Solar Climate Justice Scorecard

Woodridge Solar Project Analysis

COMMUNITY CLIMATE COLLABORATIVE

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Executive Summary

The Community Climate Collaborative (C3) used its Solar Climate Justice Scorecard[i] to assess a proposed solar development in Albemarle County, Virginia. C3's Solar Climate Justice Scorecard allows advocates, decision-makers, and developers to find where solar projects can better support a just clean energy transition by assessing their contribution to distributional justice, restorative justice, and other socioeconomic and environmental factors. After careful consideration of the justice, climate, environmental, and economic impacts of the project, we at C3 have recommended that the Albemarle County Board of Supervisors vote to grant the project a special use permit. The developer's score –which considers only developer-controlled factors– was 30.75 out of 35 (or 88%), and the total project score–which considers all factors–was 37.75 out of 50 (or 76%).

i C3 has released the beta version of the Solar Climate Justice Scorecard. We encourage interested parties to reach out with comments and suggestions at policy@theclimatecollaborative.org so we can continue to improve this open-source and community-built tool.

Authors and Acknowledgements

This report was written by:

Katie Ebinger
C3 Climate Policy Analyst

Caetano de Campos Lopes
C3 Climate Policy Director

From our team, we want to thank Susan Kruse, C3's Executive Director, for her additions; Ellie Cowan, C3's climate policy intern, for her contributing research; Coles Jennings, C3's Director of Corporate Sustainability, for his assistance in connecting us with local solar experts; and Teri Strother, C3's Director of Communications, for her design and labeling recommendations.

We also want to thank our local partners, including Matthew Gillikin and the team at Livable Cville, as well as Sara Boyer who generously donated her time to design this report. Her assistance was possible through the generous donation of the Charlottesville Area Community Foundation, which provides C3 with access to the Catchafire platform. We also want to recognize the time and knowledge that various solar industry experts provided. External review by community experts does not imply affiliation or endorsement.

Land Acknowledgement

This proposed project sits on land that was taken from its original inhabitants, the Monacan and Manahoac,[1] who called this place home for at least 10,000 years.[2] As we discuss how to permit this site for future use, it is important to recognize that any use comes as a result of colonialization, forced removals, and the genocide of Native Americans. Giving this land acknowledgment feels inconsequential in comparison to the long history of atrocities, but it is an important step. Using this land to correct the disproportionate burdens of energy generation is one small step in decolonizing the energy system.

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Introduction

To address the climate crisis, it is crucial that we replace fossil fuel-powered energy with renewable sources. Albemarle County, Virginia, has the opportunity to make an unprecedented contribution to reducing greenhouse gas (GHG) emissions by approving a proposed solar farm outside of Woodridge, Virginia. This report uses C3's Solar Climate Justice Scorecard, referred to interchangeably as "the tool," to assess the extent to which the proposed Hexagon Energy's Woodridge Solar Project aligns with best practices in (i) procedural justice, (i) distributional justice, (ii) restorative justice, and (iv) other socio-economic and environmental factors.

Albemarle County, Virginia, has the opportunity to make an unprecedented contribution to reducing greenhouse gas emissions (GHG) by approving a proposed solar project outside of Woodridge, Virginia.

Background Information and Definitions

Hexagon Energy, a clean energy developer based in Charlottesville, Virginia, is proposing a utility-scale solar farm outside of Woodridge in Albemarle County, Virginia (Figure 1). The site is located near Woodridge Market at the intersection of Rolling Rd and Secretarys Rd. The plan proposes a phased construction project to add solar panels to 650 acres of the 1500-acre site. Currently, the site is a timber plantation of Loblolly Pine. In Albemarle County, proposed solar projects in designated rural areas must request a special-use permit that needs to be approved by the County's Planning Commission and the County Board of Supervisors. As of this report's release date in February 2023, the development proposal has been approved by the County's Planning Commission, and it is expected that the Board of Supervisors will vote on the development plan in early 2023.

Throughout this analysis, the Woodridge site and the accompanying proposal created by Hexagon for the County of Albemarle are referred to as the" Woodridge Solar project/site," "Woodridge project/site," or the "Hexagon project." It should be noted that Hexagon Energy has several solar projects throughout the country, but this analysis solely focuses on the project in Albemarle County, Virginia.

