or it is manifest that development of major renewable energy facilities based on wind and solar resources to provide electrical generation is a reasoned means to combat climate change, and wholly compatible with the public interest (Lynch 2021:36)." This logic provided critical support for the ruling issued in the case regarding renewable energy siting regulations.

The characterization of large-scale renewable energy facilities as a "public good" has been critical to the way energy social scientists have theorized about public responses (Sherren 2021). Renewable energy viewed primarily as a public good underlies the focus and goal of much of the so-called social acceptance research: to figure out how to overcome the "barrier" (Boudet 2019; Wüstenhagen, Wolsink, and Bürer 2007) of social acceptance. By understanding renewable energy as a public good, it seems to naturally follow that any public resistance or questioning about the development of renewable energy is not in line with the public good, and therefore this "barrier" should be broken down or overcome. Articles about public response to

USS facilities often initiate by framing the research as aimed at addressing the problem of social acceptance (Pascaris et al. 2021) because it interferes with the development of a “promising” energy source (Carlisle et al. 2015, 2016).

Unfortunately, large-scale renewable energy facilities are not unequivocally a “public good”. As noted by Sherren, “they do not *exclusively* represent public goods but also economic benefits to developers and town councils (2021:19 emphasis in original).” In addition to the discussion of economic benefits, there are other features that complicate the framing of USS as a “public good”, namely the land use trade-offs, global environmental impacts related to mining and manufacture of solar panels, and the question of whether new renewable energy facilities lead to actual reductions in the use of fossil fuels or other forms of energy. However important this conversation about whether USS represents a “public good”, many scholars largely “set it aside (Sherren 2021:19)” in theoretical development and empirical explorations of public response to renewable energy development. I will next discuss each of these topics in turn to build the case for social research to engage more directly with the complexity of framing USS as a “public good”.

Land use trade-offs

The land use footprint of USS is substantial, and larger than for most other forms of energy development (van de Ven et al. 2021). For example, one modern average-sized on-shore wind turbine with blades about 50 meters or 160 feet can produce approximately the same amount of electricity as 17 acres of solar panels (EWEA 2016; Moore et al. 2022). Utility-scale wind energy facilities may often encompass the same overall project footprint area as a USS facility, but the configuration of wind turbines is much more dispersed allowing other activities such as agriculture to continue on the ground more easily. Wind turbines only necessitate about

10% of the total project area while solar panels are often placed in highly clustered arrangements necessitating up to 90% of a project area (Kiesecker et al. 2019).

The land use requirements of USS are not necessarily a problem when compared to total land areas. “Nationally, for a scenario with decarbonization, ambitious electrification targets, and enhanced demand flexibility, the U.S. Department of Energy (DOE) expects solar PV will require 3.58 million acres by 2030 and 10.29 million acres by 2050 (Moore et al. 2022:2).” Given the total land area of the 48 contiguous states is 1.9 billion acres, there is plenty of space for these levels of development from a purely spatial standpoint.

Still, which land will be used is still important to consider. As Kiesecker et al. warn, “If sited with the goal of maximizing production, renewable energy may negatively impact biodiversity and carbon storage (Kiesecker et al. 2019:1).” The clearing of natural lands for construction of USS facilities results in direct habitat loss or fragmentation and removal of aboveground carbon storage. In a global assessment of the land use impacts of the wind and solar energy expansion needed to achieve the goals of the Paris Climate Agreement, the authors forecast that more than 11 million hectares of natural lands, including impacts to about 2.5% of key biodiversity areas globally, and an associated substantial reduction in stored carbon amounting to about 9% of the greenhouse gas emission reduction targets. Admittedly, this forecasting presents a “worst case scenario”; there are plenty of opportunities to minimize these impacts through planning and regulation on the project siting (Kiesecker et al. 2019).

A key uncertainty regarding land use is the extent to which USS may compete with agriculture. Preliminary research of USS proposals in New York state found that 46% of the parcel acreage of proposed project boundaries is classified as agricultural (Kay, Nilson, and Stedman 2020). This is in line with the observed solar siting tendencies in Europe, India, Japan and South Korea; a recent study found that solar primarily competes with used, degraded, and potential cropland in these regions (van de Ven et al. 2021). There are substantial opportunities for solar to be used in conjunction with agriculture (also referred to as agrivoltaic or dual-use practices), such as through using the land around panels for sheep grazing or pollinator habitat. But the practical potential of these options, especially with regard to their potential to be deployed at utility-scale is not well understood (Moore et al. 2022). This uncertainty is perhaps best exemplified by a new funding opportunity by the U.S. Solar Energy Technologies Office, the Foundational Agrivoltaic Research for Megawatt Scale (FARMS) program, designed to fund projects that will: "examine how agrivoltaics can ***scale up*** to provide new economic opportunities to farmers, rural communities, and the solar industry (SETO 2022 emphasis added)." The solicitation goes on to explain that existing research on this topic is minimal. Relatedly, the impact of USS and the potential agrivoltaic options on the soil is not well understood: "How land conversion from agriculture to solar power will affect soil quality, soil carbon sequestration, and nutrient runoff are complex and poorly understood topics (Moore et al. 2022:47)." Similarly, van de Ven et al. note, "The impact of USS infrastructures on local microclimates is a field in early research stages" and existing research is "too uncertain to draw robust assumptions (2021:9)."

Relatedly, recent research suggests that the land use efficiency (LUE) of operation USS facilities is approximately six times lower than initial estimates (van de Ven et al. 2021), indicating that we are only just beginning to fully comprehend the full land use impacts of these facilities. The various other land use options for the areas where USS can be located, e.g. biodiversity conservation, carbon storage, agricultural production, natural recreational spaces, etc., are all also equally (if not more) in the public interest as renewable energy production, further complicating the characterization of USS as a public good.

Global externalities

The manufacturing and disposal of photovoltaic panels presents a variety of environmental and labor justice concerns. Panels are composed of hazardous materials, and their manufacturing occurs primarily in Global South nations with poor regulations and/or lax enforcement. Byproducts of the manufacturing process have led to substantial water and land pollution in China. Furthermore, with a useful life of approximately 30 years, we can expect a substantial increase in e-waste that will need to be carefully recycled in the coming decades. Based on current and historical global trends the burden of this waste is likely to primarily affect nations of the Global South or marginalized communities of the Global North (Bell 2017; Mulvaney 2019). Similarly, part of Germany's *Energiewende*, the national effort to transition to a low-carbon energy system, included optimistic plans to revitalize an industrial region in the eastern part of the county to manufacture photovoltaics, a so-called Solar Valley. These plans were curtailed by the mass subsidized production of panels from China starting around 2008, resulting in increased political tensions, economic decline and peripheralization for the region (Brock, Sovacool, and Hook 2021). These examples highlight the global externalities associated with increased use of photovoltaic solar, demonstrating that importance of weighing the public goods with the harms.

Energy additions and rebounds

Another important consideration for whether new USS development is a public good is whether bringing these facilities online actually represents a replacement of other energy sources, such as fossil fuels. York and Bell find that this is not always the case. From 1960 to 2009 across most nations of the word, “each unit of total national energy use from non fossil-fuel sources displaced less than one-quarter of a unit of fossil fuel energy use (York 2012:441).” Expanding energy consumption has largely outpaced the rate of transition to cleaner fuel types. While the proportion of energy supplied by renewable sources has increased in recent years, this does not always mean that new renewable generation substitutes for other energy sources. It often just supplies for new demand creating a historical pattern of energy additions rather than energy transitions (York and Bell 2019). This is directly relevant to the discussion of whether new renewable energy facilities represent clear public goods – if their electricity is used largely to supply for increased energy consumption, the public good label is certainly less convincing.

Interestingly, this idea is like that of the rebound effect – a concept that is quite common to energy policy and efficiency literature but has largely been disregarded in the larger conversation about renewable energy transitions and the study of public acceptance. The rebound effect describes how increases in energy efficiency do not generally result in the predicted decrease in overall consumption because human behavior changes in response to the more efficient technology. For example, a 10% rebound effect would mean that 10% of the energy efficiency improvement from an improved technology is offset by increased consumption (Berkhout, Muskens, and W. Velthuijsen 2000). This rebound effect can be substantial, for example, a recent study found that consumers in Isreal who purchased energy-efficient vehicles increased their car usage over time, resulting in a rebound effect of 62% (Steren, Rubin, and Rosenzweig 2022). There is similar evidence showing increased household energy consumption among homeowners who install solar panels, resulting in a rebound effects of about 20% (Deng and Newton 2017; Qiu, Kahn, and Xing 2019). These rebounds may be explained by the cost savings experienced from the technological improvement, and also in part by the idea of moral licensing, or the sense that increased energy consumption is justified on the basis that one has made a positive environmental contribution by installing solar arrays or purchasing a more efficient vehicle (Galvin 2020). The rebound literature has focused on individual-level consumption and trends which collectively result in large effects, but there is certainly potential to think about the possibility of collective rebound effects from state or national level decarbonization efforts that might be reinforced socially and politically (Galvin, Dütschke, and Weiß 2021). This discussion underscores how the energy transition is clearly not a purely technological challenge (Stedman and Nilson 2021), again further complicating the public good characterization.

Rural Just Transition

These various factors help demonstrate that it is an oversimplification to claim that USS represents a "public good". This has direct implication for imagining a 'just transition'– or a fair and equitable global process towards a post-carbon society (McCauley and Heffron 2018). The just transition scholarship is motivated by a fundamental understanding that while a low-carbon energy system powered by solar or other renewable technologies may reduce our climate problems, there is no guarantee such a system would be more economically equitable or socially just (Bell, Daggett, and Labuski 2020; Carley and Konisky 2020; Eames and Hunt 2013; Rasch and Kohne 2017).

Many scholars and social justice activists are making significant strides in defining a vision and principles for a just transition (see, e.g. Cha et al. 2019; Mascarenhas-Swan 2017; McCauley and Heffron 2018; Newell and Mulvaney 2013; and Wang and Lo 2021 for a recent review). For example, Cha et al. (2019) define four pillars as a roadmap for a just transition: 1) strong government support for policies that support displaced fossil fuel workers in the short term, and restructure local economies and transform former fossil fuel sites, 2) dedicated funding streams for programs such as wage displacement and seeding new business development and working re-training programs, 3) strong diverse coalitions in which workers and communities work together on plans for a transition before a fossil fuel facility is closed, and finally 4) visioning for economic diversification so that future community economies are not reliant on a single industry. While these pillars are clearly important considerations, they are focused specifically on transition for current fossil fuel dependent workers and communities. They do little to clarify what the just transition principles mean for planning and siting new renewable energy generation. Other visions for a just transition emphasize the need to focus on shifting from an extractive to a regenerative economy (Mascarenhas-Swan 2017). This idea seems to imply that profit-driven private large-scale renewable energy development would not coincide with this vision but does not directly make this point or provide a clear pathway for meeting our energy (and justice) needs within the existing market economy.

These existing efforts fall short of providing a concrete vision of a just transition for rural America (Harfmann, Nilson, and Zastoupil under review), and in particular, whether and under what conditions USS fits within this vision. For example, Cha et al. acknowledge their four pillars are meant to be a starting point for larger visioning of the just transition, and note in particular that future research should "focus on the specific needs of rural communities (2019:5)." The just transition vision has tended towards urban-centrism, based largely on its roots in the labor movement and environmental justice activism. The main examples of just transition scholarship focusing on rural issues is when discussing job-related needs of fossil-fuel workers and communities in transition. There just transition vision has not adequately attended to the issues and concerns of rural communities that are potential sites of new renewable energy production, in particular those that are not traditionally "energy communities" (Harfmann et al. under review).

This is not to say that no scholarship has focused on rural sites of large-scale energy development with an explicit justice lens. As one example, there is a growing body of scholarship critiquing large-scale wind development in the Isthmus of Tehuantepec, Mexico. Avila-Calero (2017) outlines how the state-sponsored neoliberal approach to wind development lacked formal consultation with local indigenous communities and produced illegal and unfair leasing contracts. Others note how the Mexican government's embrace of wind development as part of a "green energy revolution" repeats historical patterns of oppression between elite and marginalized communities within the country (Ramirez and Böhm 2021). There are also documented failures to fulfill promises of developing a regional manufacturing facility for wind turbine production, wide ranging societal and environmental impacts from construction, and procedural injustices experienced by indigenous communities (Mejía-Montero et al. 2021). Select case examples also suggest there has been insufficient regard for public involvement in siting and planning decisions of large-scale solar facilities in the American West (Mulvaney 2019) and Morocco (Rignall 2016). While doing a good job of pointing to rural concerns, this research does not fully define a vision for a just transition inclusive of rural experiences and concerns.

Part of the reason for this lack of a rural focus has been inadequate focus on energy topics in rural scholarship. Social consequences related to energy have dramatic impacts on rural people and places, and there is disproportionate opportunity in rural areas to accommodate energy generation facilities. Meanwhile, there is disproportionate consumption of energy or the products of energy in urban spaces, making energy activities central to the relationship between rural and urban society. Despite recognizing this trend, rural social science has fallen short of embracing energy issues as a dominant concern of the field (Beckley 2017). This dissertation takes aim at helping fill this gap with a rural justice lens that steers clear of framing USS as an unequivocal public good and public opposition as its barrier.

Theoretical and methodological background

The approach of this research follows constructivism: the understanding that social reality is constructed through shared understandings among individuals of each other's actions and intentions (Berger and Luckmann 1990). Humans develop routines to handle common circumstances efficiently and without much thought. When faced with new situations for which our commonsense knowledge has not routinized, we recognize a potential problem. Sometimes, these situations are quickly understood and "reintegrated into the unproblematic routines of everyday life (Berger and Luckmann 1990:24)." In other cases, some situations are outside of one's experience and need be processed to be understood. Social representations theory (SRT) provides explanation for how this cognitive processing happens, first and foremost through the mechanism of anchoring. Anchoring describes how something, e.g a situation, object, social process, is given meaning by being mentally placed into a category that people already understand (Moscovici 2000; Stedman and Nilson 2021). It is anchored to a collection of other social objects to help us make sense of it and decide how we will respond.

SRT draws upon the Durkheimian understandings of representations as both social and individual. For Durkheim, representations are categories of human thought which do not take fixed, durable forms but rather are subject to change with places and time. Both individuals and social groups can develop representations, these are inseparable as people are both individual and social at the same time: “So between these two sorts of representations there is all the difference which exists between the individual and the social, and one can no more derive the second from the first than he can deduce society from the individual, the whole from the part, the complex from the simple (Durkheim 1965:28).” When new representations are forming, people engage in discussion with other members of their social groups and gather information from other sources such as the media. These collective actions make new the process of forming new representations social (Wagner and Hayes 2005).

Social constructions and representations impact action, as individuals act so as to modify the perceived social reality, and how this reality compares to imagined alternatives (Berger and Luckmann 1990). While SRT is only directly engaged in the first article (Chapter 2); social constructivism underlies the approach to the full dissertation. The methods utilized, including the survey and qualitative observations, measure individual perceptions and related processes which are based upon an understanding that society is socially constructed. These data collection strategies are based on perceptions of solar energy such as support and opposition to solar energy, and whether the development of USS fulfills ideas of procedural and distributive justice. These perceptions make up key parts of what USS *represents,* and these representations are important to understand as they shape what people believe about USS, and how they are likely to act: “People behave according to what they believe the system is, what they wish for it to be, and the magnitude and nature of the gap between the two (Stedman 2016:898).”

Chapters 2-4 provide more detailed information on the methodology engaged for each step of the dissertation. Overall, the research utilized a flexible approach, which was necessary given that the commitment for this project to be “real world research (Robson 2011),” engaging with a policy issue in real-time. Mixed methodology is based on the philosophical foundation of pragmatism (Creswell and Clark 2017). Pragmatism suggests multiple paradigms (e.g. positivism and constructivism) can be used to address research problems (Teddlie and Tashakkori 2012). The research initiated with qualitative, ethnographic observations which were interpreted to formulate the second, deductive stage of survey data collection and analysis. The approach to analysis was dialogical – meaning a dialogue between observations and theory with both inductive (field work) and deductive steps (survey) (Ashwood 2018a; Orne and Bell 2015).

Research questions

This dissertation is focused on developing a better understanding of the social dynamics (e.g. public response, policy landscape, justice concerns) associated with utility-scale solar development in rural upstate New York. Broadly, I ask what does utility-scale solar development *represent* for the people and communities proximal to proposed development, and more broadly for all New Yorkers? This topic is tackled with three distinct research articles, which respond to the following questions:

- Does support for solar energy vary based on the scale of development (rooftop, community, and utility) or region of residence (west, north, Albany)?
- What variables are related to opposition of local USS development?
- What are the key state policies shaping USS development in New York state, and how are these related to procedural and distributive injustice?

These questions help contribute to developing an understanding of USS as more than an unequivocal "public good" and provide insights for defining what a just transition means for rural places.

II. Are big and small solar separate things?: The importance of scale in public support for solar energy development in upstate New York.[1]

Abstract

In 2019, solar energy made up the largest share of new electricity-generating capacity in the U.S. This growth is increasingly driven by large "utility-scale" projects. Although data from public opinion polls indicate an overall high level of support for 'solar energy', generically framed, these polls rarely, if ever, consider the issue of scale of the proposed projects. This is a crucial gap: in response, our work explores public preferences for three distinct scales of solar energy. Support was measured with a mail survey implemented in three regions of Upstate New York in the fall of 2020. A total of 575 residents responded to the survey for a response rate of 18.4%. We find that support for utility scale solar is significantly lower than support for community or rooftop solar. The survey findings are complemented by fieldwork (interviews, public comments, editorials) which demonstrate that direct experience with utility development in or near one's community helps spur public discourse and the subsequent formation of better developed attitudes towards utility solar. Opposition to utility solar is more common among residents in Western New York, where development is the most active. Furthermore, many residents are categorizing utility solar as an industrial activity that would negatively impact the existing rural landscape, and furthermore questioning the need for such development when the same technology could be deployed on rooftops or other already developed spaces. We suggest that

[1] Published article: Nilson, R., & Stedman, R. (2022). Are big and small solar separate things?: The importance of scale in public support for solar energy development in upstate New York. *Energy Research & Social Science*, *86*, 102449. https://doi.org/10.1016/j.erss.2021.102449

more pro-active attention to the scale of solar development is pertinent to understanding public responses and informing public engagement.

Key words: solar energy, energy transition, utility-scale solar, social acceptance, social representations

1. Introduction

It is around nine p.m. in a small town in western New York State, two hours into a packed and tense board meeting that will end up lasting over three hours. Thomas, a middle-aged white man, self-described as an entrepreneur who has lived in the town for about 40 years, is giving a short public statement in the second round of the evening's public comments. He apologizes for not being as informed as many of his fellow residents in attendance, as he has only recently heard about the town's proposed solar projects, the impetus for the night's meeting. However, from his point of view, there is something he finds confusing. Seeking clarification, he asks, "Why are we not talking about big solar and small solar as separate things?" He notes that most residents who oppose increased solar development invoke the really large projects. He urges the town board to consider breaking things down into "two chunks", or two classifications of 'big' versus 'small' solar that could be discussed separately, as this could facilitate more fruitful deliberation and help resolve conflicts. In conclusion, he questions the board: "why not establish some clear definitions of 'big' and 'small' and establish rules for them separately?" (field notes, October 9, 2019).

This vignette underscores how upstate New Yorkers have been taken by surprise by the significant growth of the large-scale photovoltaic solar industry in their region. To be clear, none of the 'big' utility-scale solar projects that Thomas mentioned have been constructed yet, but their prospective development comprises a key part of the state's plans for achieving a decarbonized electric grid by 2040. As we observed in this town meeting, familiarity with local proposed utility-scale projects is calling attention to the issue of project scale and leading residents to desire local regulations that would treat different scales of solar development separately. We invoke this story here to call attention to the importance of the direct experience with proposed local projects scale in shaping public responses to solar development. In this study, we explore public perceptions of solar development in upstate New York, a region where there is substantial solar development activity (i.e., facilities undergoing siting review, but no existing constructed large-scale projects) with both qualitative fieldwork and a mail survey. From the survey data, we compare public preferences for different scales of solar development and discuss regional trends in these preferences. Qualitative fieldwork, including observations such as that described here, complement our survey data to highlight relational acceptance and developing representations of utility solar among upstate New Yorkers when exposed to local proposals.

2. Background and theoretical framework

2.1 The Move towards Solar

The rise in public support for alternatives to fossil fuels, associated renewable energy mandates and policy incentives, and decreased market costs are all contributing to substantial growth in the development of photovoltaic (PV) solar panels. For example, in the U.S., solar made up the largest share of new electricity-generating capacity in 2019 accounting for 40 percent of total additions, followed by natural gas (32 percent) and wind (18 percent). Crucially for our work, while there is continued increased growth of rooftop solar or smaller distributed generation projects, a majority of the recent solar industry growth can be attributed to large PV projects in which thousands (or hundreds of thousands) of panels are installed on open land (Wood MacKenzie and SEIA 2020). The development of these large PV solar projects is starting to garner attention from social scientists in the U.S. (Mulvaney 2019; Pascaris et al. 2021), Europe (Roddis et al. 2018, 2020), Africa (Hansen et al. 2018), and Australia (Measham et al. 2021).

All PV development relies on the same fundamental technology – the use of photovoltaic solar panels to convert sunlight into usable electricity. But these panels are deployed in various arrangements, which we refer to as "scales" in this paper. There are no universally accepted definitions to distinguish types of PV solar developments (Bolinger et al. 2017), and similarly no singular usage of the term "scale" in the energy context (Baxter et al. 2020). In this study, we discuss three scales of PV solar which are all actively under development: rooftop, community, and utility. While these categories might be considered different scales based on size alone, we want to emphasize that the difference between these types of projects is about more than just the physical size (i.e., the number of panels used and the physical area covered by their configuration). Also embedded within these categories are differences in ownership arrangements, where the project is placed (ground-mounted versus on existing buildings), the spatial reach of the project including inputs (e.g., capital investments and raw materials) and distribution of outcomes (i.e., distribution of electricity, financial benefits).

While it could also be useful to distinguish between the 'physical' and 'spatial' components of scale (see e.g. (Baxter et al. 2020)), this is not a straightforward distinction for the way PV solar is actually developed; rather, the physical size and placement elements are conjoined with energy distribution patterns. For example, the rooftop and community projects developed in upstate New York state (our study area) are considered "distributed generation" resources, meaning they are developed within a local electricity grid primarily to provide for local energy needs (Table II.1). Alternatively, utility scale or grid-connected projects are large electricity production facilities designed to connect directly to the electric transmission grid, where high-voltage power lines can transport the electricity long distances (SEIA 2020b). Rooftop panels are purchased or leased by individual property owners, and the system size corresponds to the electricity usage of that property. In community projects arrays of ground-mounted panels are installed by a developer at a project site. Local residents and businesses can subscribe to the community project to earn credits on their electric bill for a portion of the solar that is generated, but overall utilizes an area that is quite small (i.e. < 50 acres), relative to utility projects (see (NYSERDA n.d.)). Alternatively, utility scale or grid-connected projects connect directly to the electric grid for long-distance transmission (SEIA 2020b). The development of these utility facilities is not dependent upon local electricity users as subscribers – rather, the electricity produced is sold on the wholesale electric market. Therefore, utility facilities are much larger than community projects (i.e., > 100 acres), and are developed and owned by large, often international, corporations.

