Community Shared Solar in Virginia: Political and Institutional Barriers and Possibilities

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abstract: *Solar photovoltaic (PV) energy has provoked intense policy debate at the state level in the United States. Electric utility providers and other interests have fought to scale back or cut favorable state policies as grid-connected solar PV installations have increased. One innovative approach to dealing with these challenges is to permit community net energy metering (NEM) or "shared solar" that allows multiple electric utility customers to share the costs and benefits of ownership in a local solar PV facility. This has stimulated the development of off-site shared solar arrays, or solar gardens, and increased access to PV technology. In Virginia, however, no rules exist that require electric utilities to permit community shared solar through NEM. This article utilizes the punctuated equilibrium theory (PET) framework and a historical institutionalism methodology to examine the political forces that shape state policy and to analyze why Virginia has dismissed community solar legislation multiple times. Such an approach is useful in understanding how other historically laggard states may adopt community shared solar legislation in the future.*

Introduction

Community shared solar is generally defined as projects "with multiple individual owners living in geographic proximity to [a] solar project, and sharing the costs and benefits of ownership of the solar project" (Farrell, 2010, p. 2). Also referred to as "solar farms" or "solar gardens," these installations are gaining popularity as consumers' desire to lower their energy costs and to reduce their carbon footprint grow. This article examines the forces that shape state solar policy in Virginia and why the legislature has failed to pass laws that would create community shared solar energy. Virginia serves as a case study proxy for other laggard states without community shared solar policy that make slow progress or are reluctant to adopt new policies. No previous literature has addressed community solar mechanisms in the regulatory context of Virginia specifically. Hence, further research is needed into the barriers and possibilities for community shared solar in order to determine the best path(s) forward given Virginia's unique regulatory landscape. The main research questions of this study seek to determine what forces shape state-level solar policy in Virginia, and why community shared solar legislation has not passed despite multiple attempts. This approach is useful in understanding how other historically laggard states may adopt community shared solar legislation in the future.

This research focuses on off-site shared solar that allows "customers [to] enjoy advantages of solar energy without having to install a system on their own residential or commercial property" (National Renewable Energy Laboratory, 2015, para. 1). This differentiates it from other shared-type solar approaches such as community group purchasing, on-site shared solar like solar PV on a multi-unit building, or community-driven financial models such as "Solarize" programs. The article looks at the political processes and forces that shape community shared solar using Baumgartner and Jones' (1993) punctuated equilibrium theory (PET), as this framework illuminates the determinants of policy change and stability. The following section reviews the current status of community shared solar policies throughout the United States in general and Virginia in particular; following that, the article examines results from prior research on these policies. The article then discusses the methodology and results from the subsequent analysis, reflecting on policy implications for Virginia and other states looking to adopt community shared solar legislation.

Background

Though oil and gas energy resources continue to dominate in today's industrialized world, to an extent their importance is already declining (Burkett, 2011). With the overall rising cost of energy, governments increasingly place greater emphasis on conservation and the pursuit of alternative energy sources such as wind, biomass, and solar photovoltaics (PVs). Solar PV systems are one of the most practical ways for businesses and homeowners alike to capture solar energy and provide electricity to a building. Reports indicate that solar PV deployment in the United States has incresed significantly in recent years. Solar PV made up roughly 40% of all new installed electric capacity in 2014, outpacing all other generation sources such as coal, natural gas, wind, etc. (Solar Energy Industries Association, 2015). Solar PV deployment grew particularly for commercial and residential or non-utility PV systems, also known as "distributed PV" (DPV).[1] Since 2010, installed U.S. solar PV capacity increased 418%, with over half of this increase from DPV alone (U.S. Energy Information Administration, 2014). In 2013, grid-connected DPV reached nearly 6,000 MW of total installed solar PV capacity (U.S. Energy Information Administration, 2014), and this number continues to grow each year.

Virginia had 13.57 MW of installed net-metered DPV capacity as of December 2014 (State Corporation Commission, 2014b). This is enough to power well over 1,000 homes. According to December 2015 data, this figure increased to 21.86 MW. However, this capacity is far less than the smaller, adjoining state of Maryland, which had 92 MW of net-metered DPV capacity at the end of 2014 (Maryland Energy Administration, 2014). Differences in state policy to encourage DPV may explain this disparity in installed capacity. For unlike Virginia, Maryland has a mandatory Renewable Portfolio Standard (RPS) requiring electric utility providers to deliver a proportion of their power from renewable sources like solar. Maryland also has a superior net energy metering (NEM) policy compared to Virginia, and offers state tax credits for DPV investment.

States such as California, Colorado, Hawaii, and Massachusetts also have greater installed capacity in part due to their allowance for community shared solar arrangements. Currently 14 states and the District of Columbia have enacted formal community shared solar measures, while six other states, including Virginia, have proposed such legislation (see Table 1). Though Virginia may lag behind some of its counterparts in terms of solar PV policy and installed capacity, it remains a state with copious solar potential due to its sun resource availability and relatively robust economic base. However, community shared solar legislation has not passed to date.