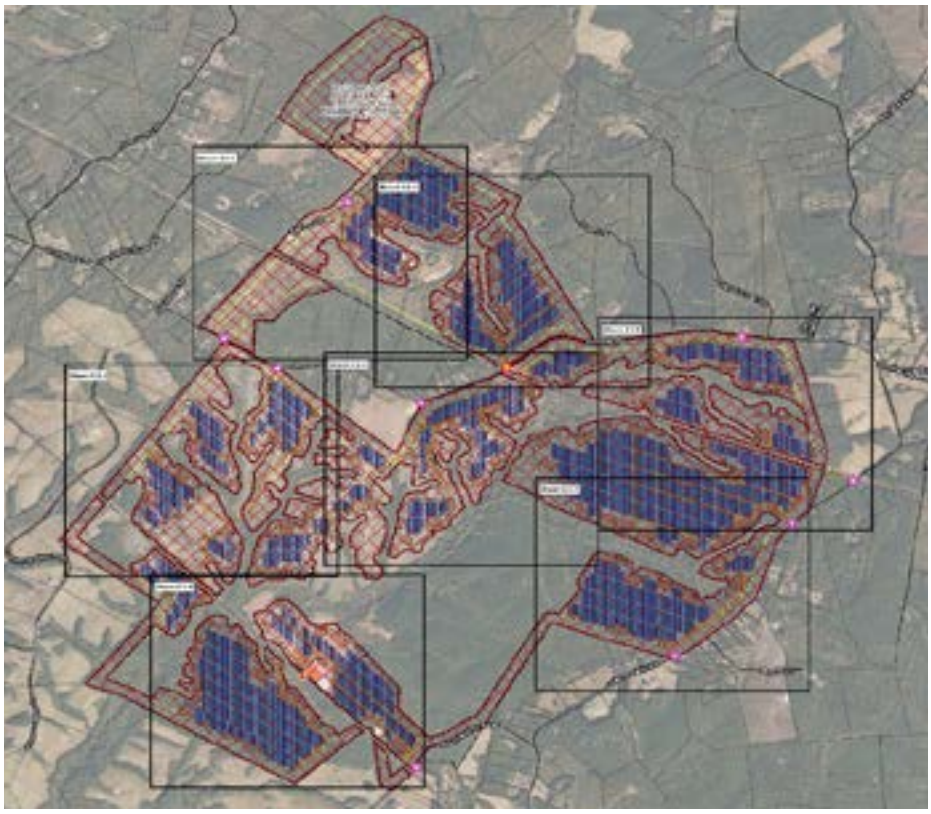


Figure 1. Map of the proposed solar site bound in red from the Woodridge Solar Special Permit.[3] The blue-shaded regions represent the sites of the proposed panels.

How Do We Use the Tool?

The Solar Climate Justice Scorecard asks a series of scoring questions to understand how well a project as a whole aligns with the principles of climate justice and other environmental values.

The scoring questions are first divided into three categories:

1. Questions that are under the control of the developer and are applicable to both on-site and off-site projects;
2. Questions that are under the control of the developer but depend on whether the project is on-site or off-site;
3. Questions whose scoring is external to the developer's decision.

The developer score for the Woodridge site is 30.75 out of 35 (88%), and the total score for Woodridge is 37.75 out of 50 (76%). The goal of our scorecard is to allow users to understand how different projects compare to each other and identify the key strengths and weaknesses of individual projects, shedding light on unidentified opportunities that may improve their overall benefits.[ii] A low score on this assessment does not necessarily indicate that a project should not be supported.

ii Overtime as more projects are analyzed and more feedback is received, C3 hopes to create a more clear rule for qualitatively assessing projects.