Table II.1.
Dominant scales of solar energy in New York state

Scale	**Type**	**Characteristics**
Rooftop	Distributed	• Individually owned or leased • Sized according to property's energy usage
Community		• Subscription-based • Generally < 50 acres
Utility	Non-distributed	• Private, corporate ownership • Generally > 100 acres

Despite these important differences, public opinion research focusing on support or opposition to energy development has generally operationalized "solar energy" as a generic idea, ignoring the above distinctions regarding scale. U.S.-based opinion polls have identified substantial support for “solar energy”. The Pew Research Center’s *International Science Survey 2019-2020* found that 91 percent of the public in the United States favors using more “solar power” as a source of energy (Pew Research Center 2020). The nationally representative 2020 version of the *Climate Change in the American Mind* survey included a variety of measures of solar policy support, such as whether people who purchase solar panels should receive tax rebates, or whether there should be more funding for research into renewable energy sources, such as wind and solar. Responses to these questions indicated relatively high support, averaging about 80% of respondents (Leiserowitz et al. 2021).

These findings suggest that increased solar development should be well received by the public. But generic support for solar energy does not necessarily suggest an absence of controversy and opposition to specific developments. Much research on public attitudes of wind energy has demonstrated a so-called “social gap” in which high public support for wind energy does not predict social acceptance of individual projects. Often, local opposition to wind facilities has been understood as an attitude-behavior discrepancy, characterized as ‘Not in my backyard (NIMBY)’ syndrome (Boudet 2019; Devine-Wright 2009). But opposition to energy facility siting does not necessarily represent a discrepancy at all (Batel and Devine-Wright 2015); rather, people may genuinely support the idea of the energy technology while simultaneously not supporting a specific project for a variety of reasons. These include concerns about impacts of the project to the local economy (e.g. jobs, property values, tourism) or natural ecosystems, attachment to the existing place characteristics (R. Stedman and Nilson 2021), perceived injustices in the public engagement processes or distribution of economic benefits, a lack of trust in the industry, government, or developer, and a variety of sociodemographic factors such as political ideology, values and norms (Boudet 2019). While social research has done a good job of engaging these concerns, to date, there has not been a single unified theoretical perspective or framework for classifying public responses to new energy technologies, or identifying the relative importance of different drivers of community opposition when it does occur (Boudet 2019; Sherren 2021; Sovacool 2014). One of the limitations of existing energy research, especially that in the U.S. context where our work is situated, is a lack of explicit attention to comparing public preferences across different energy options (Bergquist, Konisky, and Kotcher 2020). We contribute to filling this gap by focusing on how public preferences for solar energy vary based on the scale of development, as described above.

There have been a few recent studies engaging perceptions and responses to large-scale solar in recent years. For example, a case-study of the U.K.'s first large-scale solar facility (350 MW) identified a wide range of public concerns that contributed to opposition of the project including factors related to aesthetics, environmental, economic, project details, temporal, social, construction, and process (Roddis et al. 2020). Survey work of residents of the Southern California identified that people are less likely to oppose solar development when greater buffer distances are used between the facilities and various other land uses, such as wildlife migration routes, breeding grounds, and recreational areas. Socio-demographics may also play a role, with people of color and those with conservative political ideology more likely to oppose large-scale solar, but these relationships have not proven consistent across all analyses (Carlisle et al. 2014, 2015, 2016). Furthermore, most of the existing studies on community acceptance of large-scale solar have found very low levels of opposition, ranging from almost universal to opposition among only 10% or less of the surveyed population (Carlisle et al. 2014, 2015, 2016; Hanger et al. 2016).

2.2. Social representations theory: making sense of unfamiliar phenomena

For most people in New York State, large scale solar developments are unfamiliar: as of Fall, 2021, no large utility projects have yet been constructed in our study regions so people lack direct experience with them in the landscape. As such, we turn to social representations theory (SRT), which addresses the processes of how people come to understand or make sense of new or unfamiliar phenomena. It builds on Durkheim's concept of collective representations that link individualist understandings embedded in attitude systems to societal processes (Wagner and Hayes 2005). SRT posits that when people are faced with a new situation or concept, they will process this new information by drawing upon prior experiences and understandings of the world. A core process of this framework is anchoring, in which people interpret new objects, ideas, or phenomenon by placing them within a category of social objects they already understand. Anchoring is not purely individualistic but also communal, acknowledging the role of the media and public discourse in shaping representations (Moscovici 2000). In the processing of a new phenomenon, members of a group engage in discussion with one another and may gather information from other sources such as the media. Through this collective discourse, social ideas arise and change until a particular construction of reality is widely understood (Wagner and Hayes 2005). In other words, SRT "contends that public discourse leads to the emergence of overarching representations towards objects and processes… [that] often take the form of newly emergent attitudes (Evensen and Stedman 2017)."

Various scholars have applied SRT in studies of public response to new energy technologies. Explorations of representations are especially useful for considering how symbolic place meanings inform perceptions of and reactions to energy infrastructures. In other words, SRT research in the energy development context often supports framing local opposition as a place protective action rather than a selfish "NIMBY" behavior (Devine-Wright 2009). For example, focus groups and visual association tasks with residents in the U.K. revealed that high voltage pylons and power line infrastructure can have both positive and negative symbolic associations (Devine-Wright and Devine-Wright 2009). The research suggests that representations of power lines are co-constructed with place representations – e.g., those who interpret the countryside as 'natural' are more likely to view power line proposals as 'industrial' and therefore object to their development (Bailey, Devine-Wright, and Batel 2016). Other research combined focus groups with a survey of residents from two coastal towns near offshore wind development in North Wales, revealing how stronger opposition in one community was associated with residents who had stronger attachments to place and who formed representations that the proposed wind project would threaten their place identity(Devine-Wright and Howes 2010). Additionally, negative representations of a region's natural resource extraction legacies have been linked to opposition to unconventional oil and gas development in the Marcellus Shale region of New York and Pennsylvania (Bugden, Evensen, and Stedman 2017). Similarly, Bergquist et al. (Bergquist, Ansolabehere, et al. 2020) engage questions of place and of scale to study the formation of representations about proposed electric transmission infrastructure projects in the American Midwest, noting that symbolic place meanings applied to various scales (local, state, and national) inform the interpretation of transmission infrastructure as either a threat or opportunity. This engagement of scale of place meanings complements our engagement of multiple scales of solar development.

2.3 Context: Solar in New York state

Increased solar energy generation is a key component of New York's plans to decarbonize the electric grid by 2040. As of 2019, less than 2.5 gigawatts (GW) of solar were installed in the state, accounting for about 2 percent of New York's electricity. The majority of this is produced by distributed generation projects (e.g. rooftop or community) (SEIA 2020a). New York's Climate Leadership and Community Protection Act (CLCPA), which went into effect in early 2020, mandates an additional 6 GW of distributed solar be developed in the state by 2025. The CLCPA set no specific mandate for utility solar development, but estimates of what would be needed to meet the state's goal of a 70 percent renewable electric grid by the year 2030 (DPS and NYSERDA 2020), combined with recent development trends in the state, suggest that utility scale solar is likely to far outpace other forms of onshore renewable energy development and could account for between 15 to 20 GW over the next several years[2]. This implies that new installations of utility solar in New York could increase at about three times the rate of distributed solar over the next decade. While these amounts alone would already substantially increase solar production, fulfilling the state's goal of decarbonization by 2040 is likely to result in an even greater push for solar developments.

Currently, the largest operational solar facility in upstate New York is less than 10 megawatts (MW)[3] in size, but there are now dozens of energy companies pursuing much larger projects across the region. The largest proposals are almost exclusively in rural, upstate New York. Proposed expansion of solar generation on Long Island, which currently hosts the state's

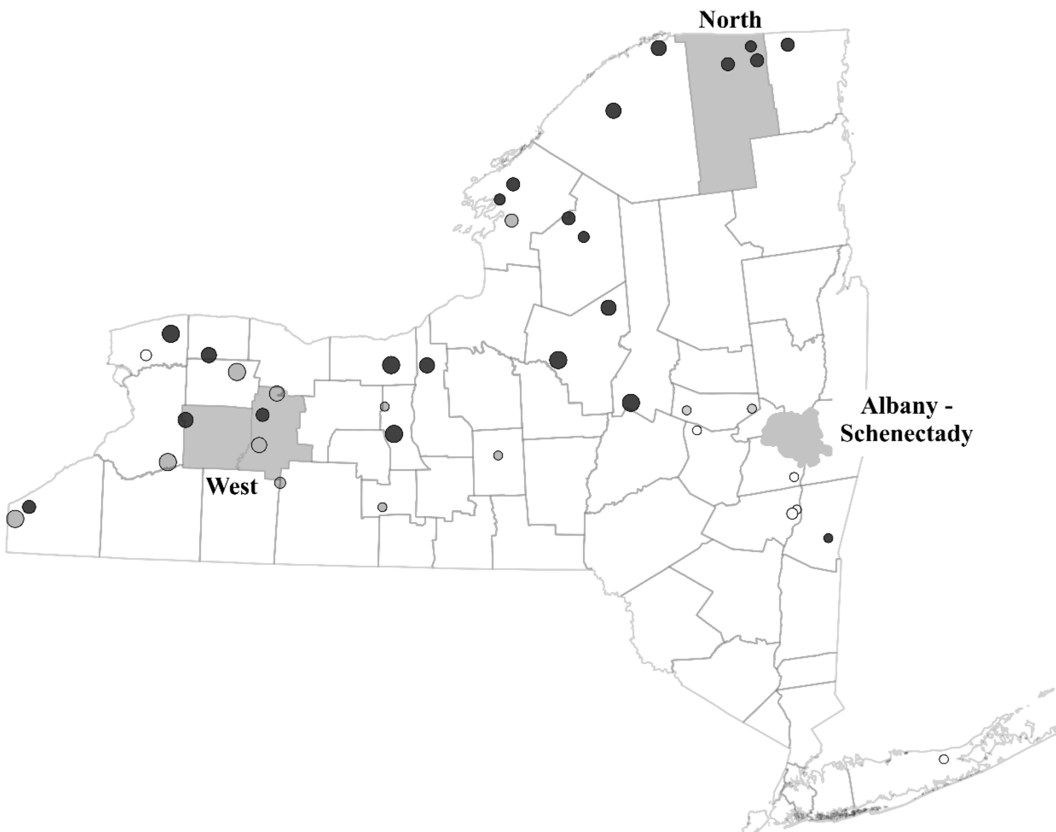
[2] This estimate was calculated by the authors based upon the estimated proportions of different energy types for meeting the state's 2030 goal provided by the New York Department of Public Service (DPS and NYSERDA 2020) and the relative proportion of each onshore renewable energy type documented in: the state's large-scale energy facility siting review process (Article 10), the New York State Generation and Tracking Attribute System (NYGATS), and the projects awarded long-term contracts by the New York State Energy Research and Development Authority (NYSERDA) over the last 5 years. It remains a hypothetical estimate as various political and technological factors could either slow down or streamline the development of large-scale solar. The latter is clearly intended however by New York's recent Accelerated Renewable Energy Growth and Community Benefit Act (NYSERDA 2020a).

[3] 1 gigawatt (GW) = 1000 megawatts (MW)

largest solar facility at 32 MW (SEIA 2020a), is the sole exception. A map of the 40 largest proposed solar projects under siting review at the time of our survey data collection is shown in Figure II.**1**[4]. These projects average 119 MW and are distal from New York City--the state's major population (and energy demand) center. Each MW of solar energy production necessitates approximately 6.5 acres of land (DPS and NYSERDA 2020), so the average facility size of 119 MW would cover an approximate footprint of 770 acres. Most projects depicted in Figure 1 overlap with agricultural districts and have proposed project footprints that include substantial acreage currently designated as prime farmland, prime farmland if drained, or farmland of statewide importance. The submission of a project application signifies that the project developer has obtained site control for an area of land large enough to accommodate the proposed project, such as through purchase or lease agreements, the latter seemingly more common in New York at this time. It is also worth noting that Figure 1 only represents projects that had submitted initial permit applications as of July 1, 2020. We expect many more project proposals are likely in coming years, as there is significant anecdotal evidence that many developers continue to actively seek upstate land to lease or purchase for solar development.

[4] Figure is authors own work (see (Nilson, Kay, and Stedman 2020)) based on publicly available project data from the New York Department of Public Service (DPS) Matter Master, accessed July 1, 2020.

Figure II.1.
Map of 40 largest proposed solar projects in New York state as of July 1, 2020. Circles are centered at estimated centroid of project footprint, are scaled by size (project sizes range size from 36 MW to 450 MW) and shaded based on stage in the siting review process (darker colors indicate more recent proposals). Shaded regions represent the areas of sampled survey addresses.



3. Research Questions and Methods

3.1. Research Questions

In this paper, we interrogate the role of scale in support for solar energy development in upstate New York. We explore whether upstate New York residents differentially support three distinct types of solar energy development: rooftop, community, and utility scales. We also consider how these patterns of support may vary by regions (west, north, and Albany). Region becomes a proxy for direct experience—and the potential for it—with solar installations of various scales. Finally, we apply the lens of SRT to better understand the development of opposition to utility-scale solar and the relationships between place and project representations.

3.2. Data collection and analysis

We employed a mixed-methods approach using both qualitative fieldwork, a mail survey, and semi-structured interviews. The integration of multiple methods within a single research approach can improve theorizing as the strengths of each individual method complement one another and allow the researcher to assess the validity and generalizability of findings across cases (Pearce 2002). The rich contextual data of our fieldwork provided unique insights and informed our survey design and interview protocols, which allowed us to gauge whether these case-specific observations were valid across various communities experiencing utility solar siting.

We used participant observation to initiate an inductive and interactive qualitative approach (Maxwell 2013) to better understand how local residents were responding to proposed utility-scale solar projects in their communities. Specifically, the first author attended public meetings related to three proposed solar projects in western and central New York, including three town board meetings, six open-house events hosted by utility-scale project developers, one state-led workshop for local officials on solar siting, one meeting of a local opposition group, one in-home interview with an opposition organizer, and one state-sponsored procedural conference with a public comment period. These in-person events generated rich, detailed observations of people engaging in real-time with the solar siting process. In addition, they provided opportunities to engage in numerous informal discussions focused on gauging participant perceptions of utility-solar with many different attendees. Detailed field notes and selective audio recording and transcription were completed following each event. We engaged data analysis strategies of memo writing (Maxwell 2013) and thematic coding (Corbin and Strauss 2008) throughout the data collection and writing processes. The field observations and analysis were completed by the first author, who is not from the same region of the country but shares characteristics with many study individuals as a rural, working-class, American-born white settler.).

Thematic analysis of data obtained from this fieldwork provided informed the design of a sub-set of questions for a mail-survey that we implemented to an address-based sample of residents in three regions of upstate New York between September and November 2020. The regions were defined to include two rural regions with significant active large-scale solar facility development, one in the western part of the state and one in the north (see Figure 1). The western strata included Livingston and Wyoming counties, plus the Town of Rush in neighboring Monroe County. We did not include the entirety of Monroe County because this county includes the city of Rochester, and our goal with this sample region was to capture majority rural residents living in or near communities with active large-scale solar development. The northern strata included all of Franklin County, which is a rural county also with active utility solar development, but where development proposals for these projects have been less active in recent years. Additionally, we selected one urban region for comparison, the Albany-Schenectady urbanized area as defined by the 2010 Census. While there is rooftop and community solar development happening with this urban sample, to our knowledge no large-scale utility projects are currently being pursued within this sampling region. This urban sample represents a proxy for lack of direct experience with local utility solar development. The sample regions differ somewhat along various socio-demographic characteristics (Table II.2). The urban region exhibits the highest education levels, highest rates of belief in climate change, higher median household income, and the lowest percentage of Republicans.

Table II.2.
Characteristics of sample regions.

	Proposed utility projects (#)	Republican (%)	Median household income	Belief in climate change (%)	Mean age (years)	College degree (%)
North (rural)	3	37%	$50,000 – 74,999	91.8%	63	63.7%
West (rural)	5	50%	$50,000 – 74,999	84.3%	61	58.0%
Albany (urban)	0	20%	$75,000 – 99,999	92.5%	60	76.4%

We used a four-wave mail survey approach, first sending a copy of the survey with a cover letter, followed by a reminder one week later, followed by a reminder and additional copy of the survey two weeks after that, followed one week later by a final reminder. The random sample included addresses for 1250 residents from each region, and a total of 575 residents completed the survey, for a response rate of 18.4%. We tested for non-response bias by conducting a telephone survey of 50 non-respondents per region using a subset of important variables. Analysis of the non-respondent data indicated small but statistically significant differences between the two samples, suggesting that our respondents had slightly higher levels of education and were slightly more likely to believe in climate change compared to the original sampling frame. We conducted weighting to adjust for non-response bias [31] by population proportions (weights = non-response percent / sample percent) using a set of crosstabs with these two variables and normalized the weights (adjusted weight = weight / mean of weights) for each region of the survey sample following procedure in Vaske (2008). We conducted the analysis for this article using both unweighted and the weighted datasets and found there were no meaningful differences in the results between the two, so we report the results with the original unweighted dataset. Finally, we asked a simple follow-up question by email to a sub-set of survey respondents who had indicated high levels of support for rooftop solar, but subsequently indicated low support for utility solar. We asked these respondents to elaborate on why their level of support varied between the two scales. We emailed all 22 respondents who fit these criteria and had voluntarily provided their email address; of those, we heard back from 9 respondents.

The survey asked respondents about their level of support for three scales of solar energy development. Specifically, respondents were asked "How strongly do you support or oppose development of the following types of solar installations in or near your local community?": "On rooftop of home or business", "Community-scale" and "Utility-scale". Acknowledging the complexity of scale definitions as described earlier, while needing to simplify wording for respondents and strike a neutral tone, the survey instrument provided the following definitions:

> **Community-scale** solar generates electricity for use in the local area. These are small or mid-sized, often using several acres of land.
>
> **Utility-scale** solar generates electricity that is not used locally but transmitted and sold for use elsewhere. These are large, often using hundreds of acres of land.

Our plan was to return to in-person fieldwork after the survey analysis; unfortunately, COVID-19 related constraints eliminated this possibility. We shifted our approach to interviews with 14 town supervisors (the highest elected official of the smallest level of government) with at least one proposed utility-scale project at the time of the interview (Figure 1). Town supervisors were targeted for interviews because of their knowledge and involvement in local siting and land-use decisions. Supervisors are likely to be the first local public official that a solar developer would contact as they initiate public involvement for a proposed project, and they are required to be notified when a project developer submits an application. Many project proposals were in the very early stages of public participation at the time of our interviews, but given their role, we could still be relatively certain that supervisors would be aware of emerging local responses, if any, to the proposed project. The supervisors were recruited chronologically based on the initial application date of their town's project. Most of these interviews were completed by telephone, with one conducted in-person, and interviews ranged in length from 16 to 70 minutes (average = 37 minutes). Supervisors were asked to describe their town, share their experience with the utility solar siting process thus far, and identify and describe local responses to the proposed project. We used a semi-structured format, allowing for additional probing questions that arose during the interview based on initial responses. Each interview was audio-recorded and transcribed, and then analyzed thematically to respond to the research questions and better understand patterns observed in survey responses.

4. Findings

4.1. Support is highest for rooftop solar and lowest for utility solar

Among survey respondents, mean support for rooftop solar is highest (4.37 on a five-point scale ranging from 1=strongly oppose to 5= strongly support), followed by support for community solar (3.94), and finally lowest for utility solar (3.04 – see Table II.3). A repeated measures analysis of variance test comparing the mean level of support for the three scales shows that mean differences are statistically significant and 'substantial' [32], both when considering the entire sample (p-value $<.001$; $\eta = 0.597$) and when tested independently for each sample region (Table II.3). These findings demonstrate substantially different levels of support when comparing across the three scales which have not been demonstrated empirically in prior research. Most striking is that the mean level of support is close to neutral for utility solar, exemplifying that there is much lower support for utility solar developments in upstate New York than has been measured in national polling efforts which focus on "solar energy development" in a much more generic way.

Figure II.2.
Mean level of support for each scale of solar, by region

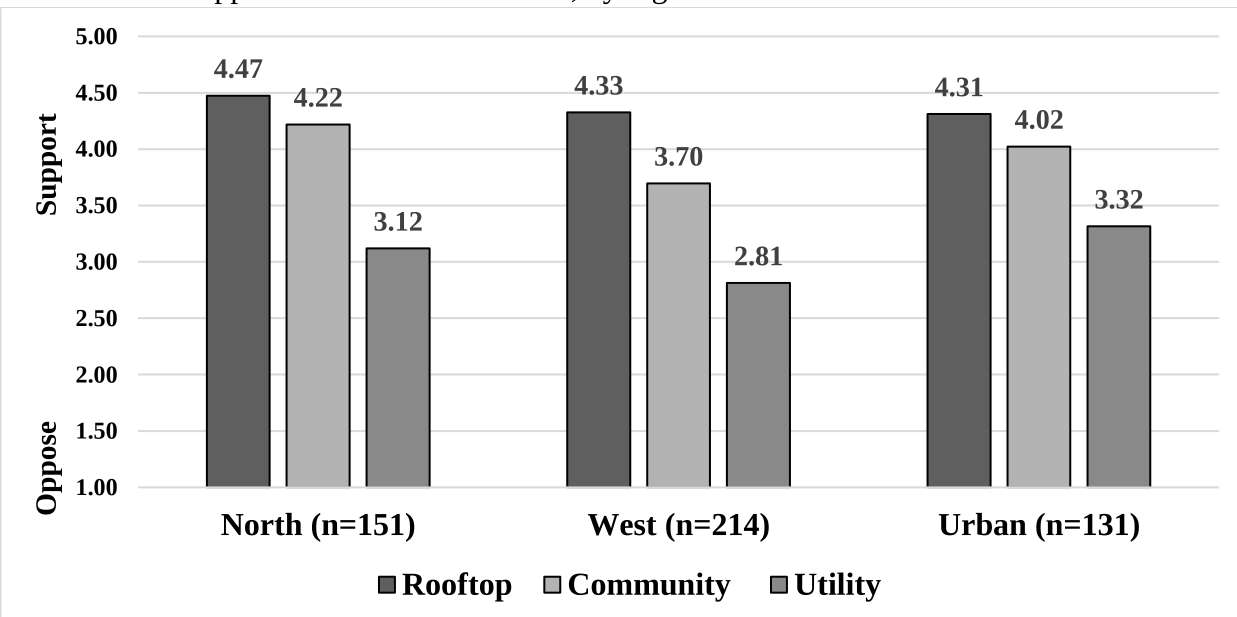


Table II.3.
Mean level of support for three scales of solar energy, tested for each sample region and full sample.[1]

	N	Rooftop	Community	Utility	F-value	p-value	Eta (η)
North	151	4.47[a]	4.22[a]	3.12[b]	87.62	<.001	0.608
West	214	4.33[a]	3.70[b]	2.81[c]	149.72	<.001	0.643
Urban	131	4.31[a]	4.02[b]	3.31[c]	47.82	<.001	0.519
Full sample	496	4.37[a]	3.94[b]	3.04[c]	274.68	<.001	0.597

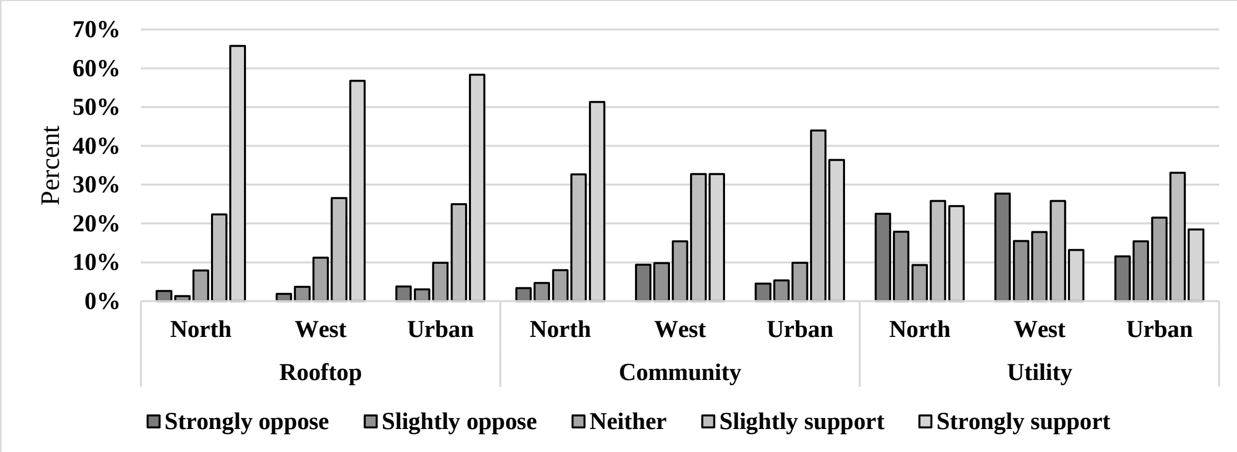
[1]Means on scales of 1 "strongly oppose" to 5 "strongly support" the development of the types of solar development in or near your local community. Means with different letter superscripts are significant at p<.05 based on Tukey's HSD post-hoc tests for unequal variances – Tukey's HSD post-hoc tests were used as the data is not normally distributed. Eta (η) effect size values are all considered 'substantial' [32].