Despite this potential, key institutional players in the DPV discussion in Virginia have exerted increasing pressure. Currently 41 states, including Virginia, have adopted some form of NEM legislation allowing owners of DPV systems to sell excess electricity generated back to their electric utilities (Inskeep, Kennerly, & Proudlove, 2015). However, such legislation has not emerged without debate. Certain non-governmental organizations have pushed for increased infiltration of solar as this often aligns with their environmental sensitivity mission statements. Solar firms that manufacture and install systems hold a largely parallel vision and they desire continued interest in DPV to facilitate revenue generation. Yet, large, investor-owned utilities (IOUs) are often reluctant to see legislation that encourages DPV as it can undercut their revenues, among other reasons. Ultimately, the political environment is one where key players in this policy arena are all pursuing their own, concentrated interests.

Beyond traditional NEM arrangements, one noted provision that Virginia does not allow is the ability for customers to utilize a community NEM arrangement. Community NEM allows for the establishment of community shared solar gardens, as well as the remunerations of a solar project to be realized by multiple users in proportion to their respective ownership stake in the shared system. It also allows for increased access to solar PV technology, particularly for those who could not house such systems on their home or business. With these implications of community shared solar, examining why Virginia does not allow community NEM and shared solar despite several attempts to pass such legislation is of significant interest.

Literature Review

Net energy metering allows electric utility customers with PV systems connected to the electricity grid to receive credits for the energy delivered back to the grid (Doris, Busche, & Hockett, 2009). These credits allow customers to offset electric bills or to receive outright payment in the event that they generate more than they consume (Hughes & Bell, 2006). Selling leftover electricity back to the grid significantly enhances a renewable energy system's economic viability, particularly if it collects the full retail rate. Such is the case in Virginia (Database of State Incentives for Renewables and Efficiency, 2015).

NEM has greatly facilitated the expansion of renewable energy through on-site generation. However, great divergence exists in NEM policies among U.S. states, particularly with regard to terminology, capacity limits, and eligible technology. For instance, while Virginia does allow NEM, it has a relatively modest capacity limit of 1 MW for commercial and 20 kW for residential systems,

Table 1. Summary of Community Shared Solar Legislation in the United States

State	Policy Name	Status	Year
California	Virtual Net Metering / Senate Bill 43	Enacted	2013
Colorado	House Bill 1342*	Enacted	2010
Connecticut	Senate Bill 928	Enacted	2015
Delaware	Community Net Metering Provisions (Order 7946)	Enacted	2010
District of Columbia	Community Renewables Energy Act	Enacted	2013
Hawaii	Senate Bill 1050 / House Bill 484	Enacted	2015
Maine	Net Energy Billing to Allow Shared Ownership	Enacted	2009
Maryland	House Bill 1087 / Senate Bill 481	Enacted	2015
Massachusetts	Virtual Net Metering / Senate Bill 2768	Enacted	2008
Minnesota	Solar Energy Jobs Act (HF 729)	Enacted	2013
New Hampshire	Group Net Metering / Senate Bill 98	Enacted	2013
New York	Community Net Metering / CASE 15-E-0082	Enacted	2015
Oregon	House Bill 2941	Enacted	2015
Vermont	Group Net Metering	Enacted	2006
Washington	Community Renewables Enabling Act (HB 1301)	Enacted	2013
Georgia	House Bill 657	Tabled	2014
Iowa	Senate File 2107	Tabled	2014
Michigan	House Bill 4878	Postponed	2015
Nebraska	Legislative Bill 557	Tabled	2013
New Mexico	Senate Bill 394	Tabled	2013
Virginia	House Bill No. 618**	Postponed	2016

The data on state community shared solar legislation are adapted from the Shared Renewables HQ (2016) website.
*Colorado passed House Bill 1284 in 2015 to expand participation in community solar gardens.
**Indicates most recent bill(s) proposed (Legislative Information System, 2016c).

with a limit on overall enrollment cap of 1% of a utility's peak capacity (Database of State Incentives for Renewables and Efficiency, 2015). Other states have much higher NEM capacity limits (e.g., Oregon has 2 MW for commercial and 25 kW for residential), while some states like New Jersey have no limits whatsoever. *Freeing the Grid*, an annual report published by the Interstate Renewable Energy Council and The Vote Solar Initiative that investigates each state's interconnection and NEM policies, awarded Virginia's most recent NEM policy a C on an A–F scale (up from a D the prior year), ranking it among the bottom third of U.S. states (Freeing the Grid, 2016).

Though Virginia has actually been successful at implementing NEM, one advancement on the policy that the state currently lacks is community NEM. Community NEM and shared solar arrays have been emerging in the United States in recent years as a means to overcome various barriers to entry regarding solar technologies. These developments are due in part to the inability of certain grid-connected customers to own a generating system because of site shading, roof orientation, zoning laws, roof or system size, lack of property ownership, etc. Beyond the up-front costs of financing DPV systems, such barriers are the central impediments to more widespread deployment.

Several academic, professional, and technical studies specifically investigate the potential advantages of community shared solar. Weinrub (2010) concluded that community shared solar permits higher local control over energy. Others have demonstrated how community solar can provide financial benefits and mitigate concerns about climate change and rising energy costs (Bomberg

& McEwan, 2012), as well as allowing for solar economies of scale and ideal project locations (Coughlin et al. 2012). Community solar may also contribute to collaborative emissions reductions goals, as well as overall community cohesion (Hoffman & High-Pippert, 2010). In fact, communal collaboration and unity are often cited as key to bringing civic members together for a shared goal (Austin Energy, 2012; Bollinger & Gillingham, 2012; Bomberg & McEwan, 2012). Often education and cooperation toward such a goal is established by way of social interactions (Irvine, Sawyer, & Grove, 2012). Community NEM is the key policy initiative enabling community shared solar, particularly by eliminating inequities in the market and allowing customers to aggregate their meters onto a solar array (Sun Farm Network, 2008).