Summary Tables of Overall Project Score

Developer's Score -- General

Topic	Potential Score	Actual Score
Procedural Justice	5	3.75
Distributional Justice	5	5
Restorative Justice	5	4
Other Socio-Economic and Environmental Factors	10	8
Subtotal	**25**	**20.75**

Developer's Score -- Type Specific

Off-Site Project

Topic	Potential Score	Actual Score
Other Socio-economic and Environmental Factors	10	10
Subtotal	**10**	**10**

External Score

Topic	Potential Score	Actual Score
Procedural Justice	3	0
Restorative Justice	3	0
Other Socio-Economic & Environmental Factors	9	7
Subtotal	**15**	**7**
Total	**50**	**37.75**

What Are The Limitations Of This Tool?

The environmental impacts of a solar project can be divided into the construction, operation, and decommissioning phases.[4] There are aspects of the construction and decommissioning phases that fall beyond the scope of this tool. For instance, in the case of construction, there is a concern that grading sites can degrade high-quality soils and could therefore be counterproductive from an environmental perspective. C3 recognizes the importance and complementarity of such environmental impact studies and recommends assessing them in conjunction with the results of this scorecard.

Potential Score

25

Actual Score

20.75

The Scorecard

Developer's Score - General

A solar project siting and development decisions have the potential to advance climate justice through their impacts on Procedural Justice, Distributional Justice, Restorative Justice, and Other Socio-Economic and Environmental Factors. In this section, we assess the project's performance in each of these areas with a focus on decisions that are under the developer's control and that are applicable to all types of non-residential solar projects.

Procedural Justice

Procedural justice considers how well the impacted group was engaged in planning and decision-making. Empowering community members to decide how their resources are used is crucial in the energy transition.

Procedural Justice Scorecard (5 points)

ID	Question	Scores		
PJ1	**How successful was the community engagement process?**	**Points** (0 = No 1 = Yes)	**Score Multiplier**	**Score** (Multiplier x Points)
PJ1.1	Were there multiple meetings/forms of engagement?	1	1.25	**1.25**
PJ1.2	Were materials available in multiple and appropriate languages?	0	1.25	**0**
PJ1.3	Were meetings held at various times and/or in different media to accommodate different work schedules/accessibilities?	1	1.25	**1.25**
PJ1.4	Were changes sourced from the community implemented in the final project?	1	1.25	**1.25**
	Subtotal (0-5)			**3.75**

Procedural Justice Analysis

The project scored highly in the procedural justice section. Community members were effectively engaged in the area surrounding the site. While this community engagement exceeded the County requirements and influenced the project's design, it's likely that some groups and community members faced barriers to engagement. For instance, all outreach was conducted in English. Considering only the language spoken by surrounding farmers could potentially exclude other stakeholders from participating in the process. All potential stakeholders, including those that do not speak English or that do not live in the immediate surroundings of the property, ought to be well-informed in a culturally appropriate manner to be given the opportunity to self-select into the engagement.

Distributional Justice [5] [6] [7]

Distributional justice considers how the harms and benefits of this project are felt throughout the community to ensure that no group is overburdened with the negative impacts. The negative local distributive justice impacts of a project might include noise, traffic, and air and water pollution from construction. Positive impacts include climate change mitigation, the generation of increased tax revenue, the potential closure of existing fossil fuel power plants, and workforce opportunities. Several of these benefits are also discussed in other sections of this analysis. To the extent that any harm or benefit can be distributed unevenly across a community, it was included in this section.

Distributional Justice Scorecard (5 points)

ID	Question	Scores		
DJ1	**Are the impacts of the project equitably distributed across the community?**	**Points** (0 = No 1 = Yes)	**Score Multiplier**	**Score** (Multiplier x Points)
DJ1.1	Does the project aims to prioritize local and/or displaced workforce?	1	1	**1**
DJ1.2	Does the project benefit the local community through improved economic and/or environmental conditions?	1	1	**1**
DJ1.3	Does the project benefit traditional EJCOC[iii] through improved environmental conditions?	1	1	**1**
DJ2.1	Are the negative impacts of the project expected to be distributed in a way that no one group is disproportionally exposed to them?	1	1	**1**
DJ2.2	Are there substantial attempts made to mitigate the local negative impacts in all phases of the project?	1	1	1
	Subtotal (0-5)			**5**

Distributional Justice Analysis

Hexagon is attempting to distribute the benefits and harms of the Woodridge project in a manner that does not perpetuate existing harms. According to Hexagon's Director of Development, the Company has already begun conversations with local employers. However, given that there is no formal commitment, it will be important for the public to hold Hexagon accountable for hiring locally. There was no mention of hiring displaced workers from the retired coal-gas plant or the timber site. The permit application and other Hexagon literature also did not mention workforce training for construction or operation.