4.2. Patterns of support vary by region -- with highest support for utility solar in the urban region

In both the west and urban samples, support for rooftop, community, and utility differ significantly; only in the north are the mean values for rooftop and community solar statistically equivalent (Table II.4). That said, the distribution of reported support for each solar scale by region (Figure II.3) reveals regional differences in support patterns. For rooftop solar, distributions are highly skewed towards strong support in all three sample regions. For community solar, support is strong in the north, but in the west and urban samples, the distribution is more evenly distributed, with the modal value in the urban sample as "slight support". Finally, the distribution patterns for utility solar differ markedly across regions. In the west, "strongly oppose" is the modal value; in the north, the distribution is split between support and opposition with fewer of respondents in the middle, "neither" category. In the urban sample, the distribution is skewed slightly towards support with the modal value of "slight support".

The percent of respondents who support *rooftop and community solar* closely resemble findings based on previous polling that finds high support for solar energy. Very different patterns are seen in the distribution of support for utility solar, demonstrating that a considerable portion of the respondents who express support for both rooftop and community solar are opposed to utility solar. This is especially apparent in the North and West regions where utility solar development is actively underway, but even among the Urban residents who are unlikely to have any direct experience with utility solar in or near their community, there is less support for utility solar than the other two scales.

Figure II.3
Support and opposition to three scales of solar development among three regions.



To further exemplify how the support – opposition patterns are distinct for different solar scales, we use independent one-way analysis of variance, testing for differences in level of support between the three sample regions (Table II.4). There are no statistically significant differences in support for rooftop solar between the three sample regions. For community solar, mean support is significantly lower in the western region than in the north or urban regions with a minimal effect size (p-value <.001; η = 0.193). For utility solar, again the mean level of support is the lowest in the west (p-value =.005; η = 0.148), but this value is not statistically different from the support in the north. There is a significant difference with minimal effect size when comparing utility support in the west to utility support in the urban sample.

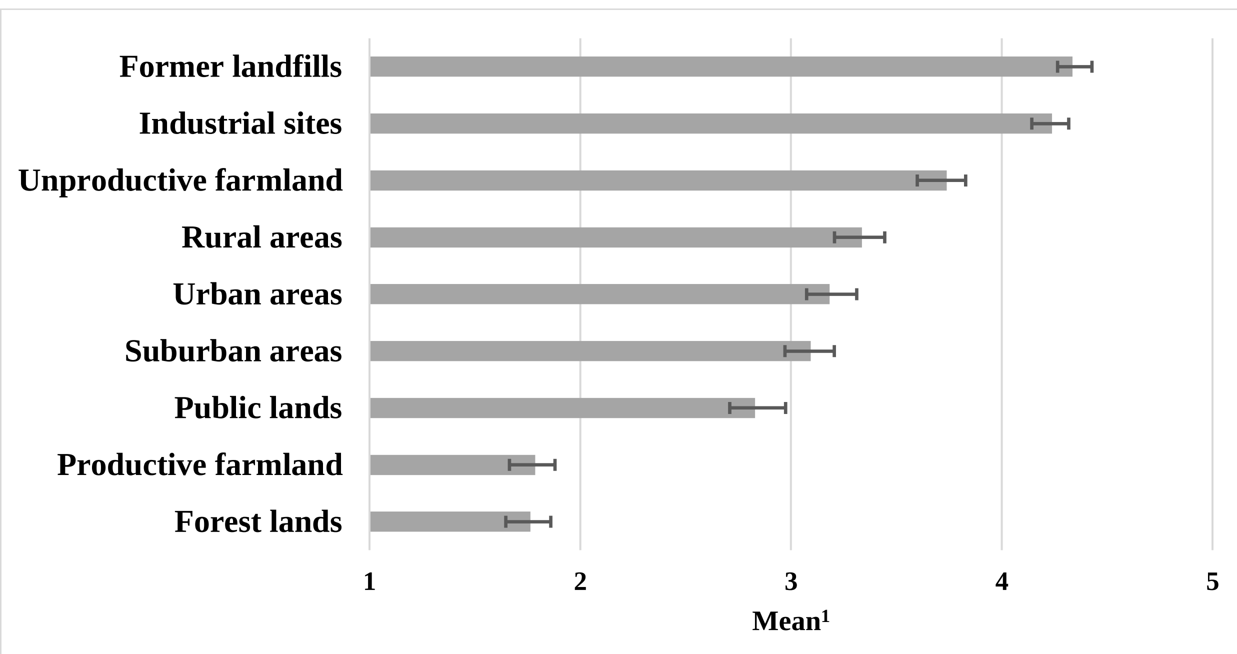
Table II.4.
Level of support for rooftop, community, and utility solar among New York residents.[1]

	N	North	West	Urban	F-value	p-value	Eta (η)
Rooftop	499	4.47	4.33	4.31	1.38	0.2516	-
Community	497	4.22[a]	3.70[b]	4.02[a]	9.57	0.0001	0.193
Utility	494	3.12[a,b]	2.81[a]	3.32[b]	5.46	0.0045	0.148

[1]Means on scales of 1 "strongly oppose" to 5 "strongly support" the development of the types of solar development in or near your local community. Means with different letter superscripts are significant at p<.05 based on Tukey-Kramer post-hoc pairwise comparisons. Eta (η) effect size values are considered to be between "minimal" and "typical" [32].

The survey results demonstrated that many respondents view utility solar as an activity that is suited to already developed spaces (former landfills or industrial sites), but ill-suited for other types of rural land (productive farmlands or forest lands) (Figure II.4). Most respondents believe utility solar ‘definitely belongs’ or ‘might belong’ on former landfills and industrial sites, while most respond that it ‘might not belong’ or ‘definitely does not belong’ on productive farmland and forest lands. This indicates that industrial and previously damaged or scarred land are ‘anchors’ that are starting to be used by many respondents to help them interpret and understand the concept of utility solar. For some, and as engaged below, this representation drives opposition to utility projects. In particular, we were able to observe this among residents who reside in the north and west sample regions who had been exposed to proposed projects in their communities.

Figure II.4.
Perceptions of what types of land are appropriate for utility-scale solar development (n=430).



[1]Means on scales of 1 “definitely does not belong” to 5 “definitely belongs”. Error bars indicate 95% confidence intervals.

4.3. Place and project representations

Interviews with the fourteen town supervisors provided deeper insights into the connections between reactions to utility solar and project 'fit' with place meanings. Half the supervisors expressed that they personally either clearly support (n=4) or clearly oppose the project (n=3) proposed in their community, while the other half (n=7) expressed that they were undecided or did not wish to discuss their opinion. The issue of scale was relevant across all interviews, regardless of the supervisor's opinion towards the project. We observed core differences in the descriptions of projects between those who supported the projects versus those who opposed the projects (Table II.5). Support was discussed in association with the potential economic opportunity presented by large-scale development, and this corresponded with place descriptions that focused on current economic hardships of the agriculture sector. For example, one supervisor described how he was really looking forward to the project because of the income it would generate for the town and local landowners – he hoped it would be a "nice little shot in the arm" to their struggling agricultural-based economy.

Meanwhile, among those most adamantly opposed, projects were instead framed as an economic and cultural threat. These supervisors also described their communities as agricultural, but importantly also mentioned tourism and amenity-based economic opportunities. Several of these supervisors expressed frustration with the use of the term "solar farms" to describe utility-scale solar, highlighting how their representation of the project as a commercial, industrial power plant did not align with how they viewed existing agricultural land uses. This points to how these supervisors value the contributions that agriculture spaces have in terms of the scenery and symbolic contributions – elements that they fear will be lost if these spaces are converted to solar development. These findings are in line with other research which has observed how symbolic place meanings inform the interpretation of proposed energy infrastructures (see e.g. (Bergquist, Ansolabehere, et al. 2020; R. Stedman and Nilson 2021)).

Table II.5: Dominant place and project representations

Perception of project	Place description	Project description
Positive, opportunity	• Rural • Agricultural • Economically strained • “On the rebound hopefully”	• “Huge farm” • A way to diversity farm income • Major development • “Nice little shot in the arm”
Negative, threat	• Rural, bucolic, scenic, historic • Agricultural countryside • Suburban; residential • Bedroom community • Not desperate (economically) • Tourist destination; e.g. “number of event venues”	• “Not a farm” • Industrial power plant • Eyesore • Commercial • “A real deleterious effect” • “Toxic panels” • “Taking prime farmland” • “Using up land”

4.4. Relational acceptance

While observing public events about utility solar development, such as that described at the start of the paper, it was clear that many residents were caught off guard by the very idea of utility-scale solar. A town supervisor similarly shared the following about his own understanding:

> *About solar, I’ve seen people with solar panels on their homes and in their backyards, but um, as far as these [large projects] to be quite honest with you, [I had not seen] any of this big stuff. I think that’s what kind of, I can say, is that we’ve never seen anything of the sizes that are proposed for New York State.*

This statement, expressed in a tone that suggested both worry and contemplation, exemplified the uncertainty this supervisor felt towards proposed large solar projects in his town. He later went on to express a wariness about his community turning into the “solar capital of the world”. This supervisor recognized how he found the use of solar panels for residential and local use reasonable and non-controversial. However, as he became familiar with the proposals for utility scale projects under consideration in his town and nearby, he developed a representation of the large utility projects as distinct and separate from smaller scales. We observed throughout our fieldwork that this supervisor’s experience was not unique – many individuals shared similar perspectives, noting they generally support the idea of cleaner, renewable energy sources. While many even pointed out that they had installed solar panels at home, this did not extend to support for utility solar projects. Their opposition or wariness towards utility solar, however, only occurred through exposure to project plans for locally proposed projects and participation in community events and discussions.

The sense that perceptions of utility solar were being informed by a preference for alternative options, such as deployment of solar in places that were already “industrial” (or at least already built-up) rather than rural countryside, was a clear theme from our qualitative fieldwork. This is further demonstrated in the following comment provided by a survey respondent:

> *Utility-scale solar would require huge tracts of vacant land. When developed, as with any other development, we affect nature in a negative way for our benefit. Rural areas are on the decline and looking at them as available space instead of looking at what is already developed is short-sighted. There are thousands of rooftops in areas, old and unused parking lots and land from factories unused. These brown sites and even hazardous waste sites could be repurposed for scalable solar sites instead of left as scars for generations.*

This statement indicates a frustration with developers and policy makers’ tacit expectations that rural land is “available space” for development, referring to the behaviors of solar developers who are actively seeking land leases for solar development. In this respondent’s view, solar makes sense on already developed spaces (rooftops, parking lots) or industrial areas (unused factory lands). Many other statements from survey respondents and in field observations also refer to abundant vacant and abandoned industrial sites in New York that could be used for solar energy generation. These sites, many agree, make more sense than the use of farmland or forests, and would not change the character of rural communities in the process.

Another respondent also noted how he associated utility solar with big industry and perceived this as a threat to rural areas and recreational activities:

> *I am all for solar power, even utility solar power, as long as no forests or big woods are disturbed or destroyed. Use existing vacant space, do not come to our rural areas and destroy habitat. We hunt, we fish, we ride trails, we camp. We do not want big industries raping our land.*

These observations support the idea that acceptance of large solar facilities is 'relational' in the sense that it is informed by the possibility of alternative options – notably, how the same solar technology could be deployed on rooftops or other areas of the built environment (Roddis et al. 2020). As noted by Roddis et al. (2020:242), these observations urge a greater consideration of how acceptance "is deeply intertwined with wider policy context and the context of which other energy technologies are currently being deployed." We observed significant public doubt and uncertainty surrounding the rationale for the deployment of utility scale solar systems, as opposed to distributed resources at the household or community level.

5. Discussion and Implications

National level polling data has suggested that most Americans support solar energy development [4,6]. Furthermore, public opinion research often suggests solar energy garners more support than other forms of renewable development including wind turbines [5], and that support even for large-scale solar is quite high in both the U.S. and other contexts [8,9].

However, these polls have not explicitly compared support across different scales of solar, and many were completed several years ago when large-scale solar development was less prevalent than it is today. Our study reveals that patterns of public support in our study region of upstate New York are more complex and nuanced than might have been assumed based on existing public opinion data. There is significantly less support for larger utility scale, ground mounted solar developments than rooftop solar. This finding calls into question the applicability of national level polling for gaining even a baseline understanding of public support for these solar facilities. However this does not necessarily suggest opinion polls are of no use (Batel and Devine-Wright 2015). Engaging specifics of solar energy, as we have demonstrated by specifying rooftop, community, and utility solar as differentiated attitude objects, provides more useful information to researchers, policymakers, and other concerned stakeholders about how public support/opposition can vary based on these specifics. This could help minimize the extent to which these groups are subject to being “misled” (see Pascaris et al. 2021) should opposition to certain scales of development occur despite strong support for “solar power”.

Public understandings of solar energy, especially that of utility scale, are still in the process of forming, and resultant social representations will continue to evolve, and perhaps solidify, as the state’s energy transition progresses. Utility solar in particular remains a very new and unfamiliar attitude object for most New Yorkers (and we would suspect for many people worldwide). Despite this uncertainty, the state is moving forward rapidly with streamlining the siting and formation of regulations for how facilities achieve permits for construction. Crucially, many opportunities for public participation in both local and state-level siting decisions have already passed, meaning that much participation that has occurred has not been built on a strong foundation of experience and information. For example, the public comment period on the formation of Uniform and Standard Conditions for large utility solar facilities closed in December 2020 (ORES 2021). We observed that many members of the public remained unfamiliar with the scope and potential consequences (both positive and negative) of utility solar development while public feedback was being accepted. The regulations have now been finalized and will have important implications for how facility siting proposals are evaluated. This raises concerns about the level of informed public involvement in the development of these siting regulations, and suggests a potential threat to the likelihood of due process, which is a critical element to achieving procedural justice in energy transitions (Sovacool et al. 2019). Facilitating greater awareness and providing more public information on utility solar is critical for ensuring the public is adequately prepared to participate in specific solar siting decisions and broader energy policy discussions. In particular, there is a need for clarification of the rationales for siting utility projects on open rural land rather than other land types (e.g., space requirements, land costs, etc.). As it stands, people are now being asked to weigh in on initiatives about which their anchors (e.g., solar as rooftop, or "farms") may mislead them.

It is important that the highest levels of opposition to utility-scale solar development are seen in our sample regions where this development is most actively under pursuit and most likely to occur. This suggests that familiarity may engender negative attitudes towards utility solar. The sample regions differ substantially in terms of the likelihood that respondents have direct experience with large-scale developments in or near their communities. All respondents were asked to indicate their level of support or opposition development of the three different scales of solar "in or near your local community", but the reality is, only those from the two rural samples are likely to have direct experience—and better-developed representations--with local utility solar proposals. Because there are more active utility proposals in the west than in the north, experience with these proposals is likely to be greater there. Respondents from the urban sample could and likely do have rooftop or community solar installations proposed near to them, but the question of utility-solar is largely hypothetical and is unlikely to ever occur (albeit subject to some possibility depending on how respondents interpret what is ‘in or near their community’). This would also be true for most individuals surveyed in any nationally representative sample—which of course would draw strongly on respondents from urban areas--and is a critical point because representations form in part from community-level discourse (Wagner and Hayes 2005) as members of the community are exposed to particular place-specific impacts of utility development. If some communities, notably more urban communities, are unlikely to ever be faced with the potential for utility solar development in their communities, and therefore utility solar never becomes a very familiar attitude object for them, we may never witness particularly well-developed attitudes, nor strong resistance in those communities. Lower levels of “opposition” to utility solar among urban communities or other places where development is never proposed is not synonymous with greater “acceptance” of local solar development. Rather, the residents who live in places where the development is more active and likely to occur have had more opportunities to develop more negative representations of utility solar through their exposure to the local consequences. This is an important caveat for social research and a reminder to be attentive to the way in which we frame and describe public responses to energy developments.

The types of lands that respondents identify as most suitable for utility solar development--industrial sites and landfills—indicates that utility solar is perceived to fit best on land that is already perceived as developed or industrial. This suggests that utility solar is being categorized, or—in social representation terms--anchored as, an “industrial” land use. We would expect less opposition to proposed utility solar in these locations. This supports the landscape essentialisation hypothesis, that is, that opposition to renewable energy developments is more likely when it is perceived to spoil a rural landscape (Batel et al. 2015)Meanwhile smaller scales of solar energy that are more anchored to individual or local community use are also more likely to be accepted. However, based on our understanding utility-scale projects on open swaths of land proximal to the energy transmission grid (which often is agricultural or early successional forest lands) is currently more cost-effective than smaller scale solar development or utility developments in more industrial land types. There are many large utility projects proposed to span more than a thousand acres of land each which have already procured long-term contracts from the New York State Clean Energy Standard based in large part on their cost-effectiveness (NYSERDA 2020b).There has not been considerable attention to the extent to which economic factors are shaping the relative deployment of different scales of solar energy. Much of the existing social research on large-scale solar development has been concerned about community acceptance because it is conceptualized as a barrier or bottleneck for successful implementation of large-scale solar (Carlisle et al. 2014, 2014, 2015; Hanger et al. 2016; Pascaris et al. 2021). Our data shows these projects to be less aligned with public preferences than rooftop or community solar, and furthermore that public views of utility-solar are shaped in part by understandings of alternative energy options. To our knowledge there is limited objective research available comparing various socio-environmental benefits and burdens of the various scales of solar development. This points to a need for future research to adopt broader approaches and engage more directly with discrepancies between developer and community objectives. This could help support proactive engagement with the public and inform opportunities to adopt elements energy transitions to achieve both climatic and democratic objectives.

6. Limitations and Future work

This study, as is the case with many others, took place in a particular socio-spatial-temporal context. As such, the *particular* conclusions and inferences that can be drawn from the findings herein are somewhat limited to this, or similar contexts. However, larger issues of energy projects moving ahead in the absence of well-informed public participation, certainly transcend the particulars of our study site. Still, our opportunities to conduct fieldwork were cut short due to public health concerns, eliminating the possibility to observe public responses to proposed community-scale solar projects and to track changes in community responses to utility projects over time. Also, our study regions vary along various characteristics, notably socio-demographics of political ideology, education levels, and income, but also in terms of number of proposed utility-scale facilities. This was a research design choice, as we sought to understand differences across exposure to utility solar development, but it also limits our ability to discuss the role of factors that may be most associated with opposition. While this is a limitation of our study, it is a challenge presented by large scale renewable development patterns – i.e., with development occurring in rural areas, there are not opportunities to observe how urban residents respond to locally proposed utility solar developments, as we have called attention to in our discussion.

Finally, there are various understandings of what is meant by scale. We were limited in our survey treatment about our level of nuance of the various elements that go into scales. Our work identifies initial reactions to solar development of various scales. We suggest that future research do a deeper dive into *which elements* of scale drive support/opposition: sheer size?

Distribution of energy resources? Local vs distal ownership? Opportunities for public participation? These could be engaged in a quasi-experimental design whereby these elements were varied systematically to observe resultant variation in support/opposition.

7. Conclusion

Solar energy development is not a monolith. Rather, it comes in a variety of forms developed at a range of scales that have different attributes. According to national polling, "solar energy" is relatively widely accepted by the public as a good alternative to fossil fuel powered energy, implying that public acceptance of the deployment of solar photovoltaics is unlikely to face strong resistance. However, the public acceptance of solar energy can be subject to re-evaluation when deployed at large scales, especially among residents who live near proposed facilities. Lower public acceptance of large scale of solar energy facilities is not itself surprising, given that expectations and impacts of any technology can be subject to change when the scale of development increases dramatically. However, the notable shift in public acceptability across scales is worth paying attention to, especially as utility solar installations are increasingly under development across the globe. With the rapidly expanding prospect of solar energy as a key low-carbon energy source, policymakers, researchers, and other concerned stakeholders should not assume public support for solar energy is likely to be high regardless of project scale and proposed locations. A more nuanced understanding and framing of solar energy should be developed both to ensure accurate measurement of public opinion, but also to contribute to greater public awareness that photovoltaic solar energy is not just a rooftop or community phenomenon, and indeed, these smaller scales are—in many places—unlikely to play leading roles in further development of renewable energy initiatives. This awareness is critical for more members of the public to adequately engage in solar siting procedures and express well-informed preferences regarding the future of solar development.