Despite the various benefits associated with community shared solar arrangements, there remain several key barriers to entry into the PV market. Farrell (2010, p. 1) discussed barriers toward and complications around community shared solar deployment, including a "lack of access to federal tax incentives" and "onerous securities regulations of community solar entities." Findings showed that community shared solar does not have a standardized model or approach, yet projects throughout the United States have found ways to overcome significant challenges to raising capital and utilizing various solar PV incentives (Farrell, 2010).

Some reports investigated options for overcoming other professional or technical barriers to community shared solar projects. For instance, the National Renewable Energy Laboratory (2014) discussed barriers such as "rules that limit project size or prohibit residential customers from obtaining credits" (p. 4), suggesting that adjustments to state interconnection and NEM policies were the best approach to dealing with these obstacles. Feldman, Brockway, Ulrich, and Margolis (2015) also focused on alterations to state policy, claiming that virtual NEM, community NEM, value of solar provisions, and other shared solar PV programs were the best approach to overcoming existing barriers. They argued that this is even more important considering a majority of community shared solar projects are located in states with enabling legislation (Feldman et al., 2015).

Without provisions that allow for community NEM, Virginia makes it largely unmanageable for residents and investors to purchase solar energy or shares in a solar generation project without installing it at their own site. Lack of utility-level support for community solar development is also often seen as a key obstacle (Austin Energy, 2012).

Methodology

In light of the preceding, further research is necessary to comprehend the political forces at play that have hindered the potential development of community NEM and shared solar arrangements in Virginia. Such analysis can be executed using Baumgartner and Jones' (1993) Punctuated Equilibrium Theory (PET). PET helps explain how change occurs in intricate social and political systems (Baumgartner & Jones, 1993). It argues that key actors attempt to control policy directions tactically through rhetoric and actions that favor their political goals. Historically, key negative focusing events in the energy realm have forced sympathetic policy actors in certain directions, sometimes toward renewable energy. However, decision makers only adopt radical change once the pressure for change becomes overwhelming. Long periods of stasis often endure until such events occur. Several scholars have utilized PET to illuminate better the determinants of policy change and stability (e.g., Breunig & Koski, 2006; Givel, 2006; Mortensen, 2005; Walgrave & Varone, 2008). PET is also a powerful framework in the way it uses developments, shifts, institutional strategies, and political environments to determine policy directions and potential changes.

The main research question can be studied by a historical institutionalism methodology that utilizes institutional structures to find sequences of social and political behaviors and change over time. The historical institutionalism methodology is a valuable approach in the PET framework for understanding the social elements that shape the goals and strategies of institutional players. Investigating goals and strategies is helpful in understanding when and why change takes place. This method is based on the assumption that institutional constraints, rules, and objectives guide the behavior of actors throughout the policymaking process. This path-dependency model also contends that previous decisions, events, and the institutional structures that have emerged may determine subsequent decisions (Kay, 2005).

In order to implement this methodology, this research uses archival records such as government documents and mass media to identify how institutions related to solar policy have formed in the United States and Virginia. This unobtrusive data collection method helped shed light on the goals, objectives, and actions of key players, particularly with regard to the potential formulation of community shared solar policy. Broad content analyses helped pinpoint trends in institutional actions and the effects of certain decisions or strategies. More specifically, a historical analysis of why institutional actors formed is outlined, followed by discussion of the current environment in which they act.

This methodology is not without limits. It is most often prone to researcher error in interpretation. Further, content analyses are simply a descriptive method, working to uncover trends, yet may not reveal all of the motives for such patterns. Despite these limitations, this methodology is a powerful tool when combined with the use of archival records, and the retrieval of meaningful information from such documents. It is reliable and suitable for analyzing historical material and documenting trends over time.

Results and Discussion

Historical Analysis

Energy consumption in the United States has historically been through non-renewable forms of energy like oil, coal, and natural gas. Powerful industrial forces began to grow as key actors in the first third of the 20th century. At this time, vehicles entered mass production and the birth of the modern oil industry began with a discovery in Texas's Spindletop oil field (Mody, Gerrard, & Goodson, 2013). Simultenously, the development of large IOUs occurred providing a new commodity—electricity—to Americans. In 1935, President Franklin D. Roosevelt's Rural Electrification Act further expanded infrastructure and electric services throughout the country (Emmons, 1993), setting the stage for the electricity providers and markets seen today.

Over the next few decades, NGOs began to grow as key players because from the 1940s on there was an increasing concern about nuclear energy technologies by the greater population as a byproduct of World War II (Morrone, Basta, & Somerville, 2012). Over the next three decades, nuclear anxieties continued, as did those concerning fossil fuel usage, as fossil fuel smog was blamed for several illnesses and deaths (Berkowitz, 2006). The theory of peak oil also arose during this time (Brecha, 2012). New organizations like Greenpeace formed in the late 1960s to combat environmental concerns and advocate for a greener earth (Berkowitz, 2006).