In siting solar PV projects, especially greenfield projects, there is a concern that historic inequalities are being repeated. The concern

iii Environmental Justice Communities of Concern (EJCOC).

is that rural and often lower-income communities will be forced to bear the burdens of energy generation while providing energy to urban centers. For the Woodridge Solar project, we assess that this is not the case. Conversely, the project is expected to increase the overall environmental condition of the land compared to the existing land-use type. While the end result of this project will provide environmental benefits, there will likely be some disturbance during the construction of the project. Such disturbances might range from construction noise/dust to land degradation from grading. Hexagon plans to mitigate these by maintaining a wide forest buffer between the panel sites, roads, and creeks.

Restorative Justice

Some of the ways that the traditional fossil fuel-powered electricity system has degraded human health and well-being include: polluting the environment, inducing climate change, and contributing to financial energy burdens. Renewable projects have the potential to correct those historic harms by redistributing benefits to those who have been disadvantaged and closing fossil fuel-powered power plants, which have historically been located in lower-income communities and communities of color.

The benefits of renewable energy projects can be redistributed to communities historically harmed by the fossil-fuel industry in the form of monetary benefits, increased job opportunities, and improved environmental/health conditions. This restorative justice focuses on the potential monetary and environmental improvements to the local community.

Restorative Justice Scorecard (5 points)

ID	Question	Scores		
RJ1	**Financial compensation for families historically impacted by bad air quality and/or high energy burdens?**	**Points** (0 = No 1 = Yes)	**Score Multiplier**	**Score** (Multiplier x Score)
RJ1.1	Does the project create low- or no-cost job re-training for renewable energy jobs?	0	1	**0**
RJ1.2	Does the project have the potential to close existing fossil fuel-powered power plants?	1	2	**2**
RJ1.3	Does the project site remedy historic environmental injustices?	1	2	**2**
	Subtotal (0-5)			**4**

Restorative Justice Analysis

The expected benefits from the Woodridge site–compared to the historical negative impacts from the timber farm–resulted in a high score in restorative justice. While the developer scored well on restorative justice, there remain actions Hexagon can take to improve their score. There has been no commitment to include job retraining in this development plan, but according to Hexagon staff, the Woodridge site is a great candidate for a low- to no-cost job training program that was created in partnership between SHINE and PVCC. Local advocacy efforts can push to create a job re-training program for displaced and other historically disadvantaged workers.

Other Socio-Economic and Environmental Factors

The other socio-economic and environmental factors considered in this report relate to the land-use change of the site –how the use of solar compares to the previous/alternative use– as well as the employment and environmental equity potential of a project.

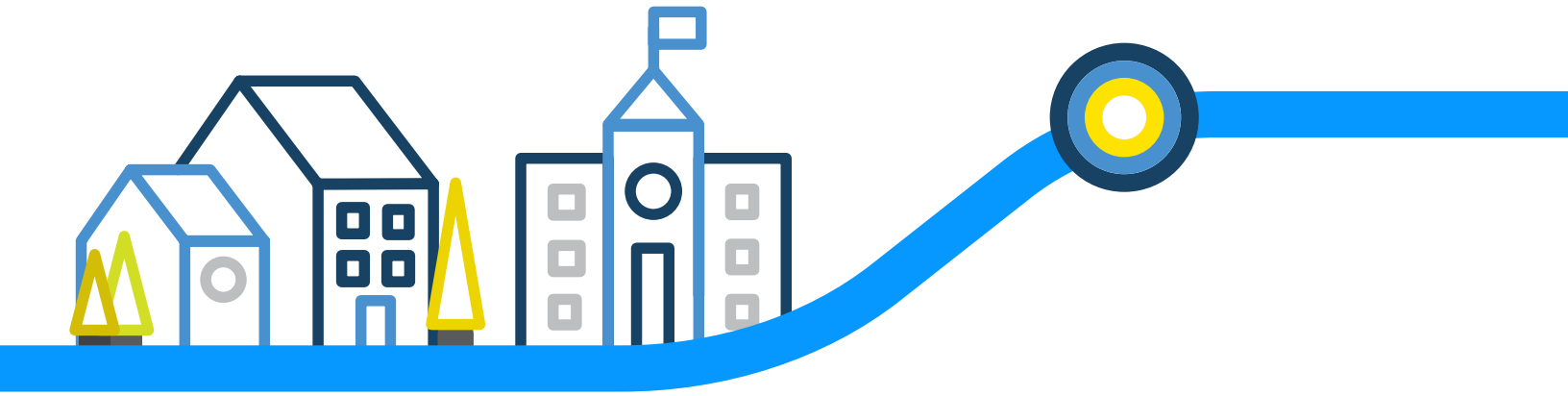
Other Socio-Economic and Environmental Factors Scorecard (10 points)

