

# **Mutual Shaping of Residential Solar Regulations in the Commonwealth of Virginia**

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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## **Background**

Climate change has spawned a global effort to reduce greenhouse gas emissions and reduce the worsening effects of climate change. Although climate change is already damaging and destroying coastal areas worldwide, the efforts to reduce greenhouse gas emissions have lagged in part from slow decarbonization in the fossil fuel-dominated power and energy sector. The premise of growth in today's global economic system has been built on access to cheap hydrocarbons; this means these sources all enjoy the power of being "default" sources of energy and the mature supporting industries that can maintain the centralized power plants that burn them.

Although alternative forms of energy such as nuclear, wind, solar, and hydropower are being constructed at faster paces, there are technical and socio-political limitations on these centralized power generation projects. Around the world in general and in the US especially, there is an effort to exploit the roofs of homes to place solar panel systems and increase renewable energy production. These systems are collectively known as "rooftop solar," "residential solar," or "small scale solar"(Vincent and Thomas, 2022). For this paper the term "residential solar" (henceforth "RS") will be used to emphasize the residential component of the paper since "rooftop solar" also applies to commercial buildings. The US federal government aims to support and foster adoption of these systems through permissive regulations and tax credits (Murphy & Pelchen, 2023). State residential solar policies however vary greatly and can greatly boost or hinder broader system adoption. Broader state strategies can range from active promotion of fossil fuels on one end to promises for 100% renewable energy in others (Virginia plans to do so by 2045). Although analyzing each state in its context is useful and needed,

looking at how states like Virginia who have promised 100% renewables enact and react to these policies can help other states in their energy transitions.

Taking these developments into mind, the main question for this paper will revolve around analyzing the specific local and state regulatory environment for RS in the author's home state of Virginia. This will include the Virginia state government, selected local governments, and private homeowner's associations (HOAs) wherever possible. Although there is research on RS policy on the federal level, the "on the ground" regulatory environment varies greatly by region and by the state. Analyzing regulations and policy on state, local, and HOA in Virginia will attempt to answer how these important stakeholder groups better promote RS adoption through their actions and interactions with each other within the state's context.

The importance of this research lies in the potential of this solar technology if further adopted broadly. In 2021, around 49 million megawatt-hours (MWh) of solar power was generated from residential, commercial, and other small-scale solar facilities in the US (*How Much Solar Energy Do Homes Produce?*, 2022). Despite this category (and by extension residential solar in isolation) being less than 1% of all the energy generated in the United States, the industry is rapidly growing. For example, the amount of home solar energy generated in 2021 was already four times more than that generated in 2014 (*How Much Solar Energy Do Homes Produce?*, 2022). Although residential solar technology is inherently limited to regions that get adequate sunlight, generation is spread across multiple parties rather than centralized solar farm or power plant. It can still positively contribute to a diverse energy generation mix for a resilient and climate friendly future. Data from the US Energy Information Administration (EIA) suggests that even today's modest levels of adoption are reducing metered electricity demand in parts of the country (Vincent and Thomas, 2022).

For the homeowner, solar panels both boosts a home's value – on average by 4.1% according to a recent Zillow estimate (Mishkin, 2019) – and can provide energy security when paired with a home battery storage system. Determining how Virginia authorities better work with each other on this issue could help inform legislation that reduces system costs and the “soft costs” tied to installation, permitting, etc. Soft costs still make up 65% of the average RS project and more solar friendly legislation can directly cut these costs (O’Shaughnessy et al., 2019).

### **Scope and Limitations**

While residential solar offers promise, there are considerable technical, social, and political challenges that hinder adoption of this technology. Although there are many social actor groups relevant to the residential solar industry, only local governments, the Virginia state government, and Homeowners’ Associations (HOAs) where possible will be explored in this paper. This notably will exclude important social actor groups including utility companies, homeowners themselves, solar installation companies, and the federal government, among others. Why is this being done? This is being done to limit the scope of the paper and focus on the policy aspects of the overall social-technical system.

All the limitations have been placed to limit the paper’s scope. On one end, federal government policies cannot account for every region and location’s various conditions. On the other end, utility companies are themselves diverse and can range from tiny electric cooperatives to massive publicly traded corporations like Duke Energy and PG&E. Including them would increase scope and quickly spin into an analysis of national economic policy and global market conditions. The author has chosen to focus on a selection of HOAs, local and state governments since they are the best reflections of every locale’s social and geographical layout. The obvious downside is that only one state can be covered.