As a result of various crises in the 1970s, the federal government began to take a more prominent role in energy matters. The 1969 Santa Barbara oil spill, coupled with growing environmental concerns, spurred the federal government to intervene. The U.S. Environmental Protection Agency was established in 1970 to focus on damage to the environment resulting from energy harvesting (Suter, 2008). Making matters more complex, the 1970s also saw oil shortages, and the 1973 and 1979 oil crises. To mitigate the effect of such crises, the federal government established several commissions to regulate and develop alternative energy sources (Berkowitz, 2006). Interestingly, in 1976 Congress authorized a committee to examine the potential for the development of electric vehicles (Masood & Bouwmans, 2015), and the federal government also became involved in wind energy.

As demand for foreign oil fell, the Organization of the Petroleum Exporting Countries cut oil prices, and diplomacy with Middle Eastern nations helped to reestablish the supply of imported oil for the United States and Europe (Barsky & Kilian, 2004). The U.S. Department of Energy formed in 1977 to deal with energy policies and safety in handling nuclear materials (Fehner & Holl, 1994). President Carter at the time felt the need to consolidate national energy policy. Consolidated agencies included the Federal Energy Administration, the Energy Research and Development Administration, the Federal Power Commission (Elliot & Ali, 1984) and the Solar Energy Research Institute (Ciment, 2006). The latter became the National Renewable Energy Laboratory of the Department of Energy.

Another key focusing event occurred in 1979 when a nuclear radiation leak at the Three Mile Island nuclear power plant in Harrisburg, PA forced it to shut down (Walker, 2004). Similarly, the 1986 Chernobyl event in the Soviet Union also led to the relative decline of the nuclear power industry (Berkowitz, 2006). The 1980s and 1990s saw an increased focus on sources of renewable energy such as wind, hydrogen, and solar PV. The Exxon Valdez oil spill in 1989 added to the increasing pressures away from oil and gas technologies. While they were still viable resources, more people were becoming attuned to the exploration of alternative energy resources (Laird & Stefes, 2009).

President Reagan's deregulatory policies of the 1980s gave way to the rise of New Federalism, signifying a comprehensive return of powers to state governmental institutions (Tobin, 1986). Reagan's policies set the stage for the growth of solar deployment in the 1990s, and ultimately, the growing power of state governments in the solar energy policy discussion. Over the past few decades, U.S. states have explicitly taken initiative by addressing issues of energy production and consumption through legislation, taxation, energy conservation standards, subsidies, and other incentives (Byrne, Huhges, Rickerson, & Kurdgelashvili, 2007; Carley, 2011).

Specialists on the matter claim that federal attempts to create national solar PV standards have proven much too partisan and, thus, unsuccessful. Additionally, federal solar would require many square miles of panels and would create line loss (Teng, Yat-Sen, Luan, Lee, & Huang, 2012) in which electricity would literally be lost by traveling through the intricate and expansive set of power lines this solution would require. Among other reasons, this pushed solar PV policy to state legislatures, initiating a huge shift in how energy policy was enacted in the United States. By the 2000s, NEM and RPS laws had emerged in several states. Other key focusing events during this timeframe such as the 2008 coal-ash spill in Kingston, TN, and the 2010 BP oil spill, added to the growing cultural and political push for solar PV and other renewable energy technologies (Valentine, 2011).

Clearly, history and critical focusing events played a key function in the development of institutional players in the solar PV policy domain. The role of fundamental actors such as state legislatures, industry, and NGOs has gained steam over the past century or so, and they are now the most crucial actors with regard to state DPV policy. Analyzing these historical events provides necessary context for outlining the current institutional framework and environment in Virginia.

Key Institutional Players

Based on the methodology described above, governmental and voluntary institutions represent the main focal categories in the state solar PV policy environment. The former are institutions or policy venues such as the legislature and the executive that enact policy on the public's behalf. These two specifically have the ability to steer governing actions in terms of solar energy policy by way of enacting, amending, and repealing laws. Another set of governmental institutions is the legal system, consisting of courts and judges, whose role is to explain, interpret, and apply energy-related laws. Governmental agencies also play a key part in this process as an institutional player through the oversight and administration of solar policy. In Virginia, agencies such as the State Corporation Commission (SCC) that regulates electric utilities, the Department of Mines, Minerals and Energy (DMME), and the Department of Environmental Quality (DEQ), come to mind.

The latter category of institutions present when looking at state solar PV policy are organizations established for a specific purpose, such as profit or advocacy. For instance, the media plays a role in transmitting state solar policy information to the public. In addition, investor-owned utilities and solar firms serve as prominent actors in this area by influencing public policymaking by lobbying. NGOs also play a role by facilitating awareness and organizing the public. Groups such as think tanks, advocacy groups, charitable organizations, and political parties work to influence solar policy enacted by governmental institutions. In Virginia, groups such as Appalachian Voices, the Chesapeake Climate Action Network, and the Virginia Chapter of the Sierra Club appear as relevant organizations.

Institutional Environment

With new liberation from the federal government since the 1980s, state governmental institutions have taken on many new responsibilities in the policymaking arena. This profound shift is unequivocally central in understanding current solar policies implemented by state legislatures. In Virginia, this system allows the state legislature, or General Assembly, to have immense power regarding state DPV policy.