III. Reacting to the rural burden: Perceived energy colonialism and opposition to utility-scale solar development[5]

Abstract:

Rural landscapes are under increasing development pressure from utility-scale solar (USS) energy facilities, but public attitudes towards these facilities remain poorly documented and understood. This study measures whether opposition to USS in upstate New York is shaped by perceived energy colonialism – the idea that rural areas are unfairly treated as internal colonies of urban demand centers to support the energy transition. Energy colonialism is conceptualized as a combination of distributive injustice, procedural injustice, periphery identity, and place attachment. We use a mail survey (N = 421) of residents of western and northern New York, regions with substantial new and pending USS development. We find that 42% of residents oppose USS installations in or near their local communities. Perceived distributive and procedural injustice, along with place attachment have the strongest effect on opposition, while socio-demographics, political ideology, and climate change belief were insignificant. Periphery, or upstate identification, was so strong across our study area that it was excluded from analysis. These findings suggest that opposition to large scale renewable energy development in rural areas exemplifies an explicitly rural environmental justice concern justified for many by the historical legacy of natural resource development. This context deserves acknowledgement in policy discussions and decisions.

[5] Chapter is currently in first round revisions for *Rural Sociology*.

Introduction

Energy production and consumption patterns are central to the relationship between urban and rural society (Beckley 2017). In the modern energy system, most of the electricity, and financial benefit from its sale, are exported to urban areas, while negative impacts associated with large-scale industrial developments often accrue in rural areas (Lee and Byrne 2019; Malin, Mayer, and Harrison 2021). This spatial dynamic likely impacts public perceptions and acceptance of renewable energy – as some scholars have noted, "Rural communities at the forefront of new energy development are asking why they are disproportionately being asked to carry the weight of the new carbon economy while urban residents continue their conspicuous use of energy (Phadke 2013:247)." Although there is a wide-body of literature on public acceptance and response to new energy technologies (Bergquist, Konisky, et al. 2020; Boudet 2019), the rural-urban dynamic of energy supply and demand has largely been ignored in this literature (Larson and Krannich 2016). In our study, we directly engage this issue: we propose a way to conceptualize and operationalize "energy colonialism" (Batel and Devine-Wright 2017) which we then use to assess whether perceptions of disproportionate burden among rural communities shapes opposition to large-scale solar development in upstate New York. Our work is anchored in and contributes to ongoing discussions of rural politics and justice.

The build-out of large-scale, photovoltaic solar facilities, also known as 'solar farms' or utility-scale solar (USS) is rapidly increasing in rural America (Hettel Tidwell and Tidwell 2021; Mulvaney 2017, 2019; Pascaris et al. 2021) and around the world (Brock et al. 2021; Measham et al. 2021; Rignall 2016; Roddis et al. 2020). While there is no universal size threshold for characterizing USS (Bolinger et al. 2017), we use this term here to refer to projects of at least 20 MW capacity, or approximately 120 acres of solar paneling. Until recently, development of solar energy facilities in the United States was geographically targeted to the public lands of the desert southwest (Mulvaney 2017). Low-carbon transition policies, improving technology, and rapidly declining production costs for photovoltaics are contributing to substantial growth of solar across the country, in particular generating land use competition with agriculture (Pascaris et al. 2021). In our study context of New York state, 84% of suitable land for future USS is agricultural (Katkar et al. 2021). While there is growing evidence of public resistance to solar development in the region (Nir 2020; Stedman and Nilson 2021), attitudes towards USS are poorly documented and understood – a gap we help to address here.

Literature Review

Public attitudes towards renewable energy

Most of the existing scholarship of public attitudes towards renewable energy development has focused on wind energy, with few exceptions specific to solar (Carlisle et al. 2014, 2015, 2016; Roddis et al. 2020). The wind literature suggests that public reactions towards renewable energy development tend to be context-dependent, multidimensional, and subject to change over time (Devine-Wright 2009). Socio-demographic variables, such as education, age, income, and gender are not consistent predictors of attitudes across studies (Boudet 2019). The role of one's proximity to wind development has been a core focus of this literature (Bell et al. 2013; Jacquet 2012; Larson and Krannich 2016; Olson-Hazboun, Krannich, and Robertson 2016). Often, the expectation has been that close proximity to development is correlated with opposition, which supports the so-called NIMBY (Not-in-my-backyard) framing (Bell et al. 2013; Swofford and Slattery 2010). Individuals subject to NIMBYism are assumed to generally support the idea of renewable energy development but resist or oppose local development out of self-interest, but this characterization has been challenged and critiqued repeatedly (Batel 2018; Burningham, Barnett, and Walker 2015; Devine-Wright 2009; Wolsink 2007).

However, the evidence on the effect of proximity is also mixed (Bell et al. 2013; Jacquet 2012; Larson and Krannich 2016; Olson-Hazboun et al. 2016), with increasing evidence that close proximity to renewable energy facilities may more often correspond with positive attitudes or support (Firestone and Kirk 2019; Hoen et al. 2019). This may especially be true when proximity is correlated with the expectation of economic benefits (Carlisle et al. 2014; Jacquet and Stedman 2011; Slattery et al. 2012). Proximity therefore is at best an incomplete explanation for public attitudes towards renewable energy, leading the scholarship to explore other important factors such as place attachment and procedural fairness.

Sense of place scholarship, and place attachment in particular, relates to the proximity hypothesis, but offers an alternative framing for understanding opposition or negative public responses to renewable energy (Devine-Wright 2009). Place attachment refers to the strength of the emotional bond that one feels with their local place or community (Low and Altman 1992; Stedman 2002). Stronger attachment, combined with the sense that large-scale energy development is likely to change the place, or elements of the place that one is attached to, can lead to opposition (Bailey et al. 2016; Bergquist, Ansolabehere, et al. 2020; Carlisle et al. 2014). For example, large-scale solar development can threaten the idyllic, rural agricultural landscapes that hold emotional value for many rural residents (Stedman and Nilson 2021). Individuals who oppose renewable energy development based upon their place attachment have been referred to as “place-protectors”, which some argue helps counter the pejorative framing of NIMBYism (Bell et al. 2013). Others note that the employing the terminology of place attachment may ultimately be just a semantic move, ultimately just representing opposition as “positively framed climax-thinking (Sherren 2021:30).”

Procedural fairness can also play a role in public response to renewable energy (Jacquet 2015; Olson-Hazboun et al. 2016; Ottinger, Hargrave, and Hopson 2014; Wolsink 2007). There are several key categories or elements that impact how people evaluate whether a given process is ‘just’: access to information, opportunities for meaningful participation, potential bias on the part of decision-makers, and effectiveness of legal options (Sovacool and Dworkin 2015). Gross’s (2007) exploratory interview study of community reactions to wind development was an early description of how the perception of a fair process was a crucial component of interviewees’ perceptions of the legitimacy of project outcomes. The importance of process fairness has been reiterated with qualitative studies in various other contexts, including Germany (Zoellner, Schweizer-Ries, and Wemheuer 2008) and Canada (Shaw et al. 2015). More recently, several quantitative studies based in the U.S. have found process fairness to be a critical driver of wind energy project support (Firestone et al. 2020; Hoen et al. 2019), or conversely the absence of fairness to lead to perceived negative project benefits (Mills, Bessette, and Smith 2019).

Enter Energy colonialism

A key contribution of this study is to better understand and assess whether opposition to large-scale renewable energy may be understood in part as a reaction to the perceived treatment of rural areas as internal colonies responsible for the provision of resources such as energy without adequate compensation or self-control over decisions. Internal colonialism describes a process in which , “countries seek to bring their hinterlands or peripheral regions under the control of the central government…The core develops exploitive relations with the periphery, using the hinterland’s natural resources and cheap labor to enhance or sustain the develop or expansion of the core (Taylor 2016:18).” The idea of core/periphery segmentation is derived from World System theory which critiques the uneven development patterns produced by globalization of the capitalist economy (Wallerstein 1974). Historically, economic advantages of rural development have not accrued locally, but rather in the industrialized regions they supply (Humphrey et al. 1993). This has long been considered a potential explanation for persistent rural poverty among rural scholars (Freudenburg and Gramling 1994), but has received limited attention in contemporary energy transitions discussions.

Batel and Devine-Wright (2017) describe the narrative of energy colonialism in their study of public response to proposed high voltage transmission lines in rural Britain. In focus group interviews with rural residents, this development was understood as a continuation of the history of extractive internal colonial relations between England and Wales. For example, the transmission of electricity from remote locations in rural Britain to urban centers was discussed as being akin to “milking” the countryside for urban needs. The perception of energy colonialism therefore can be thought of as representing concern that large-scale renewable energy perpetuates a legacy of prior initiatives which generated an unfair distribution of benefits and burdens across the rural-urban gradient. This narrative is closely related to other critiques, such as that “the state we currently live in is largely motivated to depopulate rural places, turn them into explicit sites of extraction, and further centralize wealth in urban centers (Ashwood 2018b:732).” Rural exploitation is justified by those seeking to site projects via the utilitarian logic that the burdens associated with development often make the most sense in rural places because of ample land resources and lower population density (Ashwood and MacTavish 2016).

Importantly, energy colonialism is not explicitly contradictory to the idea that proximity or NIMBYism matters in shaping responses to renewable energy development. Rather, it seeks to unpack and reframe this idea with a rural justice lens. This idea was articulated by a town supervisor from a town with proposed USS development during an interview with the first author conducted to inform our survey design:

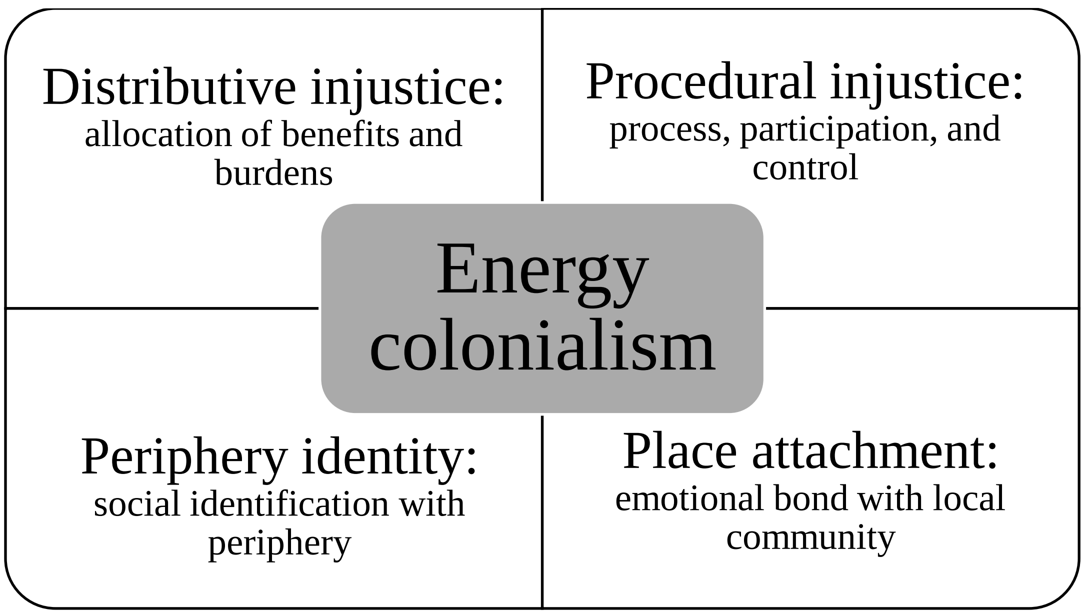
> *You know this electricity is going somewhere else, whether it's going to New York City or where it's going, I don't know, but why do we have to ruin our community to send electricity somewhere else? You know that phrase, not in my backyard? Well it's got to be in someone's. So it seems like it ought to be in the backyard of the people who are using it (Town Supervisor Interview, October 1, 2019).*

In this quote, we note that the NIMBY label is not challenged, but rather *justified* by the idea that the electricity generated will be distributed elsewhere, but with substantial local cost. Later in the interview, the supervisor noted that the project developer should be expected to provide community incentives and pay their fair share of taxes. Importantly, this supervisor's attitude towards the proposed solar project developed out of their proximity to the project, but it is distributive justice concerns that explain their opposition to the project. Using the label of NIMBYism without recognition of the justification for it is dismissive and judgmental: "The language of NIMBY itself carries a demeaning logic: that the minority is somehow lesser for standing up for their personal rights and not the larger collectives (Ashwood and MacTavish 2016:274)."

This study proposes and applies an operational definition of energy colonialism in hopes of moving beyond invocation of NIMBYism. While Batel and Devine-Wright (2017) describe how the narrative of energy colonialism highlights the importance of the lack of energy-related justice across distribution, process, and recognition domains, *a clear framework for measurement of the concept has not yet been developed*. While we agree with others who have noted that different dimensions of environmental justice are interconnected (Walker 2009), or in other words, are "interlinking, overlapping circles of concern (Schlosberg 2004:521)," we suggest that it is still analytically useful to attempt to measure these dimensions. We conceptualize energy colonialism as a combination of perceptions of distributive injustice, procedural injustice, place attachment, and peripheral identity (Figure III.1). This approach allows us to make use of measures of procedural injustice and place attachment which have been used in prior literature, as discussed above. Critically, we add perceived distributive injustice to capture concerns about how the benefits and burdens of the energy system are allocated (Clough and Bell 2016; Jenkins et al. 2016) across the core and periphery. While prior research has noted that the absence of a fair distribution of economic benefits is likely to contribute to opposition (Olson-Hazboun et al. 2016), this perception is generally not explicitly measured.

Finally, we include "periphery identity" as a component of energy colonialism. The notion that the core and periphery are not only to be found in economic geography but can also exist as identity markers is embedded in our conception of energy colonialism. Research from social psychology has emphasized that issues of identity and inclusion can play an important role in shaping attitudes and behaviors of people involved in environmental conflicts, especially with regard to perceptions of fairness (Clayton 2018; Clayton and Opotow 2003). In other words, understandings of fairness can be impacted by whether or not one perceives of other members involved in the conflict as within their same social group (Tyler 2000). This led us to include a measure of peripheral social identification with the expectation that stronger identification with the periphery-- in contradistinction to the core-- may therefore amplify the impact of perceived energy colonialism on opposition to USS. While we recognize periphery and core are not perfectly synonymous with rural and urban (e.g. there can be peripheral urban communities) our study was limited to areas with USS solar development which are exclusively rural and peripheral. Given this overlap, the expectation that peripheral identification will contribute to opposition to USS, connects with recent research which suggests that rural identity plays a critical role in political reasoning and behaviors of rural Americans in recent years (Ashwood 2018b; Cramer 2016; Hochschild 2016; Schafft 2021). One popular account suggests that rural support for conservative, Republican politics in recent years is explained by a multi-faceted resentment of people, institutions, and ideologies that are associated with urbanites and urbanism, including state agencies and public universities (Cramer 2016).

Figure III.1. Proposed components of energy colonialism.



Research Question and Hypothesis

We seek to better understand public support and opposition to proposed solar energy development among rural residents of upstate New York. Specifically, we ask what variables are related to opposition of local USS development. Drawing on the discussion above, we are particularly interested in (a) better operationalizing the idea of energy colonialism, and (b) understanding how it, and its components--contributes to opposition to USS development. We hypothesize a positive relationship between each of the four measures which comprise perceived energy colonialism and opposition to USS development.

Methods

Study Context

In 2020, New York enacted what state officials refer to as “the most ambitious and comprehensive climate and clean energy law in the Nation (DPS and NYSERDA 2020:1).” Notably, the law calls for economy-wide decarbonization by the year 2050. As of 2018, only about 27% of the state’s electricity was supplied by renewable sources, necessitating substantial renewable energy development from wind and solar in the coming years (Katkar et al. 2021). A core challenge in meeting state targets is the energy demand of the downstate region, which accounts for about two-thirds of state consumption currently supplied by almost 70% fossil fuel-fired generation. To facilitate this shift, in-state transmission projects are underway to increase the capacity to transmit electricity from new renewable energy projects in the upstate region to New York City (DPS and NYSERDA 2020). Many USS projects are under development across the upstate region: since 2017, the state’s energy development authority has entered agreements to develop 76 USS projects in the upstate region (NYSERDA 2022). Importantly, there is “a long held and widespread view of NYC as an ‘oppressor’ of rural towns [dating] back to the early part of the twentieth century ” when the city began controlling land use to secure clean water supply (Brown and Shucksmith 2017:292). Expanding electricity infrastructure to facilitate electricity transfer from upstate to downstate reflects and continues this long-standing narrative.

The study area includes two distinct regions of upstate New York which were selected based on the significant level of USS development happening in each at the time of our survey.

Western: Livingston and Wyoming Counties are rural, predominately agricultural and residential counties in Western New York – about half of the land area of the two counties is private farmland and a quarter is residential areas (USDA 2019). The two counties have a combined population of just over 100,000 people with population density of 84 people per square mile and a combined poverty rate of approximately 12 percent (US Census 2019). The two counties are located between the cities of Buffalo and Rochester and include several 'bedroom' or commuter communities within half hour drive of the urban areas. At the time of our survey, at least five USS facilities were proposed across these two counties.

Northern: Franklin County is a rural county in northeastern New York which borders Canada to the north. The southern part of the county is part of the Adirondack Park, and amenity-based development and tourism help support the local economy. Nearly 80 percent of the county is forested (NASA 2006), while about 14 percent is farmland (USDA 2019). The county population is just over 50,000 people, with a low population density of 32 people per square mile. Approximately 18 percent of the population is below the poverty line (US Census 2019). Compared to the counties in the Western region, Franklin County is more isolated from urban areas, about a three-hour drive north from the cities of Syracuse or Albany. At the time of our survey, at least 3 USS facilities were proposed in the northern part of the county.

Methodology

We conducted a mail survey using a random, address based sample of residential postal addresses[6] in the fall (September to November) of 2020. The survey instrument was developed following qualitative fieldwork in the study regions including in-person participant observation of 12 public meetings about proposed USS projects across various upstate communities. Additionally, secondary data sources such as news articles, USS proposal applications and their associated public comments were reviewed to inform the survey design and analysis. We used a four-wave mail survey approach, first sending a copy of the survey with a cover letter, followed by a reminder letter one week later, followed by a reminder letter and additional copy of the survey two weeks after that, and then a final reminder letter one week following. The random sample included addresses for 1250 residents from each region. A total of 421 residents (176 from the Northern sample, and 245 from the Western) completed the survey, for a response rate of 20.0%. We tested for non-response bias by conducting a telephone survey of 50 non-respondents per region using a subset of critical variables. Analysis of the non-respondent data indicated small but statistically significant differences between the two samples, suggesting that our respondents had slightly higher levels of education and were slightly more likely to believe in climate change compared to the original sampling frame. Given the importance of data weighting to avoid non-response bias (see e.g. Stedman et al.'s (2019) complaint that while non-respondent comparisons are often conducted, too often little is done to engage the implications of these differences) we conducted weighting by population proportions (weights = non-response percent / sample percent) using a set of crosstabs with these two variables and normalized the weights (adjusted weight = weight / mean of weights) for each region of the survey sample

[6] Sample purchased from the Marketing System Group.

following procedure in Vaske (2008). The results reported are based on analysis of this weighted data.

Table III.1. Operationalization and Descriptive Statistics of Survey Measures

Variable Name	Items	Descriptive statistics
Procedural injustice Chronbach's alpha = 0.744 *n* = 347	Please indicate how strongly you agree or disagree with the following statements. The process of planning utility-scale solar has been fair. (reverse-coded) People have had plenty of opportunities to participate in planning for utility-scale solar. (reverse-coded) People who made utility-scale solar plans are biased.* Scale: 1 = Strongly disagree; 5 Strongly agree	Mean = 3.28 Standard deviation = 0.95
Distributive injustice Chronbach's alpha =.698 *n* = 355	Please indicate how strongly you agree or disagree with the following statements. Utility-scale solar *burdens* upstate New York more than downstate. Utility-scale solar *benefits* upstate NY more than downstate (reverse coded) Scale: 1 = Strongly disagree; 5 Strongly agree	Mean = 3.63 Standard deviation = 1.00
Upstate identity Chronbach's alpha = .892 *n* =367	How strongly do you agree or disagree with the following statements? I identify with upstate New York. I feel committed to upstate New York.	Mean = 4.51 Standard deviation = 0.78

	I am glad to be from upstate New York. Being from upstate New York is an important part of who I am. Scale: 1 = Strongly disagree; 5 = Strongly agree	
Place attachment Chronbach's alpha = 0.752 *n* =404	How strongly do you agree or disagree with the following statements? I feel that I can really be myself in my local community. My local community is the best place to do the things I enjoy. I really miss my local community when I am away too long. Scale: 1 = Strongly disagree; 5 = Strongly agree	Mean = 4.03 Standard deviation = 0.84
Education *n* = 406	Please indicate the highest degree of education you have attained: 1 = Less than high school diploma 2 = High school diploma 3 = Some college 4 = College degree 5 = Graduate degree	Mean = 3.64 Median = 4 Standard deviation = 1.07
Age *n* = 399	In what year were you born? (Transformed to age)	Mean = 62 Standard deviation = 14.5
Gender (male) *n* = 405	What is your gender? 0 = not male 1 = male *Note: Survey response options included male, female, and other. Five respondents selected "other". These were grouped with female respondents for analysis.	Mean = .54 Standard deviation = .50
Political party	Generally speaking, do you consider yourself a…	Mean = 4.13

n = 363	1 = Strong democrat 2 = Weak democrat 3 = Independent, but lean democrat 4 = True independent 5 = Independent, but lean republican 6 = Weak republican 7 = Strong republican	Median = 4 Standard deviation = 2.13
Rurality *n* = 413	Which of the following best describes the area where you currently live? 0 = Small town or suburbs of a city 1 = Rural, open countryside	Mean = .57 Standard deviation = .50
Region *n* = 421	North = 176 West = 245	
Climate change belief *n* = 399	Do you think that climate change is happening? 0 = No 1 = Yes	Mean = 0.87 Standard deviation = 0.33
Familiarity with utility solar *n* = 407	Are you familiar with utility-scale solar proposed in or near your local community? Scale: 1 = Not at all; 5 = Very familiar	Mean = 2.37 Standard deviation = 1.26
Opposition to utility solar *n* = 364	How strongly do you support or oppose development of utility-scale solar installations in or near your local community? Opposition = Slightly oppose, Strongly oppose No opposition = Strongly support, Slightly Support, Neither support nor oppose	Opposition = 153 (42%) No opposition = 211 (58%)

*****Dropped from composite analysis due to alpha if deleted value.

Dependent measures.

Our dependent variable, "Opposition to USS" was measured with a single-item question: "How strongly do you support or oppose development of utility-scale solar installations in or near your local community?" Response options on the survey ranged from 1 (Strongly support) to 5 (Strongly oppose). There is no universally understood and clear definition of utility-scale solar energy and many descriptions can be highly technical, vary by jurisdiction, and poorly understood by the general public (Bolinger et al. 2017; Urban Grid 2019). This led us to provide the following description of USS in the survey: "Utility-scale solar generates electricity that is not used locally but transmitted and sold for use elsewhere. These are large, often using hundreds of acres of land."

Independent measures.

