

Applying the Social Construction of Technology to Public Support of Renewable Energy

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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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Introduction: The Need And Opportunity For Renewable Energy In Appalachia

Energy consumption in the U.S. is increasing every year and has yet to peak. We currently rely on fossil fuels, with about 79% of U.S. energy coming from coal, petroleum, and natural gas (Center for Sustainable Systems, 2022), and some models estimate that the U.S. will run out of them within the next 100 years (Kuo, 2019). However, there is a larger threat than just resource depletion—fossil fuel usage is harming the environment and people’s health. In the U.S., 29% of global warming emissions come from the energy sector, mainly from coal and natural gas. Air and water pollution from coal and natural gas plants are connected to many health issues such as breathing issues, neurological damage, and cancer (Union of Concerned Scientists, 2017).

Appalachia is being strongly impacted by the shift towards renewable energy. Appalachia is a region comprising 423 counties across 13 states, spanning from southern New York to northern Mississippi, see Figure 1 (Appalachian Regional Commission, n.d.-a). In Virginia, 25 counties and 8 independent cities in the western region of the state are in Appalachia (Appalachian Regional Commission, n.d.-c). From the 1880s to 1970s, Appalachia was the country’s “primary coal-producing region” (Zipper & Skousen, 2021), but mining has declined since. Between 2001 and 2021, coal production dropped 64% in Appalachia and coal employment decreased by 62% (Bowen et al., 2022).



Figure 1. Blue shaded area on the map shows the Appalachian region (Appalachian Regional Commission, n.d.-b).

Appalachia has historically been and is currently a key region for energy in Virginia, creating an opportunity for it to lead the way in renewable energy development. Large scale wind and solar projects are most successful in rural areas with access to land and resource potential, criteria that Appalachia meets (Tosado et al., 2021). However, resource availability is not enough. Projects must still gain approval and support from the localities where they are proposed. As renewable energy infrastructure becomes widespread, areas are not always welcoming to development (Osaka, 2023). According to the Renewable Rejection Database, which tracks denied solar and wind projects in the U.S., 144 projects were rejected in 2022 and 123 projects were rejected in 2023. This is a big jump from 58 rejections in 2021 and 33 rejections in 2020 (Bryce, 2024). There is a pressing need for clean energy, but if projects continue to receive pushback and fail to receive approval, then progress will never be made. This

paper focuses on what factors affect public support for renewable energy projects in Appalachia in order to determine how to successfully implement new technologies.

Current Renewable Energy in Appalachia and the Development Process

Even though coal is on the decline, Appalachia has remained crucial to coal production in the U.S. 27% of coal produced in the U.S. comes from Appalachia, and underground mines in the region make up 58% of total underground coal mine production (U.S. EIA, 2022-b). In 2020, the Virginia Clean Economy Act was passed which requires the state's two largest utilities, Dominion Energy and American Electric Power, to no longer use carbon-emitting electricity generation technologies by 2045 and 2050, respectively. This legislation will force Virginia to retire coal and natural gas and replace it with clean energy sources in the near future. In 2021, renewables provided 9% of Virginia's total electricity net generation. The state has 25 conventional hydroelectric power plants and 2 pumped-storage hydroelectric facilities, one of which is the Bath County Pumped Storage Station in Appalachia (U.S. EIA, 2022-a). At the end of 2021 there were 51 utility-scale solar facilities in Virginia, and only 1 was in Appalachia, see Figure 2 (Virginia Department of Energy & Virginia Solar Initiative, University of Virginia, 2022). There are currently no utility-scale wind farms in Virginia (U.S. EIA, 2022-a).