With this framework in mind, it should be noted that there have been recent, increasing pressures from IOUs, NGOs, and the solar industry in the DPV discussion in Virginia. This can be attributed largely to incentives such as the federal Investment Tax Credit that made solar technologies more cost equivalent to other types of energy resources (Barbose, Darghouth, & Wiser, 2012). The physical prices of PV panels have dropped drastically in recent years due to technology amelioration (Feldman, Barbose, Margolis, Wiser, Darghouth, & Goodrich, 2012), and installation costs are becoming more economical as contractors become more familiar with systems (Barbose, Weaver, & Darghouth, 2014). State and local governments have streamlined permitting processes as well, making it considerably easier than ever before to set up a DPV system (Goodrich, James, & Woodhouse, 2012).

While NEM and DPV may assist Virginia in meeting RPS requirements, mandated greenhouse gas regulations, economic development targets, and overall grid reliability (Pitt & Michaud, 2014), there remains great debate surrounding NEM. NEM is a low cost to government policy that was originally enacted to enhance a pricey market in its infancy, yet as hard costs of materials continue to plummet due to technological advancements and economies of scale (Stanfield, Schroeder, & Culley, 2012), IOUs in Virginia have been pushing back on the NEM issue. Firms such as Dominion Virginia Power and Appalachian Power Company assert that NEM undercuts utility revenues by allowing customers to rid the fixed costs that apply since such customers still have to be connected to the grid (Pitt & Michaud, 2014). These IOUs also often argue that expanded solar deployment may cause technical problems for the transmission and distribution grids (Pitt & Michaud, 2014).

Hence, IOUs have been pursuing monthly "stand-by charges" for solar PV owners using NEM, as a way to help pay for the existing generation infrastructure they need for upkeep. For instance, the Virginia General Assembly adopted House Bill (HB) 1983 in 2011 that enabled Virginia utilities to pursue stand-by charges. The Virginia SCC subsequently approved Dominion's request for a $4.19/kW monthly stand-by charge for owners of net-metered systems larger than 10 kW (Shapiro, 2011). Appalachian Power Company, Virginia's second largest electric utility provider after Dominion, also recently received Virginia SCC approval for a similar stand-by charge (State Corporation Commission, 2014a). Similar policies have passed or been considered in Arizona, Georgia, Idaho, Maine, Oklahoma, Vermont, and Wisconsin (North Carolina Clean Energy Technology Center, 2014).

Addressing some of these concerns, the Virginia SCC prepared reports on the effects of NEM and DPV to utilities in 2011 and 2012. A 2011 Virginia SCC NEM study found that at existing levels of market penetration, "customer generators impose a very small net cost on Virginia's utilities in total, and such cost results in an 'immaterial' average annual bill impact on non-net metering customers" (State Corporation Commission, 2012, p. 8). The study also found that under a fully subscribed program, in which installed capacity reached 1% of peak demand in each utility's service area, the average residential electric bill would only increase by $6.73/year (State Corporation Commission, 2012). Further, reaching this capacity would require about a 50-fold increase over 2011 DPV levels, indicating the multitude of installations that would need to occur even to reach that level.

Still, solar energy advocates, installation firms, and others claim that the utilities' arguments and the Virginia SCC's conclusions are speculative and that Virginia should continue to allow and push for favorable NEM incentives. Solar supporters point to the environmental, public health, and economic development benefits that DPV provides, as it reduces air pollution from conventional power plants and creates job opportunities (Perez, Norris & Hoff, 2012). They also argue that it provides value for utilities by reducing the need for conventional generation fuels, avoiding new generation capacity, and reducing the tension on existing transmission and distribution infrastructure (Beach & McGuire, 2013).

Arguing that Virginia's electric rate structure currently causes all customers to pay for distribution in an amount proportional to their electricity consumption, advocates have also sought to repeal stand-by charge legislation such as SB 582, 2012 and SB 1025, 2013. Therefore, they assert it is unfair to set apart the owners of DPV systems, when any patron who consumes electricity at a below-average rate places the same distribution burden on utilities. They contend that utility stand-by charges create a sizable financial hindrance for customers with DPV systems, yet do not generate adequate revenue to justify the expense of administering the program (Pitt & Michaud, 2014).

Virginia's Department of Environmental Quality and Department of Mines, Minerals, and Energy convened in 2014 and facilitated a Distributed Solar Generation and Net Metering Stakeholder Group in response to Senate Resolution 47 (Legislative Information System, 2014). Comprised of representatives from utilities, the solar industry, local governments, environmental advocacy groups, and academia, the stakeholder group was tasked with studying the costs and benefits of DPV and NEM in Virginia (i.e., not community NEM), and to recommend a method for evaluating such data (Legislative Information System, 2014). However, all of the Virginia utility representatives formally withdrew from the group (Pierobon, 2014), exemplifying the political and ideological struggles getting these key institutional actors to collaborate.

Again, what is seen is an environment wherein these institutional actors pursue their own interests and agendas. This resilient conflict has come to a boiling point in recent years, with players on both sides wanting to voice their claims. In Virginia, legislative proposals to expand NEM to community NEM arrangements have encountered much counterattack and criticism from utility providers, particularly the IOUs. These IOUs often have access to state officials and policymakers, using their financial influence and lobbyists to advocate their points of view. Though public officeholders have the political authority to make and carry out public policy decisions, they are frequently and habitually coerced by those with financial resources who have a self-interested motivation to get involved in the policy process (Nichols & McChesney, 2013). In the arena of state-level solar policy, those with the largest financial resources are the IOUs.