To apply the concept of energy colonialism to our study context we utilize the upstate/downstate dichotomy in no small part because of its salience among state residents. In New York, 'downstate' typically refers to New York City and surrounding urbanized areas that comprise the core region of the state, while 'upstate"' refers to the rest of the state, or periphery, including all of the state's rural areas but also urban areas of Buffalo, Rochester, and Syracuse. As other scholars of the upstate region have noted, "we often think of upstate as "rural," even though most upstate residents live in metropolitan areas (Thomas and Smith 2009:5)." Importantly however, we did not survey residents of upstate cities, only residents of suburbs, small towns, and the rural countryside given the distribution of proposed solar facilities.

We measured distributive injustice with two items to capture the perception that USS burdens upstate New York more than downstate. We also measured strength of upstate identification with a five-item social identification measure (Postmes, Haslam, and Jans 2013) which achieved high reliability. Place attachment was measured with a subset of items first used in Jorgensen and Stedman (2001). The measure of procedural injustice draws on commonly accepted elements of procedural injustice from existing literature about whether or not a given process is ‘just’: a lack of access to information, a lack of meaningful participation, bias on the part of decision-makers (Sovacool and Dworkin 2015).

We control for socio demographic attributes: education, age, gender, rurality, region, and political party. We incorporate climate change belief as a control variable as prior literature has found mixed evidence of a relationship between environmental attitudes and support of renewable energy (Boudet 2019). We also control for familiarity. USS development is a new issue in the study region, many large projects have been proposed, but have not yet been constructed (Nilson and Stedman 2022). Familiarity helps control for whether individuals are drawing upon direct experience and familiarity with proposed projects.

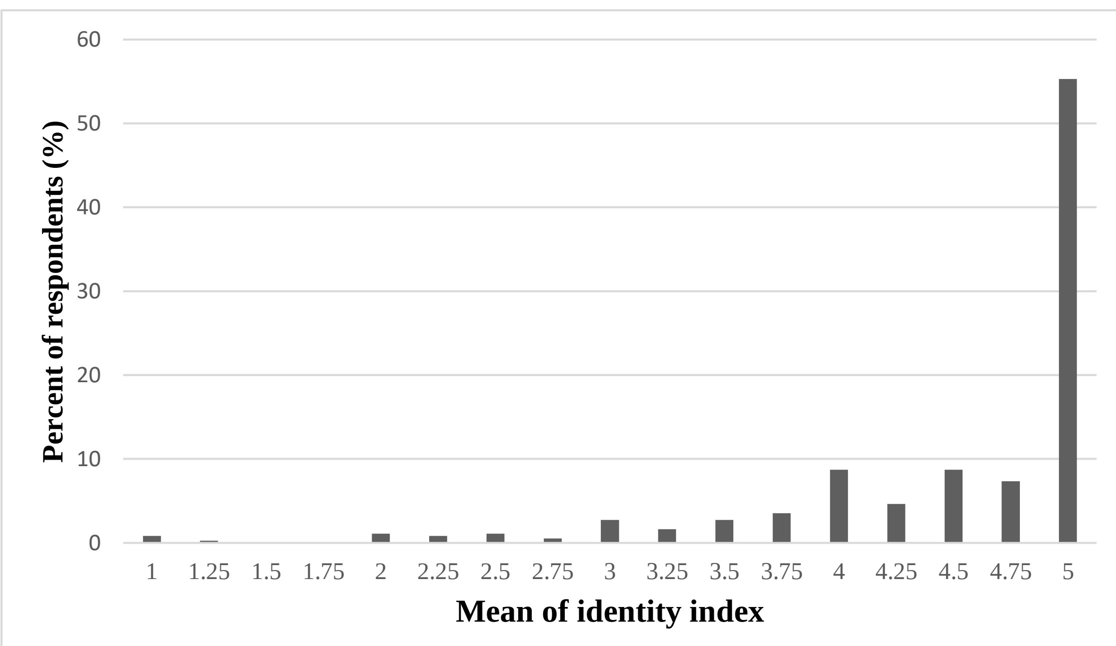
Results

Descriptive statistics

Operationalization, descriptive characteristics and reliability analysis of survey measures are reported in Table III.1. Results are based on the weighted data set. Most respondents had some level of college education. The average age of respondents was 62 years old. Fifty-four percent were male. Respondents were relatively evenly split on political party. Fifty-seven percent of respondents reside in the rural, open countryside, with the rest residing in small towns or suburbs of a city. Most (87%) believe that climate change is happening. Most respondents report being either not very familiar or somewhat familiar with local USS development.

We conducted reliability analysis to assess the composite scales of four key elements of our operational definition of energy colonialism: place attachment, procedural injustice, distributive injustice, and upstate New York identity. Each of these variables was measured with two or three survey questions with a five-point scale of increasing agreement. The Cronbach's alpha value was greater than 0.6 for each summed scale (Table III.1). Place attachment was relatively strong (mean = 4.03 on a five-point scale), while measures of perceived procedural and distributive injustice were relatively evenly distributed (mean = 3.28 and mean = 3.63 on five-point scales, respectively). Strength of identification with upstate New York ("periphery identity") was *very* high, with strong agreement (5 out of 5) as the modal value on the combined index variable (Figure III.2). Although a very interesting finding in itself, this lack of variation dictated that we exclude this variable from regression analysis.

Figure III.2. Strength of upstate identity (*n* = 367).



Scale: 1 = Strongly disagree; 5 = Strongly agree

Opposition to USS

Figure III.3 reports the distribution of responses to the measure of USS opposition. On a five-point scale of increasing opposition, the mean value is 3.06. For analysis, we generated a binary variable of opposition/no opposition, by including individuals who either slightly oppose or strongly oppose USS as “opposing,” and those either supporting or neither supported nor opposed as “not opposing”. Forty-two percent of respondents oppose local USS development.

Figure III.3. Support and opposition to utility-scale solar energy development (*n* = 364).

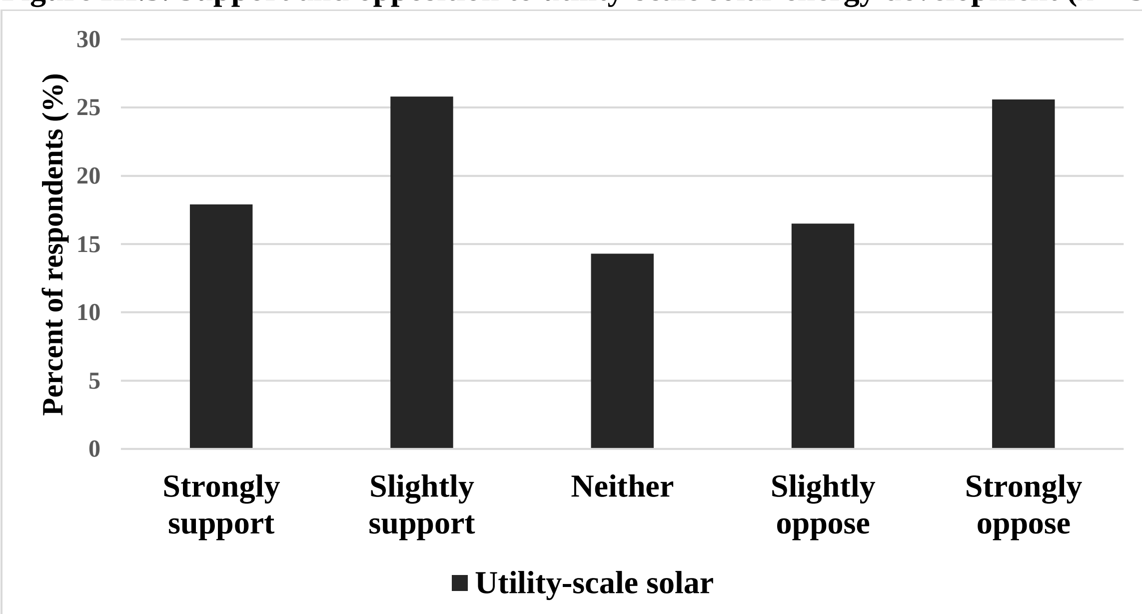


Table III.2. Bivariate Correlations of Key Measures*.

	1	2	3	4	5	6
Political party (1)	**1.00**					
Climate change belief (2)	**-0.39**	**1.00**				
Place attachment (3)	**0.14**	**-.04**	**1.00**			
Procedural injustice (4)	**0.25**	**-0.29**	**-0.03**	**1.00**		
Distributive injustice (5)	**0.32**	**-0.25**	**-0.05**	**0.51**	**1.00**	
Familiarity with USS (6)	**0.15**	**-.07**	**0.01**	**0.13**	**0.10**	**1.00**

*Select variables reported. No correlations between independent variables exceeded 0.6**.**

We sought to better understand sources of variation in opposition to USS. Bivariate correlations between independent measures were all less than 0.6 (see Table III.2). We conducted multivariate logistic regression predicting opposition, summarized in Table III.3. Model 1 attempts to predict opposition to local USS based on socio-demographic attributes, climate change belief, and familiarity. The model has very poor explanatory power (Psuedo R^2 = .04) and is not significant. In other words, opposition to locally proposed USS projects is not explained by socio-demographics or region. Perhaps more importantly, it is also not explained by either belief in climate change or conservative political ideology. These latter variables are often included in analyses of support/opposition to renewable energy *in general*, but do not play a role in opposition to local developments.

Table III.3. Multivariate logistic regression estimates predicting opposition to utility-scale solar.

Dependent Measures	Model 1 Odds ratios	Model 2 Odds ratios	Model 3 Odds ratio
Education	1.18	1.15	1.19
Age	1.00	.99	.99
Gender (male)	.84	.77	.81
Political party	1.20*	1.07	1.08
Rurality	1.07	1.11	1.21
Climate change belief	.83	1.37	1.46
Familiarity	.94	.90	2.74
West	.82	.78	.76
Place attachment		1.81***	1.71**
Procedural injustice		2.05***	5.24**
Distributive injustice		2.27***	2.34***
Interaction term (Familiarity* Procedural injustice)			.73*
Model estimation sample	290	271	271
Model Psuedo R-square	.04	.23	.23
Prob > chi2	.35	.00***	.00***
AIC	270	213	212
BIC	303	256	258

*p <.05; ** p < .01; *** p <.001.

In Model 2, we add the three core variables of energy colonialism (place attachment, procedural injustice, and distributive injustice, recalling that periphery identity was excluded due to lack of variation). These additions contribute strongly to our understanding of opposition, as they generate a statistically significant model which explains approximately 23 percent of the variation in opposition. Stronger place attachment, greater perceived procedural injustice, and greater perceived distributive injustice are all positively and significantly ($p<.001$) associated with greater opposition to USS, as expected, with the effect of distributive injustice being the most substantial based on odds ratios.

Finally, we sought to determine whether an interaction between the respondent's perceived general familiarity and the measures of injustices may have an independent effect on opposition to USS. We found no statistically significant role of the interaction between familiarity and distributive injustice, however the interaction between familiarity and procedural injustice was statistically significant ($p<.05$), reported in Table III.3 as Model 3. The coefficient on the interaction term is less than 1, signifying that the interaction is negatively related to opposition. Additionally, the correlation between familiarity and procedural justice is relatively low (.13, reported in Table III.2). Together, this low correlation but still significant result on their interaction term signals that the relationship between familiarity and procedural injustice is not always consistent, e.g. some individuals are strongly opposed to USS and sense it is unjust, despite a lack of familiarity, while for others more familiarity may correspond with perceived injustice and opposition. Importantly, the familiarity variable measures general familiarity with USS, and not with the siting procedures in particular. Future research could measure procedural familiarity to better understand these relationships.

Discussion

Our findings support and advance the call for energy justice and transitions scholarship to take the rural-urban divide seriously (Brock et al. 2021), in contrast to scholarship that has deemed rural-urban distinctions as obsolete or problematic (Lichter and Brown 2011). We observe that characteristics that are often assumed to be associated with opposition to renewable energy—and demonstrated to be associated with *general* opposition--such as the lack of belief in climate change and conservative political ideology, do little to predict opposition to particular USS siting nearby to one's place of residence. Rather, opposition appears rooted in issues of place attachment and perceived injustices which together support the narrative of energy colonialism. That is, rural residents proximal to proposed USS development are more likely to oppose this development if they suspect that that it will be “extractive” in the sense of it placing a burden on rural, upstate areas to fulfill downstate, urban energy demand without adequate recognition and compensation. Resistance to local siting of USS does not necessarily represent a negative reaction to climate change policy action, as it is often framed in policy discourse and media. We highlight instead that resistance is based on perceptions that rural areas are treated as internal colonies. This will likely resonate with many upstate residents and helpfully spur productive discourse around finding ways to address these concerns.

This example may help advance discussions about rural injustices which have not been significantly accounted for in social and environmental justice theory and scholarship (Ashwood and MacTavish 2016; Pellow 2016). This gap that has been termed the “rural problem” (Carolan 2020) is particularly apparent in the energy justice scholarship, where scholars have understandably been primarily concerned with the disproportionate placement of energy infrastructures with environmental health effects and risks, such as coal-fired power plants and nuclear facilities, in marginalized low-income and minority communities (Scott and Smith 2017).Concerns about justice and inequality associated with siting extractive energy developments has garnered substantial attention in the literature (Bugden and Stedman 2019; Evensen and Stedman 2018; Malin 2014; Malin and DeMaster 2016; Mayer, Olson-Hazboun, and Malin 2018; Schafft et al. 2018), while these same critiques are seldom applied to renewable energy development because of an assumption that ‘green is good’. Here, we have documented perceived injustices associated with USS development and shown that these injustices are associated with opposition. This adds an important counternarrative to the emotion-driven explanations for rural political opinions and behaviors that have gained prominence in recent years (Cramer 2016; Hochschild 2016). It also pushes for future research which could respond to the justice concerns raised in rural grievances with large-scale *renewable* energy development.

Importantly, our focus here has been on public perceptions of colonialism, we cannot speak to the accuracy of the concerns that USS development is exploitative of rural communities – this largely remains to be seen as projects have yet to be constructed and long-term economic impacts to rural communities at this point remain unknown. We do wish to emphasize that the narrative of colonialism is certainly "real" to the extent that it acts as a filter through which upstate residents view proposed projects, regardless of whether they are actually unfair. There are certainly historical examples of negative impacts to rural areas based on restructuring for profitable investments in the modern capitalist system (Marsden et al. 1993). Some critical energy justice scholars are calling attention to how the contemporary energy transition—even that which focuses on renewable sources-- will continue to create and perpetuate inequities as long as energy is treated as a commodity within a globalized, capitalist industrial economy (Lee and Byrne 2019). To date, energy perceptions literature has often remained distant from the more critical just transitions scholarship which calls for comprehensive changes to the economic structure of the energy system for a truly just transition (Bell et al. 2020; Mascarenhas-Swan 2017). Instead, public opposition to renewable energy is often conceptualized as a barrier to climate action. We assert that the opposition of rural residents proximal to proposed large-scale renewable energy projects, when recognized as a narrative of energy colonialism, helps call attention to the structural changes that are needed for a comprehensive just transition. Future research and transition efforts should attempt to measure the impacts of USS development on rural places and economies in response to the concerns of residents.

There are important limitations of our analysis given the exclusion of the measure of peripheral (upstate) identity, and the sampling strategy which limited us to residents who are both upstate *and* rural. The strength of agreement with upstate New York as our indicator of this exceeded our expectations. Although a very suggestive data point in itself, the lack of variation rendered our measure useless in modeling. We focused on rural upstate residents given their proximity to proposed USS, but future work could include urban upstate residents, which may also generate greater variation—and substantive differences--in the upstate identification measure. Our survey also did not measure for level of knowledge about the state policies for facility siting, including their recent changes under state law, and economic impacts associated with USS. We controlled for perceived familiarity with proposed development, but this does not necessarily indicate level of knowledge. We expect that more knowledge about the preemption of local authority for large USS siting could be expected to lead to greater level of opposition towards USS development, but unfortunately, we are unable to measure this relationship. Measurements of knowledge are challenging in survey research and can contribute to respondent fatigue and decreased response rate. Future research could examine the role of knowledge more directly with other approaches.

Finally, the terminology of energy colonialism may raise some understandable concern, given the historical context of race relations and dispossession in our study region. Settler colonialism within the United States is persistent, domination over Indigenous and People of Color by predominately white, Anglo-American people and culture is entrenched in policy structures and systems (Taylor 2016). The entirety of lands in New York state, including all sites of proposed solar energy facilities, are traditional homelands of Indigenous peoples. Members of the Seneca Nation have led efforts in opposition to one USS project proposed on a section of the

Canawaugus Territory within our western sampling region (Corwin 2020). The energy colonialism experienced by the primarily white, rural residents of upstate New York who were surveyed for this study, is not separate from this historical context, but rather embedded within it. We should be clear however to note that this is not an attempt to compare the severity of negative impacts experienced by different social groups, but rather draw attention to the similarity in types of justice concerns that are experienced.

Conclusion

By and large, solar energy is described as a promising and clean technology and is often touted as a key response to the climate crisis. This positive framing of solar energy combined with a sense of urgency to find solutions for climate change can serve to discourage acknowledgement and discourse on justice concerns with the ways in which solar energy is developed (Mulvaney 2019). But despite being "renewable," solar energy is *not inherently just* (Bell 2017; Brock et al. 2021; Mulvaney 2019). Here we have highlighted how public opposition to large-scale solar development in the northeast U.S. can be understood through the narrative of energy colonialism, emphasizing that public opposition is connected to the wider social context and relationship of energy production and consumption patterns across rural and urban society.

IV. Utility-scale solar energy in New York: A case study of procedural and distributive considerations in state energy policy[7]

Abstract:

New York state has adopted an aggressive climate agenda with a goal of decarbonization of electricity generation by 2040. Developing utility-scale solar (USS) facilities in the state is a critical part of this transition. This paper uses a case-study approach to critically examine state policies and their relation to energy justice concerns. I draw on four years of extensive research on social and political dynamics of utility-scale solar development in New York state. Data sources include policy documents, observation of public meetings, and interviews with key informants. I identify distributive and procedural justice concerns and discuss how these concerns are shaped by three state-level policy structures: preemption, long-term contract awards, and pathways for local economic benefits. This analysis points to the tensions between energy justice dimensions and large-scale renewable energy development and concludes with policy recommendations to support a more just transition.

[7] Chapter is in preparation for submission.

By and large, solar energy is a promising technology and is often touted as a key tool for meeting energy demand amidst the climate crisis (Ardani et al. 2021). In the United States, installed solar energy capacity grew exponentially in the last decade, with utility-scale solar (USS) accounting for a majority of this growth (SEIA 2020b). However, there is growing recognition that the ongoing energy transition away from fossil fuels is not inherently fair or equitable, leading to calls for increased focus on a "just transition" (Wang and Lo 2021). USS developed under standard business-as-usual practices of maximizing production can create unintended consequences such as biodiversity and carbon storage loss (Kiesecker et al. 2019) and environmental health hazards associated with production and disposal of system components (Bell 2017). As noted by Mills, it is critically important to not "sugarcoat" the context of USS development (Simon 2022). Rather, clear descriptions and frank discussion of benefits and impacts are important to set the stage for an inclusive just transition from the contemporary, fossil fuel dependent energy system.

In response to the lack of action and reversals of federal environmental policies during the Trump administration many progressive and left-leaning states advanced their own state climate policies (Bromley-Trujillo and Holman 2020; Konisky and Woods 2018). Renewable Portfolio Standards (RPS), which establish targets for the percentage of electricity generated from renewable energy sources by a specified date, are a primary state climate policy tool (Bromley-Trujillo and Holman 2020). New York state's recent efforts are oft cited as an ambitious example (Bromley-Trujillo and Holman 2020; Cha, Farrell, and Stevis 2022; McKinley and Plumer 2019). The 2019 passage of the Climate Leadership and Community Protection Act (CLCPA) established a RPS of 70 percent by 2030, but importantly, the act also includes important provisions related to climate justice, such as establishing that a minimum of

35 percent of the benefit of climate investments be targeted in disadvantaged communities (Cha et al. 2022; Senate and Assembly 2019). But the actual strategies and mechanisms used by states like New York to advance the local renewable energy development that will allow them to achieve their RPS receive much less attention in the literature. There is a notable dearth of engagement with state level energy policy designs and there has been very limited application of energy justice principles to policy (Pellegrini-Masini, Pirni, and Maran 2020). This study initiates a conversation about the importance of these strategies and the ways in which they could be made more just.

Distributive and procedural justice

Consistent with other literature (Agyeman and Evans 2004; Liao, Warner, and Homsy 2019), I focus on two critical dimensions of justice: distributive and procedural. Applied to the energy context, distributive justice refers to equitable distribution or allocation of benefits and burdens or risks from energy production and consumption, while procedural justice is concerned about fairness in participation and procedures, calling for inclusion and accessibility in the governance of all types of energy policies and decisions (Jenkins et al. 2016). Often environmental and energy injustices are categorized with a three-tenet framework (Jenkins et al. 2016; Lacey-Barnacle, Robison, and Foulds 2020; McCauley, Grant, and Mwathunga 2022), while some even advocate for four dimensions (Sovacool et al. 2019). The third tenet, recognition justice, focuses on appreciation and involvement for all affected stakeholders. As recognition is inherently connected with procedural concerns (e.g. absence of recognition could be addressed through ensuring adherence to fair process) here concerns about recognition are engaged within the procedural dimension. Similarly, the fourth dimension of cosmopolitan justice is captured here as an aspect of the distributive dimension. Cosmopolitan justice is used to acknowledge global externalities and protection of global human rights, notably from mining of raw materials and waste streams associated with renewable energy technologies (Sovacool et al. 2019). These "cosmopolitan" issues help emphasize local versus non-local distributive concerns with renewable energy development but are nonetheless related to the (re)distribution of benefits and burdens.

This study is also informed by a feminist approach to energy research (Bell et al. 2020). The feminist approach engages a systemic perspective encouraging a focus on the study of power and calling specific attention to the inherent contradictions between a truly just energy system and a profit-driven market economy. Similar concerns have emerged from scholars imagining a just transition from the perspectives of political economy (Newell and Mulvaney 2013) and ecology (Brock et al. 2021). For example, Brock et al. (2021) note that as long as the renewable energy sector remains committed to free market ideology and low cost renewable electricity, new "sacrifice zones" will emerge to meet demand for cheap manufacturing of renewable energy components. Their research on the solar manufacturing industry leads them to term the recent rapid development of solar energy to be, "merely the latest iteration of an industrial growth model (2021:1756)." The feminist and related approaches encourage research to move beyond the categorization of injustices into procedural and distributive dimensions (or the three-, or four-dimension frameworks), but to think systemically about the structural conditions which create injustice so that we may move towards not only a low-carbon energy system, but also a just system that avoids recreating social and economic inequities.