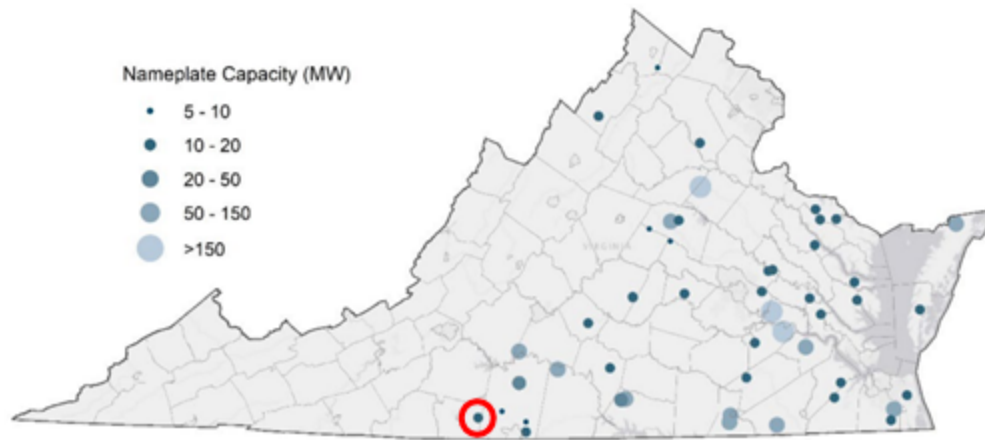


Figure 2. Utility-scale solar facilities in Virginia. The red circle highlights the one site in Appalachia in Henry County (Virginia Department of Energy & Virginia Solar Initiative, University of Virginia, 2022).

In Virginia, a state permit is required for any new renewable energy facility with a capacity greater than 5 MW, and the exact process depends on the size (Cherry, 2024). On the local scale, projects need a land-use permit based on zoning and planning ordinances of the given locality (Sud & Patnaik, 2022). Counties typically review special use permit (SUP) applications for projects through their board of supervisors and planning commission. Many counties have specific provisions in their zoning codes that address large-scale solar developments. Currently at least 10 counties have imposed acreage or density limits on the total amount of solar that is allowed to be built in the county. In some of these counties that cap has already been met or is quickly approaching, essentially setting a moratorium on solar development (Burden, 2023). Local opposition often results from concerns due to noise, appearance, and other localized impacts (Frolo, 2023).

Social Acceptance of Renewable Energy

Most people in the U.S. interact with energy every day whether they are conscious of it. For this reason, the social acceptance of renewable energy involves collective practice and participation with the technology, as this is not an individual issue. To achieve successful implementation and public support, areas around proposed technologies should be considered “communities of relevance” (Marres 2016), as the people living there have an interest in the issue at hand and should be involved in decision making (Batel, 2018). Citizens are not just a group being impacted by the system, they are part of the system. All people benefit from how renewable energy lessens climate change impacts. However, this is not directly felt by most citizens. A reduction in carbon emissions is far less personal than a solar field in your county. Other impacts from renewable energy are more felt by the community, such as how construction may disrupt land use and/or wildlife. Understanding how people living nearby will be affected by renewable energy facilities is a crucial implementation step to ensure that the community will support the project.

A previous analysis of interviews with various stakeholders in renewable energy projects such as developers, regulators, and engineers found that a main source of opposition to renewable energy comes from a fear of the unknown (Cass & Walker, 2009). Often people are unsure of how projects will be implemented and their effect, making them resistant. In order for the technology to be successfully implemented, this unfamiliarity must be overcome. A key component of this is local ownership. Renewable energy implemented by outside groups who do not understand the area’s culture and people will likely face more opposition than local initiatives (Flaccavento, 2010). When considering the small, rural communities that make up Appalachia, large outside corporations will likely face resistance (Buckley, 2022).

To examine the basis of public support and opposition, I will apply the Social Construction of Technology (SCOT) framework to analyze how characteristics of different social groups form their perception of renewable energy. A social constructivist view on technology is based on a multidirectional model that describes the developmental process of a technological artifact as alternating between variation and selection. Interpretive flexibility is also involved in this developmental process, which is a concept that the differing perspectives of a technological artifact held by social groups create distinct problems according to each group's priorities (Bijker & Pinch, 1987). In this way, technology will conform to social pressures in order to appease social groups' needs. These concepts are relevant when considering renewable energy. Proposed developments go through many phases of edits, largely dependent on feedback they receive from various stakeholders who all have different opinions and requests. Examining public support, or lack of it, of previous renewable energy projects will highlight how social groups in Appalachia feel about renewables, and how that impacts the development of these projects.