Human and Environmental Health Questions				
ID	**Question**	**Scores**		
SE1	**Environmental impact mitigation**	**Points** (0 = No 1 = Yes)	**Score Multiplier**	**Score** (Multiplier x Score)
SE1.1	Is the project in a site that is already well-served by transmission lines, substations, roads, etc. so that major infrastructure investments can be prevented or mitigated?	1	2	**2**
SE1.2	Does the project present strong strategies to mitigate/prevent major soil, vegetation, and wildlife disturbances?	1	2	**2**
Economic Questions				
SE2	**Overall economic stimulus to the surrounding community**	**Points** (0 = No 1 = Yes)	**Score Multiplier**	**Score** (Multiplier x Score)
SE2.1	Will the project create temporary jobs?	1	2	**2**
SE2.2	Will the project create permanent jobs?	1	2	**2**
SE2.3	Will the project reduce local energy burden?	0	2	**0**
	Subtotal (0-10)			**8**

Other Socio-Economic and Environmental Factors Analysis

Overall, the Woodridge project is expected to improve the economic and environmental condition of the locality where it is sited. Environmentally, the developer commissioned an extensive vegetation management plan to address ecological concerns and they plan to mitigate environmental damage where possible. Economically, the project is expected to yield more jobs and economic output than the business-as-usual scenario (see methods section).

While these economic benefits are important, the project is not expected to reduce energy burdens. When the electricity flows back to the grid, any price reduction is diluted across the entire grid and therefore not meaningful to individuals. It's possible for advocates to push for the development of battery storage associated with the site in order to build resiliency into the project.



Potential Score

10

Actual Score

10

Developer's Score - Type Specific

Off-Site Considerations

In this section, we assess other socio-economic and environmental factors within the developer's control that relate only to off-site solar projects. Off-site projects, like Woodridge, are projects where the energy generated is sent to the grid, rather than used on-site.

The Woodridge project scored the maximum points for mitigating negative environmental impacts and for mitigating climate change. The project was able to score so highly, in part due to the historic land-use degradation of the existing timber farm on the property.

Off-Site Scorecard (10 points)

ID	Question	Scores		
	Binary Questions	**Points** (0 = No 1 = Yes)	**Score Multiplier**	**Score** Multiplier x Score)
OF1.1	Will biodiversity be overall improved?	1	1.25	**1.25**
OF1.2	Will soil quality be overall improved?	1	1.25	**1.25**
OF1.3	Will water quality be overall improved?	1	1.25	**1.25**
OF1.4	Has the project been designed in a way to prevent potential negative impacts from the heat generated by the solar panels?	1	1.25	**1.25**
	Range Question	**Points** (0—5)	**Score Multiplier**	**Score** Multiplier x Score)
OF2.1	Will the solar project contribute to substantial climate change mitigation?	5	1	**5**
	Subtotal (0-10)			**10**

On-Site Considerations Analysis

The Woodridge project scored the maximum points for mitigating negative environmental impacts and for mitigating climate change. The project was able to score so highly, in part due to the historic land-use degradation of the existing timber farm on the property.