Prior Community Shared Solar Legislative Proposals in Virginia

In 2012 Virginia Delegates Scott Surovell and Kaye Kory proposed HB 672 entitled *Distributed Electric Generation; Community Solar Gardens*. This bill would have authorized the establishment of community shared solar gardens in Virginia for projects with at least 10 subscribers for any retail customer of a utility and for those smaller than 2 MW (Legiscan, 2012). Under the proposal, a special purpose entity or nonprofit organization would have controlled the subscribers and would have been responsible for owning and operating the community shared solar garden. The individual subscribers would have received credits on their respective utility bills from the energy generated at the shared solar garden based on their ownership percentage. Such credits would have to be purchased by the utility provider through NEM. If these NEM credits exceeded the owner's bill in a given period, they could be rolled over to future ones. Crucially, the bill also mandated that "if the electricity output of the community solar garden is not fully subscribed, the utility is required to purchase the unsubscribed renewable energy at a rate equal to the utility's average hourly incremental cost of electricity supply over the immediately preceding calendar year" (Legiscan, 2012, para. 1).

HB 672 was referred to the Commerce and Labor Committee, and then relegated to a special Subcommittee on Energy (Legiscan, 2012). After minimal debate, the House unanimously voted to table the bill[2] and it was left in the Commerce and Labor Committee on February 14, 2012 (Legiscan, 2012), meaning that the bill could emerge again, if necessary.

In January 2014 the bill reemerged, this time as HB 1158. It had the same title as the previous version, and most likely rematerialized due to the shift in political winds caused by the 2013 gubernatorial election in Virginia that brought Democrat Terry McAuliffe into office (Gabriel, 2013). Delegates Surovell and Kory presented HB 1158 again with identical text to the 2012 version (HB 672). However, HB 1158 was also referred to a special Subcommittee on Energy in Commerce and Labor, ultimately being tabled and left in this committee in February 2014 (Legiscan, 2014).

The 2015 legislative session saw yet another community shared solar bill materialize, this time by Delegate Richard C. Sullivan Jr. This bill went through the same process and was again tabled (Legiscan, 2015). Another bill, HB 1636, titled *Net Energy Metering; Program for Community Subscriber Organizations*, was proposed by Delegate J. Randall Minchew during the 2015 legislative session. The bill was more explicit about community NEM, and would have allowed "community subscribers and community subscriber organizations" (Legislative Information System, 2015, para. 1) to participate. Like similar bills, HB 1636 was referred to the Committee on Commerce and Labor and its special Subcommittee on Energy, and it too was tabled (Legislative Information System, 2015).

The 2016 legislative session in Virginia saw still another relevant bill proposed, indicating a dedicated commitment to get a community shared solar bill passed in the state, as no other state has proposed as many related bills. This version, HB 618, *Community Solar Gardens*, proposed by Delegates Paul Krizek and Vivian Watts, also included language to enable community solar gardens (Legislative Information System, 2016c). However, this bill included language that would have allowed utilities to levy a "reasonable charge" to cover associated costs with administering the program. Regardless, once again, the bill was referred to the Commerce and Labor Committee, and then to the special Subcommittee on Energy. On February 9, 2016, the Energy Subcommittee recommended to continue this bill to 2017 by voice vote (Legislative Information System, 2016c).

Lastly, two other bills proposed during Virginia's 2016 legislative session would have helped the state expand community energy programs. HB 1286's language contained a provision to authorize community energy programs under the net metering aspect of the bill, whereas HB 1285 authorized, but did not mandate, Virginia's IOUs and electric cooperatives to establish community energy programs (Main, 2016). Like all of the other community energy or solar bills in Virginia, however, neither bill passed after being sent to the Energy Subcommittee. In February, both bills that were similar to HB 618 were recommended to continue to 2017 (Legislative Information System, 2016a; Legislative Information System, 2016b). The Subcommittee on Energy is often regarded as utility-friendly (Main, 2015), and the frequent tabling and postponing of bills related to community NEM and shared solar suggests that future bills will have great difficulty gaining enough support to become law.

Analysis

This research suggests that prior community shared solar legislative proposals failed to pass in Virginia due to escalating stresses from IOUs, the solar industry, and NGOs. Electric utilities in the state lobbied the Virginia General Assembly to table all of these bills, and were successful with money and corporate dominance in this state-level political process. Dominion Virginia Power lobbied vigorously against the bill in defense of oligopolistic controls on their market prices. All 10 delegates from the Republican Party who opposed HB 1158 collectively received over $45,000 in campaign contributions from Dominion in 2013 alone (Virginia Public Access Project, 2014a).