Research Question and Methods

My research will answer the question of how public support affects the development of renewable energy. I assessed prior solar and wind projects that were both approved and denied. To choose these projects, I researched renewable energy projects in Appalachia and consulted a 2021 report titled "Opposition To Renewable Energy Facilities In The United States from Columbia Law School". I first chose projects in the Appalachian region of Virginia, and then expanded to other states in Appalachia to fill any gaps. For those projects outside of Virginia, I selected counties with similar demographics to the Appalachian region of Virginia such as median income, percentage of population that is white, and percentage of population with a

bachelor's degree or higher (Pollard et al., 2023). I selected Leatherwood Solar in Henry County, VA (approved solar), Beech Ridge Wind Farm in Greenbrier County, WV (approved wind), Pulaski County solar farm in VA (denied solar), and Duke Energy Renewables wind farm in Mason County, KY (denied wind). Information on and the rationale behind the case studies chosen is shown in Table 1.

Table 1. Case studies chosen, their location, decision, and why they were chosen for this research.

Case Study	Location	Decision	Reason chosen
Leatherwood Solar	Henry County, VA	Approved	Only utility-scale solar facility in Appalachian Virginia (Virginia Department of Energy & Virginia Solar Initiative, University of Virginia, 2022)
Pulaski County Solar	Pulaski County, VA	Rejected	Recently denied in 2022 and is in Appalachian Virginia
Beech Ridge Wind Farm	Greenbrier County, WV	Approved	Similar demographics to Appalachian Virginia (U.S. Census Bureau, 2022-a)
Duke Energy Renewables Wind Farm	Mason County, KY	Rejected	Similar demographics to Appalachian Virginia (U.S. Census Bureau, 2022-b)

After choosing the projects, I researched the decision-making process to determine what factors lead to support or opposition of renewable energy development in Appalachia. I read local news coverage, statements from support and opposition groups, citizen letters to local governments, and comments from local governments. I identified key reasons for approval or denial from stakeholders in order to determine the social groups involved. I also found common

themes in order to understand what factors are most crucial to the success of renewable energy implementation from a social perspective.

Results

The following case studies illustrate a contrast between the desire to use renewables to address climate change versus pushback due to feelings of Appalachia's rural land being exploited.

Leatherwood Solar

Leatherwood Solar is a 20 MW-AC solar power plant in Henry County, VA (SolUnesco, 2023). It is located on about 200 acres of retired farm and industrial land and was developed by Energix Renewables (Energix, 2021). The land rights were first secured in 2016 (SolUnesco, 2023), and the solar farm has been operating since August 2021 (Vogelsong, 2021).

There was little information available about the approval process for this project. However, since Leatherwood began operating, Henry County has shown opposition to solar. On November 24, 2021 the Board of Zoning Appeals turned down requests from two solar companies to create solar farms. Supporters of the projects spoke at the board meeting, including those whose land was being leased for the projects. They highlighted the “financial freedom” this would provide their family and the opportunity to use their land for something positive (Hietala, 2021). Others shared concerns that solar farms would harm the land's value as an agricultural resource and affect viewsheds.

Lee Clark, the director of planning, zoning, and inspections recognized the benefits the solar farm would provide for property owners leasing their land, but also said he must consider

the “greater good of the county” (Hietala, 2021). He ultimately decided not to recommend approval of the zoning request due to “several concerns,” and the Board voted unanimously to deny the SUP (Hietala, 2021). Rejecting two more solar farms just months after Leatherwood began producing energy suggests an openness to solar in Henry, but a desire to keep it limited.

The Virginia Citizens for Responsible Community Development are a group supporting solar in Henry County. They promote “solar projects that enable rural towns and counties throughout Virginia to cultivate a robust tax base” in order to avoid residential and commercial development (Virginia Citizens for Responsible Community Development, n.d.). They view solar farms as positive economic development, and believe that when implemented correctly they bring in tax revenue while protecting the rural landscape from industrial development that would bring permanent, high-impact projects. Ultimately they want to “maintain the rural character of Virginia” and advocate for solar projects on land that is “already zoned for heavy-duty industrial or residential development” (*Virginia Citizens*, n.d.).

More recently, in July 2023 the Henry County Board of Supervisors approved a cap on solar panels in the county with a 5-1 vote. Virginia Citizens for Responsible Community Development publicly opposed the solar cap, arguing that this ordinance will limit the county from bringing in temporary, profitable development that will lead to job growth and clean power. The new ordinance limits the total acreage for solar farm development to 1% of the total land in the county. Henry County currently uses about 75% of the allotted land for solar panels (Romero, 2023).