On the technical side, the paper will not discuss RS's main solar competitor Community Solar (henceforth "CS"). A report filed for the Virginia Solar Pathways Project gives a good definition:

"A solar development model in which multiple customers acquire rights to the energy or capacity of a shared solar installation in order to realize environmental, economic, or other benefits." (Reiter et al., 2016, vi)

The premise of Community Solar is to pool resources into a shared solar farm to achieve cost savings or other benefits. This model of development holds greater appeal to those that either cannot individually afford or physically qualify their residences for RS systems (Reiter et al., 2016, vii). Community Solar can be deemed "residential" since it can be proximal to residential communities but it will not be covered in this paper since utilities have direct input into these projects. Utilities are only relevant to RS since these systems are tied to the broader power grid.

This overall project will investigate how a few selected local governments, the state government, and HOAs (where possible) have affected and disrupted the adoption of residential solar technology throughout the state of Virginia. How might these groups collectively hinder residential solar? The lack of a cohesive policy landscape for this technology means the federal government cannot completely guide the nation's energy goals. As such, local and state authorities have an exaggerated impact on solar adoption on a macro scale and will make these decisions based on local social, geographical, and economic conditions. This paper will effectively imagine potential improvements to the social context and policy aspects of residential solar in Virginia to further push the state's decarbonized future.

## **Methods**

Evidence for this research will be collected by analyzing the positions of local and state governments and relevant HOAs (to the best of my ability) in relation to developments of technology and politics. Research on state and local county governments will rely more on official regulations and press releases than for any potentially selected HOAs.

News articles and online interactions of various kinds (comments, forum posts, videos, etc.) will be analyzed. Various analyses of literature and current discussions within society on an official (news articles, press releases, etc.) and unofficial level will be conducted to determine how technical and social adoption of this technology has progressed and may continue to progress in the future in Virginia. Quantitative and qualitative data will be analyzed in relation to technical developments to find mutual shaping between the stated social groups and the technology.

## **Results**

Research was initially in the three areas mentioned above. From initial research the author found NC State's DSIRE tool that has a database of relevant energy-savings and clean energy regulations, codes, and incentives on the federal, state, and local levels. Virginia was selected and the author, after ruling out federal regulations and unrelated local incentives/rules, went through each of the Virginia state-level incentives. For the selected local governments (Loudoun and Albermarle) their respective law codes and regulations were printed out and examined. Forms for solar applications were also printed out for analysis. The application processes themselves give a good picture of the effect of state regulations on local oversight for solar since so much has already been built up on the state level. Finally, given previous research on the state and local levels, the initial expectations for research on the HOAs were reduced.. Nevertheless, there were still resources researched on the state of all HOAs broadly in Virginia that were included. Finally, some news articles about HOAs and solar regarding the VA Clean

Economy Act of 2020 were looked over. The results section will discuss the specifics of what was found but will leave specific analysis of how each group is influencing and interacting with each other to the Discussion section.

Within the state of Virginia's government, there are three major bodies that are relevant to the topic at hand. These are the state's General Assembly, the Virginia State Corporation Commission (SCC), and the Virginia Department of Energy ("Virginia Energy," not to be confused with VDOE, the VA Department of Education). The General Assembly is Virginia's primary legislative body; it is the "First and Oldest Continuous English-Speaking Representative Legislative Assembly in the Western Hemisphere" (Virginia House of Delegates, n.d.). It is a bicameral body with a "lower" house and "upper house" of representation. The SCC is an independent branch of the state that holds regulatory authority over any organization that is either state-owned or under special regulation by the state. Its main areas of purview include power utilities, railroads, insurance and securities, state-chartered financial institutions, and retail franchising. (DSIRE, n.d.). There are three head commissioners who are elected to six-year terms. They help implement legislation but their decisions can only be overturned by the Virginia Supreme Court (SCC, n.d.). In this context, when news sites refer to "regulators" approving this or that solar site, they typically refer to the SCC. In contrast, Virginia Energy, formerly the Virginia Department of Mines, Minerals and Energy (DMME) (Still, 2021), is charged with managing and regulating the usage of the state's energy and mineral resources. Unlike the SCC, the Department of Energy is part of the executive branch. They have a heavier focus on oil/gas/mineral resources than simply generating energy (State of Virginia, n.d.) but are still important in implementing the Governor's Virginia Energy Plan (Governor of Virginia, 2022).

Within Virginia state regulations there are a wide variety of the mundane/basic to the more “flashy” or recent laws passed. Some more basic regulations include those on Interconnection Standards, Solar Easements, Local incentive option regulations, and guidelines on local ordinances for solar and wind.