Dominion is the single largest contributor to Virginia candidates' election campaigns in the state besides the Republican and Democratic parties. In 2013, the utility disbursed well over $800,000 to influence Virginia state elections (Elsner, 2014). Terry Kilgore, the chairman of the special Energy Subcommittee, received $23,500 from Dominion in 2013 (Virginia Public Access Project, 2014b), and $31,000 in 2011 (National Institute on Money in State Politics, 2014a) for reelection efforts, making the utility his largest campaign contributor in these elections. As recent lobbying expense documents show, "Dominion spent $299,753 from May 2012 through April 2013 lobbying the state legislature, and had at least eight lobbyists as employees and four additional lobbyists as contractors" (Elsner, 2014, para. 5). Dominion also contributed $7,000 and $3,000 to the respective campaigns of Delegates Surovell and Kory (National Institute on Money in State Politics, 2014b; National Institute on Money in State Politics, 2014c), possibly swaying the direction of the community shared solar legislation in Virginia.

Dominion essentially has an interest in preserving its supremacy in Virginia's electricity market and thwarting the growth of DPV, especially considering the threat it may pose to corporate profits. A recent report published on behalf of the utilities trade group Edison Electric Institute outlined the hazard that DPV presents to the customary business model of generating and selling electricity from centralized and fossil-fuel burning power plants (Kind, 2013). In fact, in 2013, Virginia utilities collectively generated electricity primarily from large power plants using nuclear technology (38%), coal (28%), and natural gas (29%), while only 4% was attributed to renewable sources (American Coalition for Clean Coal Electricity, 2014). It should also be noted that Virginia utilities were successful in defeating three related solar bills in 2014 (SB 350, HB 879, and HB 906) that would have permitted multi-family housing community dwellers such as condominium owners to aggregate their meters through NEM (Main, 2014). These bills were also left in Commerce and Labor early in 2014. Additional solar related bills thwarted by Dominion that did not pass in 2015 include HB 1925 and SB 1160, which would have expanded third-party power purchase agreements.

The solar industry and the solar-advocating NGOs also play a key role in influencing state solar policy in Virginia, yet do not often have the money power that large IOUs such as Dominion have. A comprehensive review of National Institute on Money in State Politics data supports this claim. While these IOUs often have power in money and access, the solar industry and NGOs do possess power in numbers and organizing ability, representing another key input toward Virginia legislative decisions. Several NGOs are publicly known to lobby the General Assembly on the environment, climate change, and DPV. These include Appalachian Voices, Community Power Network, Environment Virginia, Maryland/DC/Virginia Solar Energy Industries Association, Piedmont Environmental Council, Virginia Chapter of the Sierra Club, and the Virginia Conservation Network. The Chesapeake Climate Action Network has a webpage with a petition to take action on unlocking Virginia's solar power potential (Chesapeake Climate Action Network, 2014). Among other policy decisions, the petition focuses on the legalization of community shared solar. The solar industry also has a key role in pushing for DPV and community solar, and a sizeable network of installers in Virginia. However, these groups often have a difficult time competing with the large IOUs in influencing energy policy decisions.

In Virginia, the General Assembly, the governor, and the SCC are the three key parties responsible for the electric rates, regulation of utilities, and the latter's processes. This system of state control allows the legislature to have significant authority and control in policymaking, albeit not without the input of the noted key actors. Through money, access, and lobbying, Virginia's IOUs have been able to maintain considerable control over policies they disfavor and guide public outcomes, despite the fact that they are regulated by the Virginia SCC. Conversely, the legal system and the media are not sufficiently involved in this policy process. Through the PET framework, HBs 672, 1158, 1636, and 618 did not pass in Virginia due to the long-existing stickiness concerning shared solar and community NEM, bounded rationality of legislators (i.e., they are too busy and, thus, must focus on their agenda), and the influence of money and corporate dominance in politics. In fact, Virginia solar policy decisions do not often pass without the influence of focusing events that trigger shifts in the equilibrium.

To illustrate, individual consumer NEM legislation did not pass in Virginia until 2000 (Database of State Incentives for Renewables and Efficiency, 2015), as a distant byproduct of the key negative focusing events that had occurred in the energy industry decades before (e.g., 1970s oil crises, nuclear disasters), among other reasons. The Three Mile Island and Chernobyl nuclear disasters, coupled with the local nuclear reactor accident in Surry, Virginia in 1988, started to raise awareness and alter public cognition of some of these energy and environmental issues. Other nuclear accidents, oil spills, and coal mine disasters throughout the 1990s such as the South Mountain No. 3 Mine Explosion in Norton, Virginia continued to push public perceptions away from these dirty energy sources and toward cleaner ones. Virginia's IOUs did not fight as hard against NEM legislation at the time due to negligible market penetration figures. However, Virginia's solar policy marketplace has been relatively motionless since the new millennium, due to the lack of key events that drive public perceptions toward solar PV and renewables, as well as the influence of key lobbying groups increasingly combatting these technologies.

Referencing Baumgartner and Jones' (1993) PET framework, Virginia policymakers are restricted on the community NEM issue by bounded rationality and disproportionate attention (i.e., overall lack of consideration). Large IOUs frame and help set an agenda that embraces the status quo, ultimately hindering the expansion of alternative solutions like community NEM. Such stasis in terms of state solar policy forms what Baumgartner and Jones (1993) term "policy monopolies" (p. 5). These monopolies often solve problems on the same terms as previous ones, many times with the intent of dismissing alternative policy mechanisms that may exist (Baumgartner & Jones, 1993).