Pulaski County Solar

On June 14, 2022 Helios Solar, LLC filed a SUP application for a 11.45 MW-AC solar project over approximately 142 acres in Pulaski County, VA. All of the land was on one privately-owned parcel that was zoned for agricultural use (Helios Solar, LLC, 2022).

Little evidence was found that many citizens of Pulaski were in support of the solar project, except for Lyom De Moraes, the owner of the land the solar farm would be constructed on. In a letter of support sent to the Planning Commission, De Moraes explained that when he bought the land in the 2010s, he planned to “eventually turn the property around for another beneficial use” during his retirement. He stated that Helios has given him the opportunity to continue farming his land and provide good to the community through clean energy. He argued that as a “strong believer in property rights” he wants to earn income from his land “while also contributing to the local economy and continuing to be a good, quiet neighbor,” and that he should be able to use his land as he wants as long as it does not harm his neighbors. Also, his land is “an ideal location for the project due to the natural screening and elevation that allows for a majority of this project to be tucked away and out of sight” (De Moraes, 2014).

Following concerns at the first Pulaski County Planning Commission meeting regarding the solar farm, Helios addressed issues by adding fencing and vegetation to buffer the project from view. Additionally, they edited the plan to position the solar panels away from two adjoining properties (Williams, 2022).

Ten citizens spoke at the Board of Supervisors meeting where the project was voted on, all against the project. One of the main concerns was that toxic heavy metals in the solar panels would leak out and “runoff into our underground water, streams, lakes, and environments as a

whole” (Turman & Turman, 2022). First Solar, the company that makes the panels, sent a letter to the Board of Supervisors addressing concerns, stating that “First Solar panels have been in the field for more than two decades” and “more than 50 researchers from leading U.S. and international institutions... have confirmed the environmental benefits and safety of CdTe PV technology over its entire life cycle” (Drozdiak, 2022).

Residents of Pulaski also had concerns about Energix, the developer and owner of Helios Solar. These mainly stemmed from one of their solar projects in Wytheville that led to a \$68,250 fine from the Virginia Department of Environmental Quality due to environmental violations at the site (PR Newswire, 2022). Energix also received a \$23,772.50 fine from the State Water Control Board due to sediment contamination and erosion of stormwater runoff infrastructure, among other environmental violations, at a solar project in Buckingham County (McIntyre, 2022). Furthermore, Energix was placed on the United Nations High Commissioner for Human Rights list of problematic companies because it “operates on Israeli occupied lands for commercial benefit” (PR Newswire, 2022). This distrust in Energix was prevalent throughout the debates for the Pulaski Solar Farm, with one resident stating that “this company and project was not a fit for the area” (Pulaski County Board of Supervisors, 2022). It is worth noting that this is the same company from the Leatherwood Solar case, however no controversy arose while researching that project.

There were also concerns about what would happen when it is time to decommission the project, and if the county would have to use tax revenue to “clean up the hazardous material left over” (Turman & Turman, 2022). Other complaints included the project being an eyesore and being able to see the solar panels in the fall and winter when the leaves are off the tree, the need

for county officials to pay close attention to the project during its construction (Williams, 2022), and whether or not this would actually be a reliable source of energy (Burchett, 2022).

Ultimately, on October 24, 2022 the six members of the Board of Supervisors voted to deny the SUP for Helios Solar, mainly due to the water contamination concerns and issues with other Helios solar projects. Before the vote, Supervisor Andy McCready affirmed his belief “in a person having the right to develop their property within reason” and that solar farms offer new opportunities to farmers. However, he stated this project seems to have “a continual drip of problems” (Williams, 2022). In the end, there was a lack of trust between the county and the developer. Pulaski Supervisors came to the conclusion that the environmental threats of erosion and contaminated runoff were too strong to approve the project.

Although this project was rejected, there is promise for renewable energy in Pulaski. In 2022, Pulaski was designated a “solar-ready community” by the SolSmart program, which is a “national recognition and technical assistance program” that was created by the U.S. DOE in 2016 to encourage solar deployment (Energy.gov, n.d.). In January 2023, Pulaski approved a SUP for a 300 MW solar farm developed by Hecate Energy (New Project Media, 2023). These recent developments for solar in Pulaski show that responsibility and trust in developing utility-scale renewable energy is crucial to success and community acceptance.