Preemption

The governance structure for siting and permitting of energy facilities is of critical relevance to issues of justice, especially procedural justice. The U.S. has traditionally operated under federalism, in other words in a highly decentralized structure recognizing policy authority at multiple levels. Preemption refers to when higher level governments choose to minimize this decentralization, passing laws to restrict the policy authority of lower-level governments (Fowler and Witt 2019). Distinct from prior literature on preemption in renewable energy policy (Lyons 2014; Sovacool 2008), the focus here is not on the relationship between federal and state government, but rather the state and local. The focus on local governments is especially critical because of their traditional role in managing local land use planning and environmental review of local development. Local governments, including towns, villages, cities, and counties are responsible for providing and managing critical public services such as economic development initiatives, local police, roads, parks, and services to support community and individual health. Local property taxes provide the dominant source of revenue to supply these services (Aldag, Warner, and Kim 2018). This arrangement justifies local control, or home rule authority, over most land use and development activities.

But this points to an especially critical challenge: under local control, resident preferences are more likely to have success in shaping siting decisions and/or preventing development altogether. Opposition groups in wind energy siting decisions have had more success where jurisdiction over siting is local (Bohn and Lant 2009; Ottinger et al. 2014). In New York, local authority over natural gas development allowed communities to put in place local bans on hydraulic fracturing, or fracking, which eventually contributed to the passage of the statewide ban (Arnold and Holahan 2014; Homsy and Warner 2013). Based on these successful acts of resistance, home rule can conflict with energy development. States such as New York have an interest in advancing renewable energy development, and indeed, a legislative mandate to do so under their RPS. Some states have re-designed their siting and permitting procedures, preempting local policy authority to restrict development. Seven states have adopted fully state-level siting authority over solar siting, while an additional 19 states, including New York, now have a 'hybrid' regulatory structure for solar siting, meaning that state government acts as the final authority for siting large projects, while retaining local-level authority for smaller projects (Essa, Curtiss, and Dodinval 2021).

There is increasing concern about the influence of industry and corporate interests, or corporate capture, in policy design and decision-making associated with preemptive measures over local policy action (Briffault 2018; Kim and Warner 2018; Riverstone-Newell 2017). The criticisms of corporate capture stem mostly from concern about the actions of right-wing conservative political actors, such as the American Legislative Exchange Council (ALEC), who has been especially influential in bringing together conservative and/or neoliberal elected officials to participate together with industry and corporate representatives in strategic planning and policy design and encourage state lawmakers to adopt preemptive policies (Hertel-Fernandez 2019; Lafer 2017). In this case, New York state is controlled by Democrats both in the state legislature and governorship, providing an important example of how preemption and potential corporate capture can transcend political party boundaries. In the current era of political polarization, the use of preemption is often a more efficient policy tool that eliminates the need to cooperate or build consensus across party lines (Davidson, 2019). Rather than being an explicitly Republican or conservative policy tactic, the state preemption of local authority is used by both parties often to advance industry interests (Bravo, Warner, and Aldag 2020). The continued promotion of private corporate interests in the energy sector, despite the transition to a low-carbon system, deserves greater attention (Ashwood 2018a).

Research Questions

This paper engages these concepts of procedural, distributive, and systemic energy justice as a critical lens to examine the state-sponsored development of USS in New York. It brings into focus the policy landscape surrounding large USS development in New York state. The paper is organized around two main research questions. First, I identify **what are key justice concerns associated with USS development in New York state?** Second, **what are the main institutional drivers (e.g. policies and structural conditions) of this USS development in New York state?** This work departs from prior energy justice research hin shifting focus from the justice concerns to describe and analyze the policy structures which shape and create the conditions for injustice. I conclude with policy recommendations aimed at reducing the likelihood or severity of injustice during the development of USS.

Methods

This case study draws upon four years of extensive research on social and political dynamics of USS development in New York state. I conducted qualitative fieldwork and extensively followed news coverage of USS development in upstate New York between April 2019 and May 2022. I sought to understand the energy justice concerns and state-level policies on USS facility siting, with a particular focus on the opportunities for public participation in the siting process. I observed six in-person project open house events of approximately two hours each, hosted by project developers in proposed host communities, to observe and document the questions and concerns of residents. Based on my engagement with residents at these events, I was invited to attend a private, two-hour organization meeting of a community stakeholder group which later joined the state siting process as a community intervenor group. I also conducted interviews with key stakeholders, including three state agency employees involved in the USS siting and project reviews, one community opposition leader, fourteen town supervisors, and two project developers. Two interviews were in-person, but the majority were by video conference or telephone. The average interview length was 45 minutes. I attended five virtual public comment hearings on the draft state siting regulations. These sources were complemented with data from state policy documents, grey literature such as white papers, informational webinars about state siting policy, and online newspaper archives. The data was organized and analyzed with focused coding using Atlas.TI Windows (Version 9.1.7.0) in response to the research questions.

For the purposes of this paper, USS is defined as major or large-scale photovoltaic solar projects of at least 20-megawatt (MW) capacity. In general, 'utility-scale' refers to projects which directly feed the electric grid, as opposed to distributed generation facilities which connect within a local distribution network to primarily supply for on-site electricity demand. The 20 MW size threshold plays an important role in energy planning in the state; projects above this size are considered large-scale by the state electric grid operator meaning these projects are subject to a specific interconnection application process (NYISO 2019). In addition, this size threshold determines whether project permitting oversite resides with the state or local jurisdiction, as discussed below. A project of 20 MW corresponds to approximately 120 acres of photovoltaic solar paneling. Thermal or concentrated solar power (CSP) technologies are not actively under development in New York and therefore not discussed in this paper.

Findings

Promoting USS development is critical part of New York's plan to achieve the RPS targets (DPS and NYSERDA 2020). New York ranks 10th nationally in terms of total solar capacity installed, but 5th in expected growth projection over the next 5 years (SEIA 2020a). There are dozens of energy companies pursuing USS projects across the state, prompting residents and government officials to reference a growing solar "wave" or "tsunami". The state has been on a mission to attract a robust pipeline of solar projects to the state, and now, "the pipeline is here" according to one state employee. As of March 1, 2022, a total of 10 major USS facilities have received siting permits in New York State, but an additional 58 major projects are in the pipeline, either currently under review or having indicated intent to apply (Table IV.1). The state recently shifted the siting review and permitting process from the Article 10 system managed by the Department of Public Service to a new Office of Renewable Energy Siting (ORES), as discussed further below.

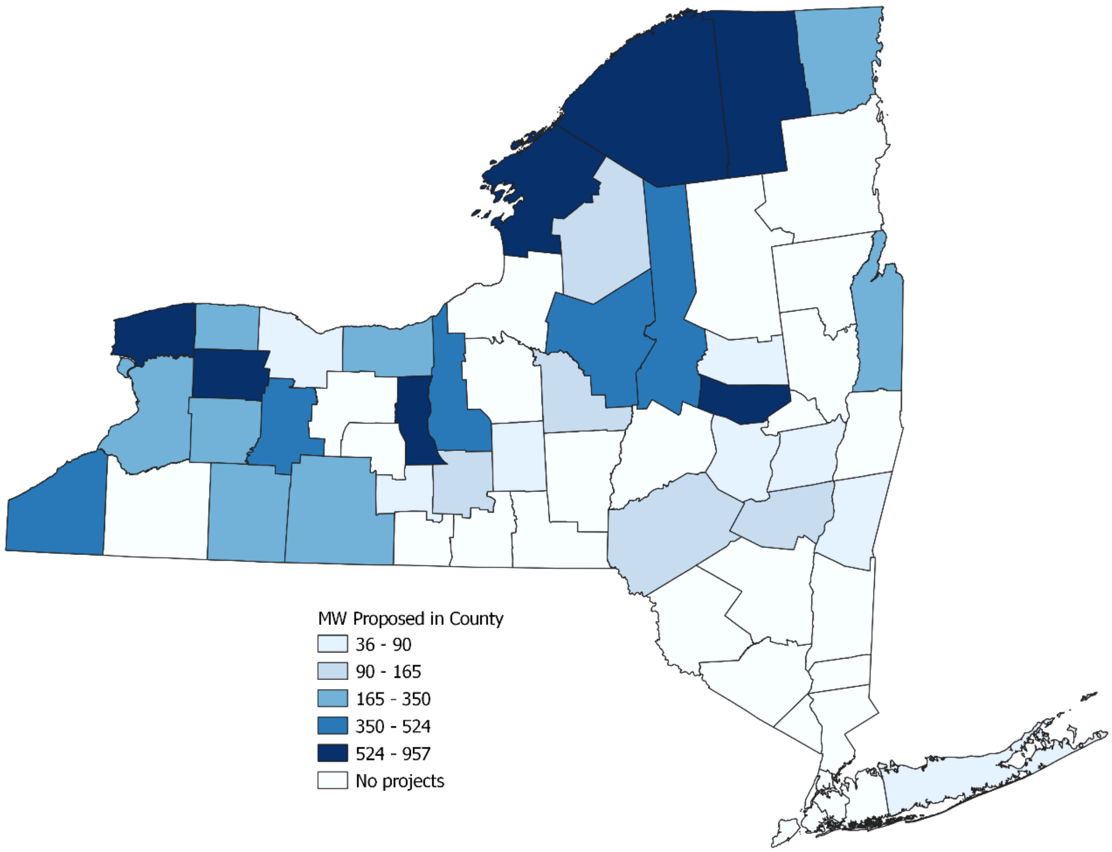
The average project size of all 68 projects is 154 MW, which corresponds to an approximate average footprint of 1000 acres of PV solar paneling, or roughly 500,000 solar panels. Figure IV.1 displays the geographic distribution of these projects by county. Counties with the most potential development in major USS facilities are all rural counties, and include Jefferson, St. Lawrence, and Franklin counties in the north of the state, Niagara and Genesee counties in the west, and Seneca and Montgomery counties in the central part of the state.

Table IV.1. Status of USS projects in the NY State development pipeline as of March 1, 2022.

	# of projects pending	**# of projects permitted**	**Average project size (MW)**
Under Article 10 siting review (Old system)	9	7	154
Under ORES siting review (New system)	22	3	181
Potential new ORES project	27	-	130
	58	**10**	**154**

Source: ORES, table created by author.

Figure IV.1: Map of Total Proposed MW of Large Utility-Scale Solar by County as of March 2022



Source: Map is author's creation, data from ORES and NYSERDA

Justice concerns

Key reported distributive and procedural justice concerns with USS development are listed in Table IV.2 and elaborated on below. These examples represent concerns that individuals and groups express in public comments and editorials. Importantly, it is not an exhaustive list, but rather represents key concerns observed across multiple sources.

Land use is a key feature of justice concerns. The footprint of USS is more land intensive than other forms of energy development, such as wind, nuclear, and natural gas extraction. The conversion of land for utility-scale solar facilities is not evenly distributed across the state. There is disproportionate development of large USS projects in rural areas, not due to the inherent differences in the solar resource, but rather to economic differences in the land cost and assemblage of enough parcels for a large project which are socially constructed phenomenon. Development is also concentrated in regions proximal to existing grid lines (Kay et al. 2020). Many upstate New York residents sense a lack of appreciation and recognition for the ways USS development may change the landscape and alter rural community character (R. C. Stedman and Nilson 2021). There are also instances of potential disturbance to indigenous cultural sites from USS development, associated with a lack of recognition of indigenous property claims (Corwin 2020).

There are distributive concerns associated with global externalities of the solar industry which current policies do not address. There are no local recycling facilities for solar facilities, and state policies do not have authority to enforce labor or environmental standards over the mining of materials or manufacture of system components that occurs globally.

As will be discussed in further detail below, the economic gains from multi-million-dollar USS facilities primarily accrue to the solar developers and the select large-scale landowners who sell or lease property for development. The relative proportion of economic gains to other residents or the local taxing jurisdictions is minimal, and hard to measure. These economic outcomes are distributive justice concerns, in that they are related to the distribution of benefits from the USS development, however they are also directly connected to the procedural feature, that is, that "private participation" in energy planning comes before the opportunities for participation from the rest of the public. The preemption of local authority is directly represented as a procedural justice concern as many local stakeholders perceive of the state's siting process as failing to provide adequate opportunities for public input.

In the next section, I describe the key policy structures which are driving USS development in New York, shaping the form it takes, and contributing to justice concerns mentioned above. Three key institutional drivers are identified and discussed below: preemption, the long-term contract procurement program, and pathways for local community benefits.

Table IV.2. Injustice dimensions and key examples from public response to USS development in New York state.

Distributive: *Inequitable distribution of social and economic benefits and costs, unfair or closed access*	**Procedural:** *Lack of adherence to due process, unfair or inadequate public participation, exclusion and lack of consent*
• Loss of or impact to sensitive natural resources, e.g. grasslands, forested lands, wetlands, farmland • Greater accrual of economic gains to industry and investors than local landowners or municipalities • Disproportionate development in rural areas, and locations proximal to existing grid infrastructure • Lack of comprehensive recycling program • Expected to create global externalities • Global supply chain labor and environmental concerns, including mining or manufacture of PV system components	• State-based siting authority (preemption of local land use authority) • Public comment opportunities impacted by Covid-19 (many sessions moved to strictly virtual, audio format) • Private participation dominates over public participation: large landowners have first notice and most local voice in development process • Dismissal of rural grievances – e.g. impact to rural community character • Lack of recognition of indigenous property claims and planned disturbances to indigenous cultural sites or burial grounds

Source: Justice definitions from Sovacool et al. (2019), examples by author.

Preemption of local control

As described above, New York preempts local authority over the siting and environmental review of major energy projects. Since 2011, this preemption had been handled by the Board on Electric Generation Siting and the Environment, led by the Chair of the Public Service Commission. The authority for this process was authorized under Article 10 of the Public Service Law, so projects which applied for facility siting review under this system are commonly referred to as Article 10 projects. This process was recently redesigned with the passage of the Accelerated Renewable Energy Growth and Community Benefit Act (AREGCBA) as part of the Fiscal Year 2021 state budget (Nilson, Kay, and Stedman 2020). Passing this Act as part of the state budget, rather than as its own legislative initiative, raised procedural justice concerns for some constituents.

Table IV.3. Comparison of USS siting procedures.

	Traditional home rule	**Article 10**	**Section 94-C**
Governing authority	Local jurisdiction (e.g. town or village)	State Siting Board, chaired by Department of Public Service	Office of Renewable Energy Siting hosted by Department of State
Local involvement	Local government (e.g. town board, planning board) oversee in accordance with State Environmental Quality Review Act and make siting determination	Local governments participate as a party/ intervenor but do not make siting determination 2 local ad hoc members may be appointed to serve on siting board	Local governments may participate as party/intervenor but do not make siting determination
Timeline	Varies, generally 2-5 years	Varies, generally 2-5 years	Within one year of complete application

AREGCBA mandated the creation of a one-stop shop for large-scale renewable energy siting and permitting, the Office of Renewable Energy Siting (ORES) within the Department of State (Nilson et al. 2020). The creation of ORES signals state initiative to treat large-scale renewable energy development more as economic development than a bureaucratic regulatory issue (Russo and Knaub 2020). Projects between 20 and 25 MW can opt-int to the new ORES process. Smaller USS projects complete siting and environmental review at the local level subject to the provisions of the State Environmental Quality Review Act (Nilson et al. 2020). Therefore, the state has authority over the projects with the more expansive local impacts and externalities. In its first year of operation, ORES was tasked with developing Uniform Standards and Conditions (USCs) for facility siting of large-scale wind and solar facilities, which serve as guidance for developers on the general expectations of facility design, although exceptions to these USCs based on site-specific conditions are still reviewed by the office on a case-by-case basis.

New York characterizes the preemption of local authority and consolidation of siting review for large-scale renewables as a mechanism for promoting the swift buildout of significant renewable energy: this goal of speeding up development is built into the name of the legislation that established ORES, the *Accelerated* Renewable Energy Growth and Community Benefit Act. Many local governments are frustrated with their loss of authority to require facility specifications or negate unwanted development. A group of towns and community organizations challenged the state's authority to create ORES in a lawsuit for violation of the home rule precedent established in the state constitution (Lynch 2021). In September 2021, the state's supreme court ruled in favor of ORES, noting in the decision that home rule is not unlimited, with the preemption doctrine representing a fundamental limitation on home rule power, citing precedent from prior energy siting cases[8]. The decision notes that "the legislature has enacted a comprehensive scheme to create a 'single forum' giving ORES exclusive jurisdiction over the siting of major renewable energy facilities, preempting local authority (Decision and Order, p. 23)."

The decision goes on to note that "while preemption stands, it is wholly mindful of local interests." This statement is unclear, and some local leaders challenge the idea that state employees understand local concerns. As one town supervisor noted in an interview:

[8] Prior preemption cases cited by court: Consol. Edison Co. v. Town of Red Hook [1983], Albany Area Builders Ass'n v. Guilderland [1989], and Matter of TransGas Energy Sys., LLC v. New York State Bd. On Elec. Generation Siting & Envt. [2009].

A guy sitting down on the other end of Long Island doesn't have any idea of the content of [my town]… I mean home rule to them is just an empty phrase. I'm convinced of that and I've talked to a lot of guys in the same chair I'm in and they are all feeling pretty much the same way. We have to, locals have to, respond to all their grandiose rules, set up by what I call people who never left their desk. They have no idea what's out here.

The perspective of many local officials seems to be that if the ORES process truly does have the same level of concern for local interests as do local governments then preemption of local authority would not be needed in the first place. If ORES was truly "wholly mindful of local interests", they would reach the same siting decisions as local governments. The lawsuit is still ongoing as the petitioners are currently pursuing an appeal of the court's decision.

"Unreasonably burdensome" and the public interest

Despite the establishment of Uniform Standards and Conditions for facility siting review promulgated by ORES, there remains substantial uncertainty about how often and under what circumstances local laws will be preempted to facilitate facility construction. One of the most often referenced lines of the AREGCBA law text reads:

> *A final siting permit may only be issued if the office makes a finding that the proposed project, together with any applicable uniform and site-specific standards and conditions would comply with applicable laws and regulations. In making this determination, the office* ***may elect not to apply, in whole or in part, any local law or ordinance*** *which would otherwise be applicable if it makes a finding that, as applied to the proposed major renewable energy facility, it is* ***unreasonably burdensome*** *in view of the CLCPA targets and the environmental benefits of the proposed major renewable energy facility.* (NY State Budget 2020:10 emphasis added)

Many public comments in response to the draft regulations reference this "unreasonably burdensome" clause and sought further clarification, examples, or further guidance about how this may be applied. In their response to public comments, ORES noted that they are obligated to consider a proposed facility's contribution to the states decarbonization targets in determining whether a local law is unreasonably burdensome and will make these decisions with site-specific considerations. But ultimately, they provide little clarity and transparency in response to the publics concerns about how an unreasonably burdensome determination would be made, raising procedural justice concerns. Thus far, ORES has issued permits for three solar facilities, but none of these necessitated significant deviations from local zoning laws and regulations.

At the time of this writing, there is one recently issued *draft* solar facility permit for the Horseshoe Solar Energy facility, a 180 MW USS facility proposed in two towns, Caledonia and Rush, about twenty miles south of the city of Rochester. The ORES draft permit grants whole or partial relief from compliance to various local laws and provisions. Table IV.3 provides the description of each specific substantive local law or provision which the developer characterized as unreasonably burdensome. For each topic, the ORES determination agreed with the developer that the local law or laws should not be applied because they would be unreasonably burdensome[9]. While both towns have solar laws and provisions in place, those in the town of Rush are substantially more restrictive of large-scale solar development, essentially prohibiting major facilities from development within the town. The draft permit for the Horseshoe facility notes these determinations have been made based on balancing competing impacts to multiple resources, the proposed measures to avoid, minimize or mitigate impacts to the maximum extent practicable. The key environmental benefits referenced in the draft permit are that the facility contributes up to 180 MW towards the CLCPA targets, "producing enough zero-emissions energy to power more than 43,000 homes in New York State and reduce carbon dioxide (CO2) emissions in the State by at least 125,335 tons (Horseshoe Draft Permit, p. 5)." The ORES determinations to elect not to apply local laws from both Caledonia and Rush demonstrates that

[9] The use of obscure language such as 'unreasonably burdensome' leaves decisions up to court interpretation, and has shown to privilege industry interests in international trade regulations (Gerbasi and Warner 2007).

the office is willing to issue permits that violate the local laws of both more restrictive town laws like those of Rush, and those of towns like Caledonia.

Table IV.4. Local laws determined unreasonably burdensome in the Horseshoe Draft Permit.

Topic	Town of Caledonia	Town of Rush	ORES determination
Height	Solar equipment should not exceed 17 feet	Solar equipment should not exceed 12 feet	Solar system can be up to 17 feet as proposed by the applicant, but overall equipment height, such as for lightning-protection devices, can be up to 20 feet as allowed in USCs
Land & Parcel coverage	Solar system should not cover more than 50% of the designated farmland of a parcel, and total surface area of solar equipment should not exceed 80% of a total parcel area	Large solar systems should not collectively occupy more than 150 acres in the Town of Rush; single system can be a minimum of 20 and maximum of 50 acres in the Town. Large solar systems shall not exceed 50% of the lot.	No limitations to percent of farmland covered, total parcel coverage, or single system sizes are required by the Office or outlined in USCs. Permittee is allowed to cover more than 50% of lot to accommodate proposed collection substation in Rush.
Setbacks	Setbacks: 750 feet from side or rear of nonparticipating residence or commercial building 250 feet from property lines of nonparticipating property with residence, or 150 feet if no residence 200 feet from right-of-way of a Town road, or 250 feet from County or state road or highway	Large solar systems shall be at least 200 feet from all property lines	The facility must comply with these setbacks in specific locations (250 feet of right-of-way line of Route 5, and West River Road; 750 feet from side and rear of non-participating residences on Route 5) but otherwise is subject to setback specified in USCs: 100 feet from non-participating residential property lines 50 feet from centerline of public roads 50 feet from non-participating property lines (non-residential)

			250 feet from non-participating occupied residences
Landscape buffer	Buffer will provide year-round screening to reduce visibility to the maximum extent practicable. Vegetation should be planted within 25 feet of required landscape screening. Plantings should be noninvasive evergreen trees or bushes which are deer and weather resistant. Buffer should be at least 10 feet within 5 growing seasons. Invasive species should not be planted.	Large solar systems shall be completely screened from adjacent properties, using existing vegetation to the fullest extent practicable and at least 2 rows of native evergreen trees or other plan approved by Town Planning Board	USCs requires a Visual Impacts Minimization and Mitigation Plan and use of a qualified landscape architect, arborist or ecologist, but details on the planting distance or plant types are not specifically outlined.
Locational restrictions	-	Rush zoning law created a specific Solar Energy systems district, but prohibited large solar systems in most of the towns zoning districts	ORES elects not to apply these zoning restrictions.
Underground requirements	-	All on-site utility and transmission lines shall, to the extent feasible, be placed underground	Office approved permittee's request to construct approx.. 250 feet of Interconnection Line above ground from the facility's substation to the existing Golah substation.

The town of Caledonia has one particularly interesting requirement that solar systems should not replace more than 50% of the farmland on any given parcel. This represents a concern about the role of solar in contributing to the loss of farmland expressed by many concerned stakeholders, both locally and statewide. Large, clear, and flat farmland is under substantial development pressure in the state, as it is often less costly for developers than attempting to site facilities on regulated wetlands, wildlife habitats, or forest lands.