According to Baumgartner and Jones (1993), venue shopping may be a way to alleviate such circumstances. However, since solar policy must pass through central legislation, other audiences such as the courts or other levels of government simply do not have as much authority as Virginia's General Assembly. This is to say, policy changes, such as the adoption of community NEM and shared solar in Virginia, will only occur once the vested interests and the overall "stickiness" of such a culture are punctuated by large shifts in the state's utilities and legislature's attitude to allow for increased deployment of DPV. Increased attention and public participation may also assist in altering the existing equilibrium.

Other than a trifling alteration to Virginia's NEM policy that increased its residential capacity limit from 10 kW to 20 kW because of HB 1983 (Cosby, 2011), Virginians are in another long period of stasis regarding NEM. While in 2013 the General Assembly did pass HB 1695 to permit this kind of NEM to eligible agricultural customers (i.e., they allow farmers to aggregate their house meters with their barn) (Database of State Incentives for Renewables and Efficiency, 2015), Virginia's laws remain antiquated relative to other states with more advanced community-oriented solar policy.

Conclusions and Policy Implications

While community NEM and shared solar gardens have been developing throughout the United States, Virginia still lags behind as a result of the legislative decisions noted above. The tabling or postponing of HBs 672, 1158, 1636, and 618 has made it unmanageable for residents and investors in Virginia to purchase solar energy or shares in a solar generation project without installing it at their own site. While community NEM would have allowed for the expansion of shared solar gardens, bounded rationality, disproportionate attention, and the overall stickiness of Virginia's state political and policymaking culture has hindered the passing of such a bill. The influence of money power and corporate dominance in politics through lobbying has continues to be extremely effective as well. Community NEM and the allowing of shared solar gardens may never pass in Virginia without a sizeable shift in the current equilibrium, possibly though one or a series of focusing events or a change in the political culture. Minimizing corporate dominance in politics would also make a difference. If such shifts or changes occur, Virginia could utilize favorable state solar policy to promote a powerful DPV future, regardless of customer class or geographic distance.

Virginia needs to undergo such a shift to tap into the benefits community shared solar may bring. The passing of HBs 672, 1158, 1636, and 618 would have allowed community-scale solar to develop, providing solar energy to a diverse customer base. Investors and installers could have worked collectively to choose the best site for community solar gardens, making for a better investment. Economies of scale relative to house-sited solar PV could have been realized, reducing risk due to the greater flexibility of the model. Ultimately, the passing of community NEM and shared solar gardens in Virginia would have expanded opportunities for consumers, even for non-homeowners who may have wished to invest in solar.

The evidence presented here suggests that state-level solar policy is not created without much input from parties who have a vested interest in influencing such decisions. Public choice theorists often term this political capture due to the fact that officeholders do not have profit to direct their behavior, the missions of interest groups capture them. Adding to the existing PET, this analysis shows that lobbyists from various organizations help set the agenda in Virginia by financially supporting political officials who advocate their views, in turn making it more attractive for the latter to pass legislation. The respective motivations, manipulations, and overall infiltration of those seeking political power incomparably shapes policy formulation.

While a number of states have passed formal community shared solar policy, other states actively continue to discuss such policy. California has been an exemplary leader in community shared solar, and has particularly encouraged solar installations on low-income, multi-unit housing properties through virtual net metering. This strategy allows multifamily affordable building owners to install a single solar PV system, and the utility allocates the kilowatt hours produced by the PV system to the building owners' and tenants' individual utility accounts. Often states that have been successful at passing some form of community shared solar legislation have eased electric utilities' minds by focusing on group billing arrangements or virtual net metering policies. Colorado, Delaware, Massachusetts, and California have relied on virtual NEM to distribute economic benefits of shared PV systems, among several other states. This has allowed them to be successful in passing such legislation.

Since prior proposed community solar legislation in Virginia focused on the specific establishment of community solar gardens, perhaps the best path forward is for future legislative proposals to focus more narrowly on group billing and virtual net metering policies. This would allow a customer with multiple meters to distribute credits to different accounts, such as renters in a multi-unit building. More narrowly focusing the bill language would also allow legislators to utilize best practices from other states that have successfully passed these types of policies, easing electric utility providers into the community shared solar idea.

This article provides evidence that the relationship between community shared solar legislation in Virginia and the relevant forces at play are complex. The results of this study indicate that the tabling of the four legislative measures that would have allowed for community shared solar, viewed through a PET framework and historical institutionalism methodology, seems predictable considering Virginia's political climate and frequent opposition to solar by its IOUs. Regardless of evidence that outlines the benefits of community shared solar, Virginia policymakers will have to continue to navigate this institutional climate when considering future policy decisions in the state.

Overall, understanding the perspectives on NEM and community shared solar, as well as the policymaking culture in the state, has helped explain why Virginia has been unsuccessful at passing such legislation despite multiple attempts. Such an analysis is useful in understanding these processes as a proxy for other historically laggard states when it comes to energy policy, helping to discern the future of community NEM and shared solar policy throughout the United States. It is certain that key challenges and prospects exist for a wider implementation of community shared solar policy, which may only be possible through a pervasive policy change event or a punctuated equilibrium.

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Endnotes

1. "Distributed photovoltaics" is used to distinguish smaller-scale photovoltaic systems from larger utility-scale photovoltaic systems.
2. The tally was 13 votes Yes, 0 votes No/No vote.

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