The interconnection standards rules relate largely to describing technical standards, mandated inspections, and arbitration/dispute settlement pathways for those with net metered buildings and other small electricity generators (DSIRE, 2015). These rules are most relevant to customers enrolled in net metering programs, which will be described later. Solar Easement regulations, first passed in 1978, allow building and home owners to create binding easements to protect their solar equipment’s access to proper sunlight (DSIRE, 2021b). The law when passed would have likely had solar heaters in mind but is now important to those with photovoltaic systems as well. Local incentive option rules allow for local governments (county, city, town) to partially or fully exempt both solar and recycling equipment from local property taxes (DSIRE, 2022). It is noted that both Albermarle county (and the City of Charlottesville, though this locale is not in scope here) and Loudoun County have passed ordinances for such exemptions. The guidelines on local ordinances generally state that local ordinances for solar and wind must follow state policy and provide “reasonable” requirements and regulations for their installation and usage (DSIRE, 2021a). What is deemed “reasonable” was generally left unclear. The initial guidelines were passed in March 2011 but more have since been passed, one set of which will be covered in the HOA section.

In the public discourse, policies like Virginia’s Net Metering policies, Renewable Portfolio Standards (RPS), and its landmark Virginia Clean Economy Act of 2020 build upon the more “boring” regulations and have certain special applications for RS adoption in the state. Net



metering, put simply, is when energy customers (here, households) get paid for the solar energy that they “sell” back into the grid (EnergySage, 2023). Although utilities at best are apathetic towards net metering due to the increased load management on their end, they are critical to promoting RS since they shorten the time to break even on an RS system.

RPS policies set minimum percentage requirements for how much of a given state’s energy generation should be from renewable sources (DSIRE, 2020). In Virginia’s case, the old RPS policies passed before 2020 were superseded by the Virginia Clean Economy Act (VCEA) of 2020. This act set Virginia on a course for 100% renewable energy generation by 2050, making it one of eleven states (plus DC and Puerto Rico) as of early 2023 to pass such a mandate (Weisbrod, 2023). The “renewable” forms will include solar, wind, some hydroelectric, biomass, and waste-to-energy (landfill gas). In regards to net metering, the VCEA boosted the metering cap from 20 kW to 25 kW and removed some utility fees for smaller RS systems (Thoubboron, 2022). In addition, the law has Virginia join a regional cap-and-trade carbon credits network, increased some utility regulations, and limited HOA power over local RS ordinances which will be covered later.

The local governments covered are generally limited in the reach of their regulations by the limits set by the state government. Most relevant regulations found revolved around permitting forms requiring basic information, electrical plans/diagrams, relevant permits, and safety compliance, etc. It should be noted that both Loudoun and Albermarle share local governments that are more solar-friendly but also contain a strong mix of suburban/urban buildup with rural landscapes. As such, these governments have focused their solar efforts more on larger utility-scale solar projects (Quigley, 2023) than on promoting small-scale solar arrays. In both counties there are strong local economic groups whose livelihoods could be impacted by

using land for solar projects. In Loudoun in particular there is a strong winery/equestrian tourism economy whose appeal could be dimmed by extensive projects (Cline, 2021). Overall, the local governments covered have some say into the RS regulatory picture but also focus more on larger projects.

From where the local governments drop off normally the HOAs would pick up. HOAs historically have been opposed to RS systems for aesthetic or other reasons. Coming into this, the author was expecting significant variations in HOA policy that would require in-depth study. The author however found that the state of Virginia has passed state-wide legislation that heavily limits how HOAs can regulate or reject homeowners' solar projects. The bill HB414/SB504 of 2020, itself an extension of a solar HOA bill from 2013, prohibits HOAs from keeping "unreasonable" restrictions. The 2020 law builds on the 2013 rules by explicitly defining "unreasonable" rules as any that in effect (Misbrener, 2020):

- Reduces RS system performance by at least 10%
- Adds at least 5% to the original installation cost

The heart of the law is to prevent HOAs from de facto banning RS systems by raising the cost and regulatory burden for the average homeowner.

The state rules still allow for "reasonable restrictions" like preventing projects that don't meet building codes and that do not look professional (i.e. exposed wires running down the roof) (ReisingerGooch, 2020). In addition, it allows for retroactive HOA-homeowner covenant declarations to still restrict solar. In the media, some advocacy groups argue that homeowners in developer controlled HOAs still face restrictions. They argue that while member controlled HOAs cannot easily retroactively negotiate with every homeowner's covenants, in developer

controlled HOAs the developer can unilaterally change the covenants (Column et al., 2021). They argue that the state should simply treat RS like satellite TV dishes and remove them entirely from HOA jurisdiction (Mackenzie, 2022). In sum, the results have shown that while the state has increasingly exerted great influence over what local governments and HOAs can handle, these local bodies still can adapt to the “greater” body.