Beech Ridge Wind Farm

Beech Ridge Wind Farm is a 156.5 MW wind farm in Greenbrier County, WV (Carmen, 2021). It is on property leased from MeadWestvaco Corporation, a timber and paper mill company (Beasley, 2007). The wind farm was developed in two phases. Phase I, commissioned

in 2010, consists of 67 turbines (Alvey, 2013). In 2020, 20 more turbines were added under Phase II (Sessa, 2019). This research focused on the Phase I approval process.

A major supporter of Beech Ridge Wind Farm was the Canary Coalition, a grassroots clean air advocacy group. Formed by Avram Friedman, his viewpoint focused on the environmental impacts of introducing renewables to phase out coal. He argued that the “future of the Appalachians depends on reducing coal-fired energy.” He spoke out in support of Beech Ridge Wind Farm, asserting that a wind farm is a “wise use of resources” that “ultimately protects the ridgetops” from the negative impacts of coal-burning plants that are “far more destructive than anything associated with wind energy” (Beasley, 2007). To combat complaints of turbines being an eyesore, he emphasized that the landscape is already “marred by deadly smog and haze” (Beasley, 2007), and this visual complaint is meaningless compared to the damage of climate change. Also, the location chosen for Beech Ridge was not untouched forest, as MeadWestvaco has already mined and logged the land for years. Clear cuts were already being planned before the wind farm proposal, which is part of what drove Invenergy to choose this site (Beasley, 2007).

After Invenergy applied for the wind farm permit in 2005, Dave Burnham, a farm owner in Greenbrier, formed Mountain Communities for Responsible Energy (MCRE) to oppose the project. Burnham said that it is “ironic that those of us who simplified our lives” and live in rural areas “should have to endure industrialization by people hundreds of miles away” (Beasley, 2007). MCRE and Burnham argued that West Virginia is already exporting 70% of its coal, and the new energy produced by Beech Ridge Wind Farm would not lessen the remaining 30% used in West Virginia, but go to adjacent states with renewable energy requirements. Burnham also

thought that energy production should not be happening on a “huge industrial scale,” and instead we should put solar panels on roofs of buildings to power that same building (Beasley, 2007).

Another contentious energy production issue in Appalachia is mountaintop removal mining, where the top 1,000 feet of mountains is dynamited and removed to extract low-sulfur coal. Supporters of wind energy say that wind turbines on mountain ridges will stop mountaintop removal mining because new forms of energy will be created on the mountaintops. However, MCRE argues that mountaintop removal mining will still happen, destroying the environment while still adding wind turbines along the ridgelines. Despite the destruction to the mountaintops, some believe that “it still looks good down here in the valley” and wind turbines would be an eyesore impacting this view (Beasley, 2007). Burnham likened the issue of both mountaintop removal mining and wind farms as “indicative of the problem of huge powerful centralized corporations coming in like carpetbaggers” taking advantage of West Virginia’s resources to sell to neighboring states (Beasley, 2007).

During the public comment period for this project, the commission received 2,671 letters of opposition and 685 letters of support (Beasley, 2007). In 2006, the Public Service Commission granted a siting certificate for the 124 turbines of Beech Ridge Wind Farm. MCRE appealed the Commission’s decision, but it was denied as the Commission said no new evidence was presented (Alvey, 2009). After this, MCRE appealed to the West Virginia Supreme Court (Beasley, 2007). On June 23, 2008 the West Virginia Supreme Court filed their decision to support the Public Service Commission's decision to approve Beech Ridge Wind Farm. They agreed with the Commission's response to all of the concerns from opposition, as shown in Table 2 (Supreme Court of Appeals of West Virginia, 2008).

Table 2. Concerns from those opposed to Beech Ridge Wind Farm and how the West Virginia Public Service Commission responded in their approval of the project (Supreme Court of Appeals of West Virginia, 2008).

Concern from opposition	West Virginia Public Service Commission's response
Negative impact on tourism	No sufficient evidence presented to support this
Negative impact on property values	Verified study from Tucker County, WV with similar turbines showed that there was no effect on property values
Noise	Over 90% of turbines will be more than 1 mile from residences, and a noise study found that noise in the project area was already louder than estimated noise from the project
Viewshed	Visual impact is only for private residences
Harm to birds	The birds species who would be killed would not be endangered
Harm to bats	Beech Ridge has already been required to conduct studies and implement mitigation techniques once the project is operating to better understand this issue

The Supreme Court also stated that “many of the negatives associated with the project related to the private interests of local landowners rather than the interests of the public as a whole... [and] the rights of local landowners are not the primary consideration in the balancing of interests” (Supreme Court of Appeals of West Virginia, 2008).