The draft permit does not provide further explanation detailing how ORES balanced competing interests. The determination of whether a local law is unreasonably burdensome rests upon the definition of the public interest. ORES is bound to support the decarbonization goals of the CLCPA. The State Supreme court decision in the Town of Copake et al. v. ORES et al. case provides some further clarification on the state's perspective of the public interest, where it cites from state environmental conservation law:

> *[F]or it is manifest that development of major renewable energy facilities based on wind and solar resources to provide electrical generation is a reasoned means to combat climate change, and wholly compatible with the public interest to "**protect the environment for the use and enjoyment of this and future generations**."* (Lynch 2021:36 emphasis in original)

ORES also noted in their assessment of public comments that the state legislature was serving the public's interest by expediting the regulatory review of facilities and infrastructure necessary to meet the CLCPA targets. Based on these examples, combating climate change is the core public interest relevant to the state in their decision-making on facility review. This contrasts to the perspective of local jurisdictions, who may emphasize other interests more heavily in their decisions, such as preservation of farmland or natural areas, minimizing industrial development, and protection of scenic vistas and landscapes with are important to community character, wellbeing, and tourism opportunities. Many local jurisdictions cite concerns about the impact of large USS projects to their community character (Stedman and Nilson 2021). Potential impact to community character is hard to predict and quantify, and thus difficult to regulate. As one ORES administrative law judge explained:

> *Air permits or the water pollution control permits are the classic ones where there are set limits, you know, you can only produce X amount of pollutants of a certain type, if you're below that you are good, right? The type of impacts like agricultural impacts, visual community character, those aren't 'bright line'. It's not like there's a standard where you've gone over the line of community character, right?... it's a very kind of a fuzzy*

> *standard, but it's a balancing, you know, avoids, minimization, mitigation. In that mix. We're balancing the environmental benefit of the project, ie. the reduction of carbon emissions and the climate goals, right, the need to get to 70% by 2030. Yeah, so we're doing that for solar for resources like agriculture, like visual community character. We are doing the analysis, and, in the balance, we are weighing, yes, the impacts of the project. So, it's not a bright line. Yeah. I don't think there'd be any way to do a bright line.*

Interestingly in this quote, the judge discusses impact to agriculture land and community character as both features that in his perspective would be very difficult to regulate with set limitations. However, some towns have tried to do so, for example, the town of Rush has passed local laws to attempt to regulate impact with the locational restrictions and acreage limitations for solar development (Table 4). ORES however did not integrate such restrictions into the uniform and standard conditions for siting review.

Accusation of corporate capture

A private consulting company was hired by ORES to assist in the drafting of siting regulations and associated public comment review. The aforementioned lawsuit accuses the ORES of being captured by corporate interests, noting "Rather than rely on the expertise of the agencies the State identified, ORES hired a private consulting company, Tetra Tech, to draft its procedural regulations and its uniform standard conditions; to review and respond to public comments on the draft regulations; and to review future individual project applications submitted for approval (Complaint, p. 12)." The lawsuit goes on to suggest this as a conflict of interest because Tetra Tech provides design and siting service to 25 renewable energy developers and projects in the state, as noted in their application for the ORES contract. In the court's decision, it disregarded this concern, noting, "There is nothing in the record to evidence that any member of

ORES has any financial interest in Tetra Tech, and the fact that Tetra Tech has experience in the field does not disqualify it from participating in the process (Decision and Order, p. 34)."

Tetra Tech is a California-based consulting and engineering services firm owned by the multinational conglomerate corporation Honeywell International Incorporated (Tetratech 2022). Honeywell manufactures materials for solar paneling including anti-reflective coating (Honeywell 2013). This is not necessarily evidence itself of bias by ORES or Tetra Tech in their review of public comments and formation of the facility siting regulations, however the relationship does invite scrutiny. It points to a need for transparency about the level of private corporate involvement in activities traditionally assumed to be handled exclusively by the public sector, but that are now often handled through public-private partnerships. Given Tetra Tech's connections to the solar industry, their direct involvement in the review of public comments and the drafting of regulations has direct implications for distributive and procedural justice.

Renewable Energy Credit system and Long-term contracts

A primary way the state supports development of large-scale renewable energy development is through a long-term contract procurement award system under the Renewable Energy Standard (NYSERDA, 2020). The New York State Energy Research and Development Authority (NYSERDA) manages the procurement contracts. They have produced an annual call for bid proposals since 2017. The Renewable Energy Standard mandates load-serving entities purchase Renewable Energy Credits (RECs). RECs are described as a "tradable, market-based instrument that represents legal property rights to the "renewable-ness" – or all non-power attributes—of renewable electricity generation (US EPA 2016)." New York state's REC system is somewhat unique from other states in that the state procures RECs independently from the purchase of the actual electricity, while in many other states the symbolic REC would be bundled together with the electricity in power-purchase agreements. The procurement contract awards guarantee a set price for the purchase of the RECs that will be generated by the facility, the bid price, for the first 20 years of the facility's operation. Long-term contract awards are not necessary for renewable energy projects to be developed, but they are advantageous for project financing as they give investors more certainty of a project's viability. Contracts provide security to developers that they will be able to sell their RECs at the Bid price if and when the facility is constructed.

Over the life of a project, approximately one-third to one-quarter of a project's revenue may be made up on REC revenues. In the last two years, the program started offering an index price option for the REC payments to stabilize the price paid to developers and help shield them from fluctuations in the market, so the total amount paid for the REC varies based on the current rates in the energy production and capacity markets. There is also variation based on location, for example projects developed in zones closer to downstate energy demand are more difficult to site and generally more expensive to develop. Given the energy demand in those regions, the market returns from energy production and capacity markets are greater, leaving a smaller balance for the state to fund through the REC system. The funding provided by REC system in New York helps attract developers to New York state who might otherwise be better off pursuing project development in others states with better conditions for wind and solar production. According to one NYSERDA employee:

> *New York doesn't have a great resource compared to the rest of the country for some of these projects, you know, New York is towards the bottom of the list as far as solar goes, it's middle of the pack as far as wind resources go, but that's part of the reason these programs have been set up is to make these projects competitive on a national and even international scale. Because, absent that, you know, it's so much more attractive to many developers to go building Texas or Iowa or California as opposed to coming to New*

> *York. So a quarter to a third [proportion of project revenues paid by REC] is like a rough rule of thumb.*

Importantly, the long-term contract award system is a separate and distinct process from the siting and environmental review handled by ORES – the awards do not guarantee that a project will be built but do provide indication that NYSERDA views the project as likely to be viable.

With the REC system and long-term contract procurement tools, it is clear that New York state is embracing market-based solutions to the climate crisis. This becomes even more clear in the evaluation criteria used by NYSERDA to choose which projects will be awarded bid contracts. The evaluation criteria include price and non-price components, but the price component makes up 70 percent of the overall evaluation, compared to 10% each for non-price components (measures of the project viability, operational flexibility, and incremental economic benefits to the state). These measures incorporate some non-economic considerations into the selection of projects, but ultimately price plays the dominant role, incentivizing developers to cut project costs to keep their bid price down so they will be competitive with other projects.

State agencies do recognize potential local impacts of large-scale solar facilities under pressure to develop at lowest possible costs, but this recognition has yet to lead to changes in the components of the evaluation criteria or how they are calculated. NYSERDA is developing a system to compare projects based on their impact to local natural resources with a Smart Solar Siting Scorecard (NYSERDA 2020c). The scorecard is a form that developer's complete as part of their Bid proposal to indicate a variety of project features, such as what percentage of the facility is on sensitive resources such as grassland, forestland, wetlands, or farmland and what actions the site plan incorporates to minimize or mitigate impacts, such as an agrivoltaics plan. However, at this time the scorecard does not factor into project evaluation, as is clearly indicated on the top of the Scorecard: "Despite its name, NYSERDA will not consider information contained within completed Scorecards in the RFP scoring or evaluation process." Additionally, and crucially, developers are not legally bound to any claims made on the scorecard. A NYSERDA employee indicated that the scorecard was developed with the idea that it may play an actual role in overall project evaluation in the future, there are currently no concrete plans for this in place. Furthermore, the employee expected that current discussions in the agency suggest the scorecard would most likely still only factor into the 30 percent non-price component of the evaluation. The employee elaborated that this is driven by the fact that NYSERDA needs to be careful to not drastically "move the goal posts" of project expectations from year to year, nor interfere with the project siting regulations process of ORES as that is outside of the scope of their authority. It seems unfortunate that these smart solar siting considerations and management practices do not play a larger role in the selection of facilities for the long-term procurement awards. If, for example, the information on the Smart Solar Siting Scorecard was to substitute for a portion of the price component of the evaluation criteria, this could provide greater incentive to developers to reduce impacts to agricultural land or other natural resources, thereby minimizing the distributional justice concerns from the local environmental impacts of large USS development.

Local economic benefits

The USS pipeline brings with it potential for substantial local economic benefits – each USS facility is after all a multi-million-dollar project. The two core pathways for long-term local economic benefits accrue to landowners who either sell or seemingly more commonly lease property to host the facility, and payments to local taxing jurisdictions from host community agreements (HCA), local property taxes or payments-in-lieu-of-taxes (PILOT) agreements.

The planning and siting of USS at the local level most often initiates with private conversations between developers and landowners engaging in land lease or purchase negotiations. This feature, termed "private participation" (Jacquet 2015) means that private actors, such as large-scale landowners, have more influence in shaping USS development than members of the general public, such as residents who do not own substantial land, or community organizations. At this stage in the process, these conversations are private and not open for public discussion or input. This timeline is critical – the actual "public input" period or public participation activities mandated by state policy only begin after private land has been secured for project development, and thus the overall project footprint already well-established. While it is true that actual project designs may shift over time, or additional landowners be brought in, by and large the overarching project area and project size is already established before the wider public may even be aware of the potential project. Overall, leasing land for USS facilities promises substantial economic payments to landowners and is therefore an attractive option for many. For example, a USS lease agreement may offer approximately $1000 per acre in annual payments, which is substantially more, often 3 to 5 times more, than what the same land could generate from agricultural rents. Private participation invites distributional inequities between different landowners, whom may have different levels of experience with bargaining for payment agreements or different lease terms (Bugden and Stedman 2019), not to mention the procedural injustices associated with private large-scale landowners having more access and thus voice in shaping the facility planning process than other residents.

Taxation and PILOTs

New York requires project developers to provide some form of local economic incentive or host community benefits to host communities, but the form these benefits take can vary. A key reason these benefits can vary is based on taxation. To help promote renewable development, the state provides a 15-year property tax exemption for value that a renewable energy system adds to the overall value of a property. This helps make all renewable systems, from small residential to large-scale projects, more financially viable (Croghan 2020; NY-SUN 2016). This exemption is standard, in that it is in place unless a local jurisdiction takes explicit action to opt-out. A local jurisdiction however cannot choose to individualize the opt-outs, in other words, if they opt-out in order to tax large-scale solar projects, homeowners with roof top solar panels would also lose the tax exemption for these systems. Opting out of the exemption results in full taxation, though for large projects the jurisdiction and developer may agree to instead enter into a PILOT agreement. PILOT amounts are not standardized by state regulations but negotiated between the developer and the local jurisdictions involved. Many, but not all local jurisdictions choose to allow their county industrial development agency (IDA) to negotiate the PILOT agreement with the project developer.

Negotiation of payment agreements can generate uncertainty and invite inequities across jurisdictions. A fact sheet about these tax regulations produced by the NY-Sun program in 2016 threatened local governments about the possibility of destructive competition between local jurisdictions, stating that requiring full taxation of USS projects could prompt developers to pursue development in other localities (NY-SUN 2016). Solar industry representatives make similar references, for example the executive director of the Alliance for Clean Energy New York (ACE-NY), an industry lobby organization, recently noted in a news article, “If the taxes are too high then the projects don’t get built (Karlin 2022).”

Some local jurisdictions have reported being unprepared to negotiate with developers, or unaware of the potential economic opportunity presented by development. For example, one

Central New York town reported being overwhelmed by sudden proposed solar development and unaware of the opportunity to require a PILOT for two 5 MW solar facilities that were approved in 2019 and 2020. Projects of similar sizes in neighboring jurisdictions will pay hundreds of thousands of dollars in PILOTs (Knauss 2021). News articles have reported that recently negotiated PILOT payment amounts for different solar projects across the state range from $5 to $30 per kilowatt (Karlin 2022). Some jurisdictions were more informed about the potential for economic benefits from USS based on prior experience negotiating PILOT agreements for wind projects. Lewis County, for example, even used PILOT negotiations as a mechanism to promote the use of marginal lands for USS, over prime agricultural soils, by offering lower payment requirements for projects developed on marginal land (Naturally Lewis 2022). Now however, due to recent changes in state tax law the ability of Lewis County and others like it to structure their local tax policies in this way may be stifled. In 2021, the state legislature adopted Real Property Tax Law 575-b which mandates a standardized appraisal methodology be used by local assessors to appraise large wind and solar energy systems. This eliminates variation in how different local assessors may appraise the value of large wind and solar systems, mandating the use of a specific method of income capitalization (Department of Taxation and Finance 2022). Income capitalization is one of three common methodologies to value property. The other two approaches are sales comparisons, commonly used for residences that are frequently bought and sold, and the cost approach, which is based on calculating a reproduction cost minus depreciation. The cost approach is common for specialty properties not often bought and sold. Income capitalization is a common approach for income producing properties with a specific income stream, such as energy production facilities, so assessors would likely have used income capitalization regardless of the new law. However, the law mandates a specific model of income capitalization, known as discounted cash flow (DCF), and requires that use of discount rates established by the state that must be used in the calculation. DCF is forward-looking – rather than the assessor looking at historical income, they instead look to estimates of future income and discount anticipated future incomes to a present value.

According to ACE-NY, the standardized DCF methodology described above is the preference of developers. A blog post on the organization's websites indicates:

> *According to renewable energy developers, the main thing missing under the current taxation system is consistency. It's very difficult to plan a multi-million dollar project, even when it is prioritized in state law, when such a key component as the local tax rate is subject to wildly different interpretations. When passed as part of this year's state budget, Part X will empower state tax officials to develop recommendations to inform local tax rates* (Jones 2021).

The post goes on to argue that the standardized methodology is critical for the state to reach the ambitious goals of the CLCPA.

In contrast, many local jurisdictions are concerned that the new mandated approach was passed in violation of procedural laws, limits the autonomy of local jurisdictions, and that the established discount rates will result in substantial decreases in local revenues. Nine towns have joined together on another lawsuit filed in April 2022 against the Department of Taxation and Finance in an attempt to avoid having to use the new appraisal methodology. As a part of this lawsuit, an assessor for several of the towns filed an exhibit explaining the likely impact of the state's mandated model and discount rates. The exhibit provides an example for assessment of a 50 MW USS facility under construction in the Town of Sharon. The discount rates established by the Department of Taxation and Finance results in an 83.5% drop in assessment for the property, leading the tax dollar amount to drop from $2.9 million to just under half a million dollars. The assessor explains that this difference is not necessarily due to an inherent problem with the discounted cash flow approach, but rather based on the established discount rates that will result in much lower assessments (Jones II 2022). The discount rates would lead to an annual fiscal impact to the Town of Sharon, its School District, Fire District, and Library District of $2.4 million tax dollars. The suit is still under review at the time of this writing, but the court did issue a temporary stay to consider whether the law violates the State Administrative Procedures Act, so that assessors need not apply the new methodology in the 2022 tax rolls (Town of Blenheim et al. 2022).

The tax law may also impact revenues for towns that have negotiated PILOT agreements. While PILOTs will still be an option, these payments may not exceed the amount that would be paid under the new taxation approach. It establishes the upper limit on possible taxation. In an interview, a local stakeholder familiar with his county's PILOT agreements indicated that one of their current PILOT agreements required $2 million annual payment for a current wind project. Their county assessor has estimated the tax payment amount under the state's new approach to be $600,000, so the $2 million established by the PILOT agreement would no longer be valid. These examples suggest the state's new tax assessment model presents favorable conditions for developers and lower revenues for local jurisdictions. .

Local employment

Another potential mode of local economic benefit is through employment opportunities. There are substantial employment opportunities associated with USS construction, but for each facility these opportunities last about two years and are not necessarily filled by local individuals. USS project developers estimate in their permit application materials that the project will require between two to five employees for the approximate thirty years of a facility's lifespan after construction, depending on the facility size. During construction, one permitted 177 MW project estimated employing between 177 to 286 full-time employees for two-years.

While some of these opportunities will be filled by local individuals, the applicant notes, “It is anticipated that many of the highly specialized workers will come from outside the immediate area (i.e. Livingston County) and will remain only for the duration of construction (Morris Ridge application, Exhibit 27, p. 11).”

Overall, with rules still under revision and local experience with USS still developing, there is limited transparency and clarity on the real local economic potential of USS, and even less potential to assess the relative distribution of economic benefits between the energy industry and local communities.

Conclusions and Policy Recommendations

Too often, critical discussion of the implications of market-based techniques which preference the interests of private industry to accomplish renewable energy development are left out of conversations about combating climate change. Many key climate change policy responses, such as those in New York discussed here, rely on renewable energy developers who are actively seeking profitable opportunities from the crisis of climate change. The potential to achieve “justice” with USS energy development is structured based on this reality. This paper concludes with several policy recommendations which could help counter injustice during the critically needed transition to a low-carbon energy system.

Collaborative consent-based siting process.

The preemption of local policy authority over USS siting introduces a procedural justice dilemma – the process is considered unfair by some local constituents, but absent some level of centralized authority, adequate renewable energy may not come online in a timely fashion. Importantly however, the state should not prioritize the profit-motives of the energy industry over community and environmental considerations. The state should avoid employing private consultants connected to the energy industry to support their regulatory efforts. Furthermore, the state could take a more active role in facilitating productive collaborative processes between developers and local municipalities and mediate a consent-based system for resolving discrepancies between local zoning and USS site plans, rather than acting as the ultimate authority on siting decisions. In such a collaborative approach, the state could still play an important role in providing technical assistance on review of facility siting permits and ensuring integration of public interests from across public stakeholders.

Use long-term contract system to promote smart solar siting.

Currently, the evaluation criteria for long-term contracts prioritizes economic considerations. There are ways to incentivize solar siting practices which minimize impact to sensitive habitats and natural areas. One example provided was how Lewis County has offered lower tax payments when developers pursue USS on marginal lands. The Smart Solar Siting Scorecard also demonstrates the type of considerations that could make USS siting less detrimental to the local environment. So far however, the state has avoided incorporating such considerations into the contract awards.

Encourage community ownership and profit-sharing.

A truly just energy system would be one that deconcentrates and redistributes wealth associated with energy production and distribution. Models of community ownership and profit-sharing could be embraced and incentivized with state policies to move in the direction of a vision of energy as a common good. Community ownership could help bolster the opportunities for broader engagement in early planning and development of USS, which currently is limited to private landowners.

These policy recommendations could help alleviate the procedural and distributive justice concerns associated with USS development. For some, these recommendations admittedly may not go far enough in that they do not ultimately eliminate the vision of energy as a commodity in an unjust market-based economy (Lee and Byrne 2019; Mascarenhas-Swan 2017). However, given the entrenchment of the market-based energy system, these provide pragmatic steps to reduce injustice within the system while still promoting actions to steer off the most extreme climate consequences.

VI. Conclusion

Broadly, this dissertation responded to the question of what USS represents. I learned that it represents a variety of things for different stakeholders in New York. The inspiration for the first article came from a resident in a town board meeting during a discussion of proposed USS development. He asked, “Why are we not talking about big and small solar as separate things?” His question revealed his frustration that policy discussions about solar energy development did not adequately differentiate between small- and large-scale solar developments. This small anecdote about a local policy concern points to a broader national issue. In national public opinion polls and policy discussions, all types of solar energy development are often grouped together to represent a singular idea, that of clean energy derived from the power of the sun. But it was clear from this research that one definition, or one category of understanding, is insufficient to articulate the differences between “big” and “small” solar development, and everything in between. The high level of public support for solar energy most likely reflects attitudes towards rooftop solar and smaller sized installations. Opposition to USS can be relational, or in other words, dependent upon an individual’s understanding of the alternative options to USS, for example, someone may oppose USS because they have not seen that all opportunities to develop solar on rooftops or brownfields, or all efforts to reduce energy consumption, have not been exhausted prior to the proposal to build USS. This idea of relational opposition has not been emphasized in prior research on attitudes towards renewable energy.

In the second article, I observed that USS can represent the perception of energy colonialism. Rather than representing a new or reimagined urban-rural resource relationship, proposed USS development is perceived to recreate the extractive relationship common to former natural resource industries in rural places. In other words, it represents yet another iteration of rural sacrifice for the provision of natural resources needed to support modern society, and especially to power urban centers. In social representation terms, internal colonialism is a heavy anchor which shapes how residents respond to USS. Importantly, the representation of USS as a form of energy colonialism is associated with public opposition to local USS development. For many, opposition to USS may be more about what is *not* changing than what *is* changing, highlighting the need for attention to rural-urban socio-political dynamics in efforts to achieve a just transition.

It should not be ignored that USS represents for many residents a re-iteration of rural sacrifice. The perception of energy colonialism risks furthering the already present socio-political tensions between rural and urban. Sociologist Arlie Hochschild provided the metaphor of "standing-in-line" for the American dream as an explanation for the anger and frustration felt by many white, rural conservatives with current liberal politics. The metaphor suggests that this group of people sense that they have for several generations been putting in the hard work asked of them by modern society to advance and achieve the stereotypical "American dream". However, they perceive new liberal politics to be more interested in advancing the social position of immigrants, People of Color, and other minority groups, effectively allowing them to "cut in line" for the dream (Hochschild 2016). New York's state's "Climate Leadership and *Community Protection* Act" may be coming to represent another example of such a policy that promotes the sense of being cut in line. Rural residents perceive of the policies promoting USS development as failing to achieve their idea of community protection that was alluded to by the name of the policy. Instead, USS development focused on minimizing economic costs, which has distinct implications for rural host communities, can trigger further division and a sense that the CLCPA was only designed with the protection of certain other communities in mind. This is likely to generate further division and frustration, making the efforts to transition to a cleaner and more socially just energy system divisive rather than inclusive. As the data from this study has demonstrated, the experiences and representations of USS among residents of upstate New York highlight that is an oversimplification to claim that USS represents a "public good".

As explored in the third article, I suggest the policies used to promote and grow USS development in New York, such as preemption of local policy authority and long-term contract programs, have been designed with more attention to the needs of the solar industry than local communities. These policies contribute to the perception of rural injustice associated with USS. Existing research on policies to promote renewable energy have focused on broader state initiatives such as the adoption of Renewable Energy Standards, without considering the specific policy mechanisms and procedures used by state to meet such standards. To achieve a just transition, it is critical that the actual implementation of renewable energy targets and goals be attentive to justice.