Given that the land's prior use was a monoculture timber farm, it had relatively low biodiversity compared to a naturally occurring forest in the region. Therefore, the proposed solar farm is expected to contribute to increasing the site's biodiversity. The Vegetation Management Plan plans for native plantings between solar panel rows as well as the introduction of locally native pollinators.

The lease for the solar project is for 35 years. It is uncertain whether the land will continue to be operated as a solar facility, returned to timber production, or converted to another use. The current plan for decommissioning involves removing all materials and roads from the site and adding topsoil to disturbed areas.[8] All vegetative buffers will remain in place.

Adding solar to the Woodridge site will result in considerable prevention of GHG emissions. According to C3's analysis, the proposed solar farm will generate nearly 400 GWh/year, which is enough to power roughly 30,000 homes, based on the average rate of energy consumption in Virginia (see Annex). In the first year of operations alone, the net GHG mitigation from the Woodridge site is ~82,000 U.S. tons (after discounting for the project's "embodied carbon" emissions and additional emission considerations, see the Methods section). The cumulated avoided emissions would continue to grow with each year of operation throughout the lifespan of the project. Conversely, the "embodied carbon" emissions and additional emission considerations shall not be accounted for again).

Potential Score

15

Actual Score

7

External Factors

The questions in this category address the aspects of solar projects that fall outside of the developer's control. For instance, the state, City, or County where a solar development is located can play a big role in how well a project is able to meet the best climate action practices. The external factor questions in this scorecard address three topics: Procedural Justice, Restorative Justice, and Other Socio-Economic and Environmental Factors.

External Factors Scorecard (15 points)

ID	Question	Scores		
	Binary Questions	**Points** (0 = No 1 = Yes)	**Score Multiplier**	**Score** Multiplier x Score)
EF1.1	Were attendants compensated? (monetarily and/or with food/childcare)	0	3	**0**
EF1.2	Will generated tax revenue be allocated toward advancing climate and environmental justice?	0	3	**0**
EF1.3	Will the avoided greenhouse gasses (GHG) emissions directly contribute to local climate change mitigation goals?	0	2	**0**
EF1.4	Will the decision of approval or rejection of this project set an important precedent that could significantly influence future solar projects?	1	3	**3**
	Range Question	**Points** (0—2)	**Score Multiplier**	**Score** Multiplier x Score)
EF2.1	Will the use of solar on the landscape decrease local tax revenue (0), cause no change (1), or increase tax revenue (2)?	2	2	**4**
	Subtotal (0-15)			**7**

External Factor Analysis

Several factors, outside of the developer's control, brought down the overall project score in this section. The scorecard pinpointed that Albemarle County, as the "hosting municipality" of this project, has an opportunity to increase equity in the stakeholders' participation and in the allocation of the project's tax revenue processes.

The Woodridge Solar project is expected to generate considerably more tax revenue than the existing land-use type (see Economic Benefits section). With this increase in tax revenue comes the opportunity to advance restorative justice by using the tax revenue on projects that particularly benefit historically energy-burdened or environmental justice communities of concern. The tax rate and structure of the Hexagon site are not finalized, which might provide the opportunity to build additional restitution into the project.

Even though the electrons from this solar PV project will flow into the same grid that Albemarle County residences and businesses draw from, there is no guarantee that the project's carbon credits will be awarded to offset local GHG emissions, Therefore, the project does not necessarily contribute to the County's climate change mitigation goals (at least not in an expressive way).[iv 9]