Duke Energy Renewables Wind Farm

In 2014, Duke Energy Renewables and NextEra Energy Resources were in the process of designing wind farms in Mason County, KY. They both discontinued their proposals just a week apart from one another due to new, stricter regulations that would have prevented their projects

from being approved (WLWT5, 2014). The situation with these two companies was essentially the same, but this research focused on the Duke Energy Renewables project.

In September 2013, over 100 people attended a Fiscal Court meeting about the Duke project. A representative from Duke gave a presentation on the project and answered questions afterwards. The main questions were about when Duke started research, how long they have been in the area securing land leases, and when county officials were contacted about the project. Duke responded by sharing that they had signed land leases for 10,000 acres, collected wind data for a year, and filed an interconnection application. They were also conducting an environmental review and reviewing federal and state permitting requirements. The project would be between 26 to 100 turbines and construction was estimated to be from 2016 to 2019. Duke emphasized that they were “still in the very early stage” and there were more steps to take before beginning construction (The Ledger Independent, 2013).

However these efforts were stopped, as on May 8, 2014 a representative from Duke Energy sent a letter to Mason County Judge-Executive Gallenstein discontinuing their project. Howard states that they believe “the project’s likelihood of success is marginal” and the company will be exploring other areas (Toncray-a, 2014).

There is no evidence of any people or groups who strongly supported either wind project. However, there were many people in opposition. A group called Citizens Voice of Mason County was the driving force against the wind project (Toncray-a, 2014). Their mission is to promote “smart-growth, enduring economic development, government transparency, and sound infrastructure in Maysville-Mason County” (Citizens Voice of Mason County, Inc., 2021). When the Duke Energy wind farm was being proposed, their Facebook group with over 500 members was active (Citizens Voice of Mason County, n.d.). A post from one member urged people to

speak at local government meetings and included a long list of concerns that could be brought up, including decreased property values and fear of wind turbines taking over a large portion of the county (Citizens Voice of Mason County, 2014).

In June 2014, after both projects had been canceled, the Maysville-Mason County Joint Planning Commission (JPC) established guidelines for future wind projects to recommend to the Mason County Fiscal Court for approval. The commission first voted on an outright ban on large industrial wind farms in the county. This failed by a 4-3 vote because there was concern that an outright ban would send a message that Mason County is not open for “other, more appropriate industrial business” (Toncray-b, 2014). The JPC agreed to restrict large, industrial wind turbines to areas of the county zoned as rural industrial, eliminating the possibility of wind farms on agriculture zoned areas. They also mandated set back distances of one mile from property lines and restricted sound levels to thirty decibels or less, even though the average noise pollution from city car traffic is seventy decibels (WINDEXchange, 2014). In September 2014, the Fiscal Court approved this ordinance, essentially banning large-scale industrial wind turbines everywhere except areas designated industrial zones (Toncray, 2014-c). Mid to small scale turbines are still allowed, as long as the energy is used at the principal site and not sent across transmission lines.

Cross Case Analysis

The research identified four main social groups: citizens against the renewable energy project, citizens in support of the renewable energy project, local government, and developers. SCOT analysis shows that each of these social groups has their own problems and ideas for solutions concerning renewable energy in Appalachia, see Figure 3.