Together, these three articles demonstrate that both public perceptions and institutional procedures are important for a richer theoretical understanding of environmental justice associated with solar energy development. In existing research, these are often not considered in tandem. Instead, often research on the perceptions or social responses to renewable energy development considers opposition as a "barrier" that should be dismantled, eliminated, or otherwise avoided. This is apparent in the categorization and characterization of public opposition being driven by visual impacts or aesthetic concerns, as is frequently referenced in literature and policy discussions. This fails to acknowledge that visual impacts are *representative* of other factors. Landscapes are social constructions, they represent the way we solve problems in a particular place (Sherren 2021). The aesthetic changes produced by large-scale energy infrastructure represent and provoke other concerns, such as the sense that the bond between the state and renewable energy developers is greater than the bond between the state and community concerns, or that while the energy system may be transitioning to a cleaner form, the expectation of sacrifice by rural areas to achieve that modernization has not changed. If research is more accommodating of these complications, it can reframe the way we discuss public opposition, not as a barrier to be overcome, but rather a guide towards how energy needs can be met in different contexts, which may sometimes include carefully planned USS facilities.

Limitations and implications for future research

This study was limited in several ways. One dominant challenge of the project—but also a tremendous opportunity--was the rapidly changing policy and development landscape for USS in New York state. As an example, during the several months of interview recruitment for experienced town supervisors, the number of proposed USS increased approximately three-fold. Furthermore, due to the different development strategies and timelines engaged by different solar developers, the level of public exposure to project designs and plans was highly variable during the research period, making it difficult to know where to sample. This likely had impacts on the level of knowledge and familiarity of the study population in ways that were hard to predict and account for during data collection. The novelty of USS development in the state and region also limited the ability to measure and assess community impacts, especially economic impacts, based on anything other than the expectations of the solar developers. There was no actual data that could be used to demonstrate the benefit-sharing aspect of distributive justice. Still, the changing policy landscape was an opportunity because it opened up discussions about the impact of state policies and public preferences for different forms of governance which factor into perceptions of injustice.

Over time, as data becomes available, it will be especially useful to track and compare direct and indirect socioeconomics impacts of large-scale renewables for rural communities. Which strategies, models, or (e.g. state policies, traits of developers, project scales, dual-use strategies, such as agrivoltaics) produce the *most just outcomes*? Often, the social literature given its focus on achieving public acceptance has asked these questions in the form of which features are most likely to lead to public acceptance. It is important to ask these questions as the energy transition continues, but to reframe this with the goal of justice rather than acceptance.

This study focused on one state, and furthermore predominately rural residents of that state. New York is an especially suitable region for this research given the state's commitment to decarbonize the electric grid combined with the stark differences between the densely populated urban area of New York city and the vast upstate area. In many ways, this dynamic means that New York mimics the social and political dynamics of the nation as a whole. Still, it will be critical to expand this line of work to additional policy landscapes, other states, and regions. The focus on upstate residents was a particularly important limitation for the measurement of regional social identity. Our sample proved to be especially high on the scale that was used to measure upstate identity. A more varied sample, including upstate and downstate New Yorkers, would allow better comparison of representations across more various levels of exposure to USS, and measurement of the relation of regional social identity with opposition or support. Even better would be to expand the range of study beyond the New York context to better understand the role of social identity in various contexts.

Finally, we need more case examples that focus on positive processes and outcomes, and perceptions of justice, rather than injustice. This study was somewhat limited to analyzing case examples in which opposition was strong and perceived procedural and distributive injustices were plentiful. Future research should engage case studies of projects and community processes which various stakeholders characterize as successful and procedurally just. There are some opportunities for this from cases in New York, where some community activism has focused on developing collaborative processes for decision making with project developers, rather than the more typical adversarial opposition groups that were highlighted in this study. These sorts of positive examples will be critical for furthering the vision and framework of a just transition.

A just transition necessitates the coming together of three critical components, public perceptions, institutional procedures, and a fair market. It must be attentive to the local voice of communities most impacted by climate change, including rural renewable energy host communities. These communities may define, perceive, and experience (in)justice differently than the dominant social justice discourse. Exposing how public perceptions are interdependent with institutional procedures is a core contribution of this study. Of course, policies and procedures must not only be attentive to the justice concerns of the public but must also lay the foundation or a fairer market system. This study expands the conversation about the just transition, inspiring further rural-inclusive research and action.

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APPENDIX A: Institutional Review Board (IRB) Approvals

Cornell

Roberta Nilson <rsn54@cornell.edu>

APPROVAL FW: Add student to IRB project --1101001927
3 messages

IRB for Human Participants <irbhp@cornell.edu> Mon, Mar 11, 2019 at 12:24 PM
To: Richard Clark Stedman <rcs6@cornell.edu>
Cc: Roberta S Nilson <rsn54@cornell.edu>

Amendment Approval: March 11, 2019

Protocol # 1101001927

Protocol title: Social Elements of Natural Resource and Environmental Management

Status: Exempt

Dear Professor Stedman,

Thank you for your email below letting us know of the addition of **Roberta Nilson** to your study personnel. The changes you propose do not change the status of the study as exempt from IRB review. Keep this approval email as official confirmation of continued exemption from IRB review for your protocol.

Best,

Janet

Janet Jayne
IRB Administrator, Office of Research Integrity and Assurance
Cornell University / 395 Pine Tree Road, Suite 320 / Ithaca, NY 14850
T (607) 255-5138 / F (607) 255-0758

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RAS
Research
Administration
Support

Cornell

Roberta Nilson <rsn54@cornell.edu>

APPROVAL RE: IRB project --1101001927

IRB for Human Participants <irbhp@cornell.edu> Tue, Apr 23, 2019 at 9:42 AM
To: Roberta S Nilson <rsn54@cornell.edu>
Cc: Richard Clark Stedman <rcs6@cornell.edu>

Amendment Approval: April 23, 2019

Protocol # 1101001927

Protocol title: Social Elements of Natural Resource and Environmental Management

Status: Exempt

Dear Roberta,

The changes you have requested do not change the "exempt" status of your above mentioned IRB protocol. Please keep this e-mail as the official approval record of this concurrence of exemption. Please note that exemption from IRB review means that your project meets the definition of research with human participants, but that the research activities fall into categories that do not require review by the IRB committee. Feel free to contact our office with any questions or concerns you may have.

Best,

IRB Team

Cornell

Roberta Nilson <rsn54@cornell.edu>

Approval for Amendment to Exempt Protocol #1101001927 [vam]

IRB for Human Participants <irbhp@cornell.edu> Fri, Jul 31, 2020 at 10:39 AM
To: Roberta S Nilson <rsn54@cornell.edu>, Nancy Anne Connelly <nac4@cornell.edu>, Richard Clark Stedman <rcs6@cornell.edu>

Dear Roberta, Nancy, and Richard,

Thanks for your email. The changes you have requested (minor updates to questionnaire) do not change the exempt status of your IRB protocol number 1101001927, "Social Elements of Natural Resource and Environmental Management."

Please keep this e-mail as the official confirmation of continuing exemption.

Please note that exemption from IRB review means that your project meets the definition of research with human participants, but that the research activities fall into categories that do not require review by the IRB committee, and can be reviewed administratively by IRB staff.

Feel free to contact me or my office with any questions or concerns you may have.

Best regards,

Vanessa

Vanessa McCaffery

IRB Administrator

Cornell University Institutional Review Board
Office of Research Integrity and Assurance
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APPENDIX B. Elected official recruitment and interview guide

Recruitment example email:

Hello Supervisor <XXX>,

I am a graduate student at Cornell University, and I am studying solar energy development in New York state. To learn more about local issues related to large-scale solar development, I have been speaking with town supervisors from around the state. I understand solar projects are being pursued in the town of <town name>, and I would be grateful for the opportunity to speak with you to learn more about your town's experience.

In the past, these phone calls have taken 30 minutes to an hour. If you are available, please let me know when would be a good time to reach you. I can be reached at this email or on my cell phone at (360)520-5947. Thank you.

Best regards,
Roberta

Interview guide:

Introduction: I am a graduate student at Cornell University, and I am studying solar energy development in New York state. To learn more about local issues related to large-scale solar development, I have been speaking with town supervisors from around the state. I would be grateful for the opportunity to speak with you to learn more about your town's experience.

- Ask if they are okay with **recording**.
- Tell them to let me know if there are any questions they don't want to answer, or if they would like anything we discuss to remain **confidential** (not connected with their name or community name).

1. **How would you describe your community – what was it like in the past, what is it like today, and how do you envision the future?**
2. How long have you been active in local government?
3. How did you first hear about large scale solar development in your area? What were your initial reactions?
    a. What about reactions of other community members?
4. How do you think this proposed project would change your community?
    a. What are the potential consequences of the project? The potential benefits?
5. Can you tell me a little more about the siting process for this project. What has that been like?
    a. What aspects of the process have been clear, and what has been difficult?

a. Are you, or have you in the past, dealt with development projects of similar size in your community?
b. In your experience, how, if at all, is the process for solar siting distinct from other proposed developments?
c. Ask local financial benefits: taxes, PILOT or community host agreement negotiations.

6. *Probing questions to get at their general perceptions of the project, if needed, for example:*
    a. *Ultimately, who do you think will have the most influence over whether or not this project moves forward?*
    b. *Why do you think this solar project has been proposed here (in this region, town, or specific site)?*
    c. *Who do you think stands to benefit the most from this project? (the local community, the energy developer, the state, New York City)*
7. Anything else you would like to tell me about the project?

APPENDIX C. Survey cover letter and follow-up

September 9, 2020

Dear New York State Resident,

New York State is pursuing an energy strategy that involves shifting away from many traditional fuel sources to a variety of alternatives. Cornell University is conducting a survey to better understand how residents think about and interact with this shift. We are especially interested in the increased development of solar energy. We ask that you please complete this survey about your own thoughts and experiences related to solar energy, climate change, your community, and the country. Even if you have little knowledge or interest in energy topics, we would still like to hear your views, as we want the results of the survey to reflect the interests of *all* residents, rather than just those with very strong views.

Your address was randomly selected from a list of all residents in your local area. Your participation in this survey is voluntary, but we certainly hope you will choose to participate. Please be assured that your responses will be kept strictly confidential and will never be associated with your name.

Please complete the enclosed questionnaire as soon as possible, seal it with the white resealable label provided, and drop it in the nearest mailbox. Postage has already been paid.

If you have any questions about the survey, please do not hesitate to contact me at RCS6@cornell.edu.

Thank you very much.

Dr. Richard Stedman

Center for Conservation Social Sciences

Cornell University

September 16, 2020

Dear New York State Resident,

Last week we mailed you a questionnaire asking for your opinions about energy issues in New York State. If you have already completed and returned the questionnaire, please accept our sincere thanks for your help. If you have not yet completed it, we would appreciate it if you would take a few minutes now to fill it out. We greatly appreciate your prompt response.

Even if you have little interest or knowledge in energy topics, we would still like to hear your views. We are interested in your opinions about actions the state or others might take now or in the future to manage energy in New York.

Postage has been provided. All you have to do is fill out the questionnaire, seal it, and drop it in the nearest mailbox.

Thanks again for your help.

Dr. Richard Stedman

Center for Conservation Social Sciences

Cornell University

October 7, 2020

Dear New York State Resident,

About three weeks ago we wrote to you asking about your views and experiences with solar energy and other energy-related topics in New York State. If you have already completed and returned the questionnaire, please accept our sincere thanks for your help. If you have not yet done so, please take the time to complete it today.

Cornell University is conducting this survey to better understand how residents think about and interact with the state's energy strategy. We ask that you please complete this survey about your own thoughts and experiences related to solar energy, climate change, your community, and the country. Even if you have little knowledge or interest in these topics, we would still like to hear your views, as we want the results of the survey to reflect the interests of *all* residents, rather than just those with very strong views.

Let me assure you once again that your participation in this study is voluntary. Please be assured that your responses will be kept confidential and will never be associated with your name.

In case our earlier mailing did not reach you or your questionnaire has been misplaced, we have enclosed an extra copy of the questionnaire. Return postage has been paid. After completing the questionnaire, simply seal it with the white resealable label provided, and drop it in any mailbox.

If you have any questions about the survey, please do not hesitate to contact me at RCS6@cornell.edu.

Thank you for your time and effort.

Dr. Richard Stedman

Center for Conservation Social Sciences

Cornell University

October 15, 2020

Dear New York State Resident,

We are writing to you one last time to encourage you to take part in the survey on energy in New York State. We want to know your opinions about solar energy, policy, and your community. Even if you have never seen a large-scale solar facility, or have little interest in energy topics, we would still like to hear your views. We want the results of the survey to reflect the interests of all residents, not just those most familiar with energy issues.

For the results of our study to be truly representative, we need your response. Please take a few minutes to answer this survey to help us better understand your opinions.

This survey is voluntary and is strictly confidential. Your individual responses will not be associated with your name.

Postage has been provided. All you have to do is fill out the questionnaire, seal it, and drop it in the nearest mailbox.

Thank you very much.

Dr. Richard Stedman

Center for Conservation Social Sciences

Cornell University

APPENDIX D. Questionnaire

A Brief Survey about Energy, Climate, and Solar Development

Cornell University
Department of Natural Resources
Center for Conservation Social Sciences

The use of solar energy is increasing in New York State as part of the state's energy strategy. Many homes and businesses are installing rooftop panels for personal energy use, and large-scale installations are being developed in various regions of the state.

To better understand how residents think about and interact with this emerging technology and other energy topics, we ask you to please complete this survey about your own thoughts and experiences related to solar energy, climate change, your community, and the country.

Please have an adult member of the household complete this questionnaire as soon as possible, seal it with the white re-sealable label provided, and drop it in any mailbox. **Return postage has already been paid**.

You have been randomly selected for this survey from a list of residents in your area. Your participation in this survey is completely voluntary, but we hope you will take just a few minutes to answer our questions. **Your identity will be kept confidential** and the information you give us will never be associated with your name. **The survey should take between 10-15 minutes to complete.**

If you have concerns, please contact Dr. Richard Stedman at the Cornell Department of Natural Resources at rcs6@cornell.edu or 607-255-9729.

Thank you for your help!

Section 1. In this section, we would like to hear your familiarity and views towards energy development in New York.

New York state plans to significantly increase renewable energy generation (e.g. wind and solar) over the next few years.

1) How familiar are you with this renewable energy plan? *(Circle one)*

Not at all	Not very familiar	Somewhat familiar	Familiar	Very familiar

2) How strongly do you support or oppose this renewable energy plan? *(Circle one)*

Strongly support	Slightly support	Neither	Slightly oppose	Strongly oppose

3) Which of the following best describes your view? *(Circle one)*

I strongly prefer **solar** over wind.	I slightly prefer **solar** over wind.	No preference between solar and wind	I slightly prefer **wind** over solar.	I strongly prefer **wind** over solar

4) How would you describe **solar energy**? *(Check one space per pair)*

Efficient	____	____	____	____	____	Inefficient
Safe	____	____	____	____	____	Dangerous
Secure	____	____	____	____	____	Insecure
Expensive	____	____	____	____	____	Inexpensive
Good for the environment	____	____	____	____	____	Bad for the environment

Community-scale solar generates electricity for use in the local area. These are small or mid-sized, often using several acres of land.

Utility-scale solar generates electricity that is not used locally but transmitted and sold for use elsewhere. These are large, often using hundreds of acres of land.

5) Are you familiar with either of these types of solar proposed in or near your local community? *(Check one box for each statement)*

	Not at all	Not very familiar	Somewhat familiar	Familiar	Very familiar

Community-scale					
Utility-scale					

6) Over the last year, how often have you done the following? *(Check one box for each statement)*

	Not at all	A few times	Many times
Talked with friends or family about solar energy			
Heard about solar energy in the media (newspaper, TV, online)			
Attended a public meeting about solar energy			

7) How do you think the following aspects of your **community** would be affected if **utility-scale solar** was developed in or near your local community? *(Check one box for each statement)*

	Strongly **improve**	Slightly improve	Neither	Slightly decline	Strongly **decline**
Economy					
Scenic beauty					
Residential property values					
Tourism					
Natural environment					
Electricity prices					
Agriculture					

8) Please indicate how strongly you agree or disagree with the following statements. *(Check one box for each statement)*

	Strongly **agree**	Slightly agree	Neither	Slightly disagree	Strongly **disagree**

Utility-scale solar *burdens* upstate NY more than downstate					
Utility-scale solar *benefits* upstate NY more than downstate					
The process of planning utility-scale solar has been fair					
People have had plenty of opportunities to participate in planning for utility-scale solar					
People who made utility-scale solar plans are biased					

9) We would like to better understand your views on **where** utility-scale solar should be developed? *(Check one box for each statement)*

	Definitely belongs	Might belong	Not sure	Might not belong	Definitely does not belong
Productive farmland					
Unproductive farmland					
Forest lands					
Rural areas					
Suburban areas					
Urban areas					
Public land					
Industrial sites					
Former landfills					

10) How strongly do you support or oppose development of the following types of solar installations in or near your local community? *(Check one box for each statement)*

	Strongly support	Slightly support	Neither	Slightly oppose	Strongly oppose

On rooftop of home or business					
Community-scale					
Utility-scale					

Section 2. In this section, we would like to learn about your views towards your community and the government.

11) How strongly do you agree or disagree with the following statements? *(Check one for each statement)*

	Strongly **agree**	Slightly agree	Neither	Slightly disagree	Strongly **disagree**
I identify with upstate New York					
I feel committed to upstate New York					
I am glad to be from upstate New York					
Being from upstate New York is an important part of how I see myself					
I identify with downstate New York					

12) How strongly do you agree or disagree with the following statements? *(Check one for each statement)*

	Strongly **agree**	Slightly agree	Neither	Slightly disagree	Strongly **disagree**
Agriculture is very important to the economy in this community					
This is a residential community; many people commute for work					
This community needs new economic opportunities					

Open and undeveloped spaces in this community should be preserved					
This community is just fine the way it is, it does not need to change					
People live in this community because of the job opportunities					
People live in this community for the peace and quiet					
Tourism is very important to the economy in this community					
I feel that I can really be myself in my local community					
My local community is the best place to do the things I enjoy					
I really miss my local community when I am away too long					
Private property rights should be protected at all costs.					
Local government should regulate use of private land for public interest					
State government should regulate use of private land for public interest					
Federal government should regulate use of private land for public interest					
Local government does a good job addressing the needs of local residents					
State government does a good job addressing the needs of local residents.					

Section 3: Your views on climate change

Recently, you may have noticed that climate change has been getting some attention in the news. Climate change refers to the idea that the world's average temperature has been increasing over the past 150 years, may be increasing more in the future, and that the world's climate may change as a result.

13. What do you think: Do you think that climate change is happening?

Yes	No

14. How sure are you that climate change is happening or not?

Extremely sure	Very sure	Somewhat sure	Not at all sure

15. Do you agree or disagree with each of the following statements:

	Strongly agree	Somewhat agree	Neither	Somewhat disagree	Strongly disagree
Public officials don't care what people like me think					
Sometimes politics and government seem so complicated that I can't understand what's going on					
People like me don't have any say about what the government does					
These days the government is trying to do things it doesn't have the right to do					
The government is more interested in serving the interests of a few organized groups, such as business or labor, than the needs of people like myself					
The government often fails to take necessary actions on					

important matters, even when most people favor such actions					

16. A number of policies have been suggested for addressing climate change. Please indicate whether you **support** or **oppose** any of the following examples of climate policy.

	Support	Oppose	Not sure
Government subsidies for energy efficiency programs (e.g. home insulation, triple-pane windows)			
Tax imported goods from countries with poor climate policies to protect American manufacturing			
New transmission lines in your community			
Expanding rural electric cooperatives that give control of energy production to rural communities			
Large solar energy facilities in your community			
Government subsidies for electric vehicles			
Government subsidies for home energy storage (batteries)			
Expand government subsidies to help low-income families pay their energy bills			
Large wind energy facilities in your community			
Prosecute fossil fuel executives for damage caused by their products			
Government spending on local public transportation			
Government subsidies for farmers using agricultural practices that capture and store carbon in soil			
A carbon tax on energy utilities that would encourage them to invest in renewable energy sources (solar, wind)			
Expanding government subsidies, low-interest loans, and loan guarantees for energy efficiency improvements on farms			
Payments directly to landowners for storing carbon on their land			
A government ban on all new fossil fuel development			

Government grants for low-income and vulnerable communities to adapt to climate change impacts			
Government subsidies for appliance upgrades (e.g. replacing gas stoves, furnaces, and water heaters with electric alternatives)			
Government job guarantees that hire people to build new energy-related infrastructure			
Continued from previous page…	Support	Oppose	Not sure
Increase government spending on research in renewable energy technologies (solar, wind, etc.)			
Plant a trillion trees globally to capture and store carbon			
Force fossil fuel companies to pay for the damage caused by their products			
Government building of 10 million new, carbon-free housing units			
Rejoin the Paris Climate Agreement			
A carbon tax on consumers that would encourage less fossil fuel consumption			
Paying and teaching farmers to use farming to store carbon in the soil			
Government building of new energy transmission system, including new transmission lines, a “smart grid”, and charging stations for electric vehicles			
Retraining, unemployment benefits, and job guarantees for fossil fuel workers who lose their jobs			
Government-built high-speed rail networks across the United States			
Distribute aid to poorer countries to help them transition to renewable energy and adapt to climate change			

17. Can these groups solve problems related to climate change?

	Definitely	Probably	Not sure	Probably not	Definitely not
New York state government					
Federal government					

Scientific community					
Energy industry					

18. Do these groups have the same values as you do on climate change?

	Definitely	Probably	Not sure	Probably not	Definitely not
New York state government					
Federal government					
Scientific community					
Energy industry					

19. Do you trust these groups to safely, efficiently, and fairly solve problems related to climate change?

	Definitely	Probably	Not sure	Probably not	Definitely not
New York state government					
Federal government					
Scientific community					
Energy industry					

Section 4. In this section, we would like to hear a little bit more about you and members of your household.

20) Which of the following best describes the area where you currently live? *(Check one)*

Rural, open countryside	Small town	Suburbs of a city	City

21) About long have you lived in your community? _____Years

22) Please circle the highest degree of education you have attained:

Less than high school diploma	High school diploma	Some college	College degree	Graduate degree

23) In what year were you born? ________

24) What is your gender? ______Male _____Female _____Other

25) Do you rent or own the home where you live?

_____Rent ____Own _____Other

26) Generally speaking, do you consider yourself a…

Strong Democrat	Weak Democrat	Independent, but lean Democrat	True Independent	Independent, but lean Republican	Weak Republican	Strong Republican

27) **What was the total combined income (before taxes) of all members of your household in 2019?** *(Please include money from jobs, income from business, farm or rent, pensions, dividends, welfare, social security payments and any other money income received by you or family members.)*

$0-10,000	$10,000 -14,999	$15,000 -24,999	$25,000 -49,999	$50.000-75, 999	$75,000 - 99,999	$100,000 -149,999	$150,000 or more

If you would be willing to speak to a researcher in greater detail about your responses, please provide a phone number or email:

Thank you for your participation!

Please use the space below to offer any additional comments:

To return this questionnaire, simply seal it and drop it into the nearest mailbox. Postage has already been provided!