In summary, from the Virginia state government there are the “basic” regulations for things like interconnection standards, solar easements, etc. and newer regulations including net metering, RPS, and those from the Virginia Clean Economy Act of 2020. Regulatory authority unlike other states is split between the State Corporation Commission (SCC) and the state’s Department of Energy (“Virginia Energy”). The SCC is independent from the executive branch and has greater powers while Virginia Energy is accountable to the Governor. Local governments have less legislative authority than the state and must balance solar projects with the interests of their local constituents. They are involved primarily in the permitting side of RS projects. Finally, the HOAs have the final say in approving a homeowner’s rooftop solar project, although with recent legislation the HOAs are restricted in what rules they can place. The state passed this to prevent HOAs from de facto banning RS through burdensome rules.

## **Discussion**

From the research described above, the author found that among the three governmental bodies studied, the state government has the most influence over how RS is regulated. Even though the state has a significantly broader scope and depth of items on the energy and environmental agendas, the state regulatory committees and general assembly also can collectively “move the needle” on any one particular issue. Even with the politics in the General Assembly and various interest groups that try to shape laws and regulations to their interests,

once a direction is set it is more difficult to undo it. Thus, change tends to be slower but steadier. For example, despite the election of a new governor who desires to repeal the VCEA (Mooney, 2023) and emphasizes an “all-of-the-above” (Ress, 2022) approach to the state’s energy needs, the SCC’s relative independence from the governorship means that the law will be hard to repeal. Thus, the governor has used Virginia Department of Energy to push his energy policy plans instead. Although there have been no mentions of regulatory infighting or toe-stepping in the media, it is not hard to imagine tension where the two have overlapping (or perceived overlapping) authority. Even still, legislation like HB414/SB504 continues to indirectly promote RS.

On the local level, the governing bodies are closer to the “average” homeowner than the state government and perhaps can more quickly react to local issues. They, however, have less power and less resources to spare on any one given issue and must maintain a balance between the interests of local groups and blocs. They are more constrained in how and what they can regulate due to federal and state rules from the top and local interests coming from the bottom. With the HOAs, they have less parochial power than they had in the past due to explicit state intervention, but they collectively have power in approving or denying a particular homeowner’s project. The state government is powerful and somewhat responsive to local conditions; it is both empowered and constrained by the breadth assigned to it. As the levels of authority from Virginia state to HOA goes downwards, the power of circumstance and discretion increases. With RS, more so than larger utility or community renewable projects, promoting system adoption ultimately comes down to a motivated household’s personal interactions with the solar market and the broader regulatory brushstrokes. It could be described as a relatively “private” decision that over a broader social landscape still has impact. Keeping the individual choices inherent to

what is ultimately a house upgrade in mind while promoting these systems will help keep promotion efforts within a broader state (and federal) climate strategy of reducing base energy consumption while decarbonizing centralized power generation.

## **Conclusion**

In summary, within the Commonwealth of Virginia the efforts among the state government, relevant local governments, and HOAs all have acted to form a regulatory environment that is generally friendly to Residential/Rooftop Solar (RS) systems. The state government – through the legislative body and the relevant regulatory agencies – have constructed ambitious targets to promote renewable energy in general and RS by extension. The structure of the Virginia State Corporation Commission (SCC) allows it some regulatory independence from the governor’s office to implement state legislation. For the two local governments covered – Loudoun and Albermarle – they both must balance solar regulation with local interests and interest groups. Thus, they have focused more on larger solar projects than on promoting individual RS projects. They are not against them though. In contrast, the HOAs until recently have typically been the most restrictive over RS systems. They have either outright prohibited them or have placed de facto bans on them through onerous and costly community guidelines. Recent legislation has significantly curtailed their ability to reject homeowners’ applications, but some activists still argue that legislation could go further.

Generally, as the levels of authority from Virginia state to HOA goes downwards, the explicit political power decreases but there is more discretion in RS approvals. The state can promote these systems, but it is ultimately left to the local governments and HOAs to greenlight them. With RS, more so than larger utility or community renewable projects, promoting broader system adoption ultimately comes down to a motivated household’s personal interactions with

the solar market, the overall economy, and the “cumulative” regulatory environment in that locale. Since Residential Solar ownership is strongly tied to single-family homeownership and socioeconomic affluence within the broader housing market, the relevant authorities should consider how actively to promote RS within the context of a broader energy and environmental strategy. More fundamentally, while it is ultimately acceptable to promote the benefits of RS within the given social environment, the broader housing system and its environmental effects must also be considered. How does this form of clean energy interplay with the environmental effects of enshrined single-family home ownership and the suburban lifestyle it encourages? At what point would promoting the RS “accessory” directly or indirectly promote the core housing paradigm it is attached to?

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