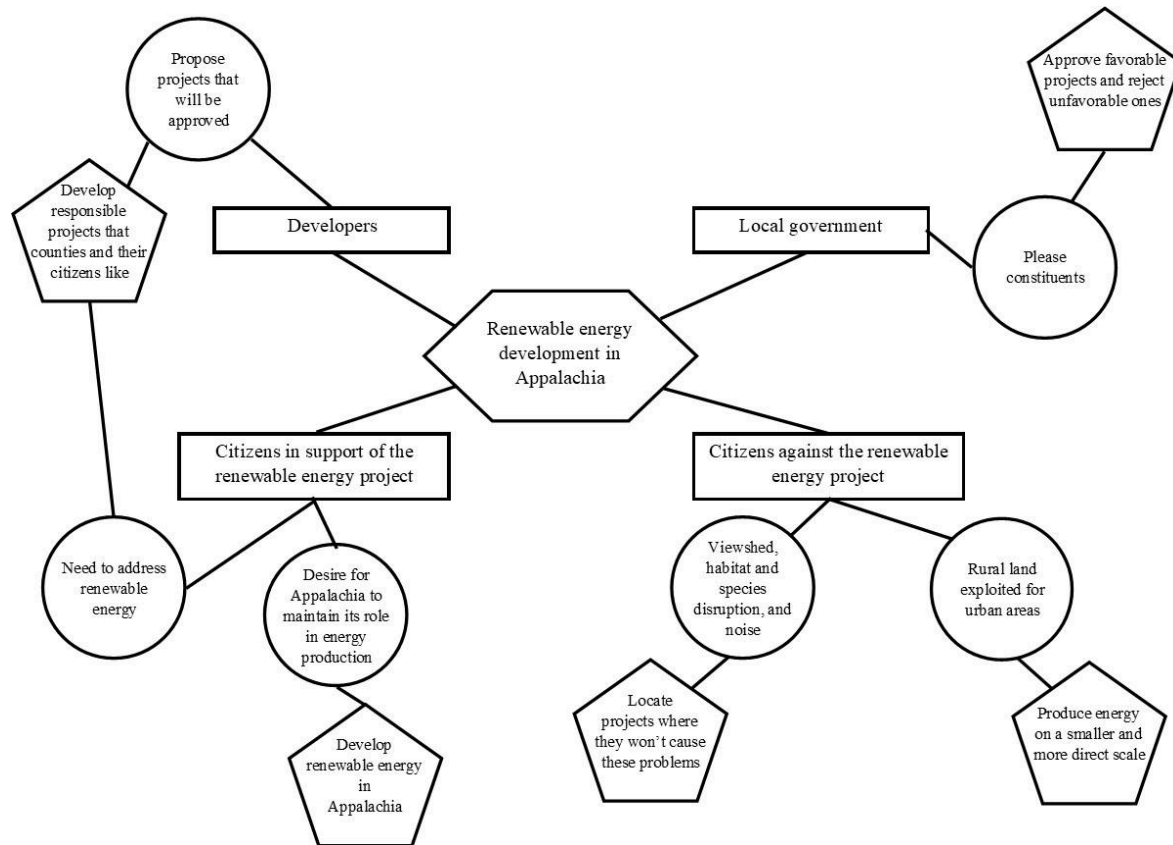


Figure 3. Spoke-and-wheel diagram showing the relationship between the technical artifact (hexagon), relevant social groups (rectangles), their perceived problems with the artifact (circles), and possible solutions (pentagons).

Citizens against renewable energy projects had common concerns like viewshed, habitat disruption, and noise, which were not unique to these developments. On top of these, the chosen case studies in Appalachia revealed region-specific issues. There were recurring feelings from Appalachians of their rural land being exploited and distaste for developers from bigger cities. For example, in Mason County much of the disapproval of the wind farm resulted from the citizens learning about the project after the developers had been researching the area and securing land for over a year. This lack of transparency frustrated citizens, and shows how important community involvement and ownership is. Many citizens also felt like they were having to solve a problem that they did not primarily cause, as on average they are living less energy intensive

lives than those living in more urban areas. The Clean Economy Act, which mandates Virginia's shift to carbon-free energy, passed with mostly Democratic support from metropolitan areas. These urban areas consume more power and also produce less of it, leading to an imbalance many rural Virginians are growing tired of (Yancey, 2023). This viewpoint was clearly seen through the Henry County solar cap and MCRE's opposition to Beech Ridge. Although some prior research suggested that many people in Appalachia are still loyal to the coal industry, those feelings were not found through these chosen case studies (Buckley, 2022).

Citizens for renewable energy developments were often primarily concerned with climate change and felt passionately about the need to address greenhouse gas emissions from current energy generation technologies. Some Appalachians saw renewable energy as a way to preserve their rural land from more intense development or other harmful uses, as seen through support for solar in Henry and for Beech Ridge Wind Farm. The research also showed that this social group supported land ownership rights and believed landowners should have the freedom to lease their land to developments, provided it does not harm the community, as seen in Pulaski County. It was also found that many people support Appalachia's role as an energy producer, and want to maintain this function by switching to renewables. In 2021, State Delegate Terry Kilgore from Scott County reaffirmed that southwest Virginia still "want[s] to be the energy resource for the commonwealth" (Scarborough, 2021).

Local governments hold power as the final decision makers and face pressure from constituents as elected officials. These cases revealed that local governments usually voted for what they felt was best for the citizens and the county's vision. This was a judgment call, and one that usually reflected comments from citizens and whether or not they thought private concerns outweighed the impact on the county. This was seen through both support and opposition to

renewable energy. The West Virginia Public Service Commission's decided to prioritize the good of the county over a few landowners and approve Beech Ridge, whereas Mason County's decided to enact strict regulations against wind energy reflecting complaints from citizens.

As the social group who design and propose renewable energy projects, developers also wield power. Their primary concerns were for their project to be approved, as ultimately they are a business that needs successful deals. They also felt pressure from the county and its citizens, and often changed details of the projects to address questions and concerns that they received. Developers for Beech Ridge Wind Farm and the Pulaski County solar farm addressed concerns by relocating the turbines/panels away from other properties to address concerns. Developers want their projects to be approved and therefore will change them based on feedback, illustrating the SCOT multidirectional model.

Interpretative flexibility can be seen through each group's perspectives and priorities affecting the design and approval of renewable projects. All of the examined renewable energy developments, whether accepted or denied, went through multiple phases of design edits, with the changes made reflecting the concerns and desires of the social groups involved. This research is a prime example of how technology conforms to social pressures in order to appease social groups' needs.

Discussion

SCOT provided a framework to use social groups to analyze differing viewpoints. For these case studies the groups were not rigid, as some people could move between the support and opposition groups depending on the details of the project. Those who opposed specific developments were not necessarily against all renewable energy. They were averse to the given

project for reasons that had to do with the specific developer or proposal. In the same way that feedback from social groups leads to changes in the development process, adjustments to a project can affect a person's opinion. SCOT analysis revealed how renewable energy development is a dynamic process, with both development plans and people's views changing as a result of one another.

A limitation of this research is the shrinkage of local journalism making it difficult to find news from small areas. Many local newspapers have scaled back, leading to a lot of news in rural communities going unreported, specifically the actions of their Board of Supervisors (Yancey, 2024). These votes are typically not reported on by larger news outlets, such as on the state level. This posed a challenge for me to find information on the proposal and voting processes for my chosen renewable energy projects. Many times it would be reported that a renewable energy project was completed and supplying energy, or that a proposal had been denied, but there was little coverage on the intermediate steps to get to that point.

In the future, I would add interviews with members of the local government boards who voted to approve or reject the project. Through local news and letters from citizens I was able to understand the reasons the people of the chosen counties were for or against the renewable energy projects in their county, but it was difficult to find any specific quotes or reasons from the people who voted on the fate of the projects. Talking to supervisors and commissioners would fill in some of the gaps to learn the rationale behind their decisions.

As I move forward to working on the engineering side of renewable energy, this research has revealed the necessity of considering the social implications of the development process. My research showed that some opposition came from people not knowing how renewable energy in their county would affect them, leading them to resist the project. This has led me to consider

how we can calm these fears of the unknown and educate people. Also, technology is not the only roadblock to addressing climate change and improving our current energy infrastructure. Local involvement is crucial, and people in rural areas do not want to feel like they are being exploited to take on the burden of renewable energy. They need to be included in the conversation, and in order for projects to be approved they need to be designed in a way that is not only acceptable, but beneficial for the locality.

Conclusion

This research shows what factors affect public support of renewable energy in Appalachia. To continue with this research, I would suggest following projects from the development stage to its eventual approval or rejection. Documenting the process firsthand would provide a better understanding of stakeholders' viewpoints and enable a clearer understanding of what leads to renewable energy project approval. The case studies showed that in Appalachia community involvement, transparency, and adaptability from developers are crucial to gaining support from the locality. It is also important to evenly distribute renewable developments so one county does not have multiple wind and/or solar farms. We must look at clean energy as an issue that can only be tackled if multiple areas and groups take on a piece of the work. In order to address climate change, more than a select group of people will need to act.

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