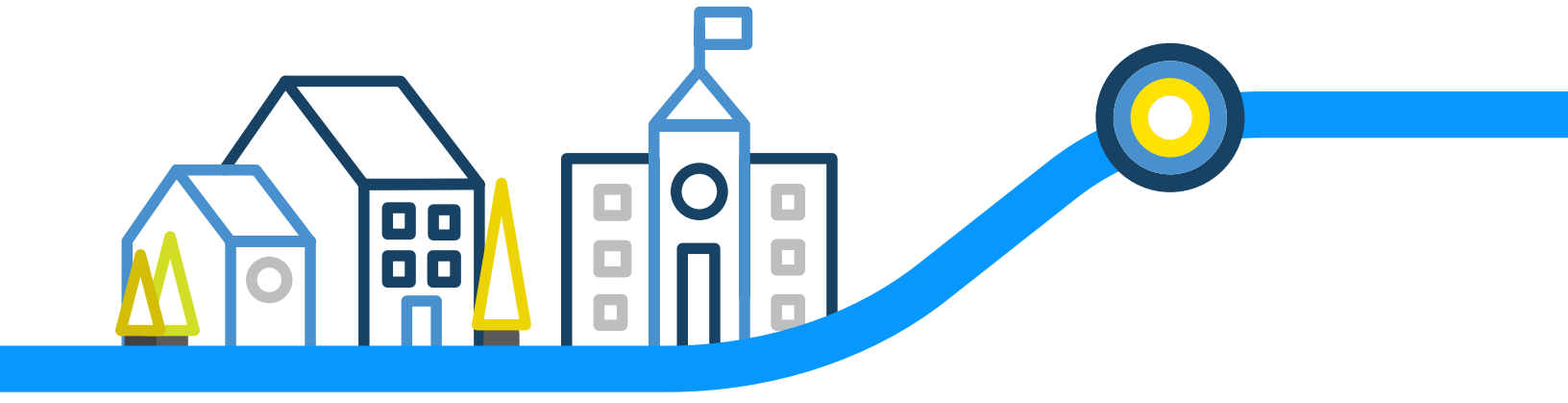
iv From a power grid perspective, C3's own calculations (using information from the PJM Regional Transmission Expansion Plan) estimate that the project has the potential to decrease the carbon intensity of the PJM grid by 0.05%. Therefore, if not used for directly offsetting local GHG emissions, the project would contribute to indirectly reduce up to 0.05% of the County's GHG emissions from electricity consumption (depending on how the PJM grid's GHG emission factor evolves).

Conclusion and Recommendations

According to C3's analysis, the developer of the proposed solar site at Woodridge scored 30.75 out of 35 (88%) and the project overall scored 37.75 out of 50 (76%) in the Solar Climate Justice Scorecard. The project performed particularly highly on topics related to climate change mitigation, increased employment, and prevention of local environmental damage (with the potential to actually increase local environmental quality). Many of the environmental benefits of the project were partly influenced by the strong community engagement conducted by the project's team. With that said, community engagement could have been improved to ease/enhance access to targeted groups who have historically been locked out of environmental decision-making and benefits.

Overall, C3 strongly supports this proposed project, particularly given the strong developer's performance (88%). We applaud Albemarle County's Planning Commission's decision to recommend that the County's Board of Supervisors vote to approve the special use permit presented by Hexagon. We recommend that the Board of Supervisors approves the project and that continued community engagement and resilience planning are both incorporated into the final construction of the project. Future advocacy can push for the following recommendations:

- Hexagon should consider including multiple languages in upcoming/new community engagement materials.
- Hexagon should continue to prioritize equity in the job training and hiring process.
- Hexagon should develop battery storage or other mechanisms for power resilience at the site.
- Albemarle County should increase the ease of participating in the public process through actions such as providing child care and meals at meetings and public hearings.
- Albemarle County should include more provisions to fund energy efficiency programs in lower-income households and other energy justice projects with direct, or indirect, funding from solar developments such as the Woodridge project.



Methodology (Annex)

The methodology portion of this document explains how C3 determined the scores for the Woodridge proposal. When applicable, the document will walk through the calculations or scoring of specific questions. For a comprehensive explanation of the Solar Climate Justice Scorecard methodology and criteria, please refer to the Solar Climate Justice Scorecard: Methodology Guide, which can be found here.

Developer's Score - General

Procedural Justice

The County of Albemarle requires that utility-scale solar PV projects in rural areas be approved through a special-use permit, which is subject to a public hearing process. The first public hearing for the Woodridge Project took place on December 13, 2022, where the Planning Commission unanimously recommended that the Board of Supervisors approve the permit application.[10] The Board of Supervisors is expected to vote on the development permit application sometime in early 2023.

In addition to the required public meetings, the Hexagon team engaged in multiple forms of community engagement, including door-knocking (...).

In addition to required public meetings, the Hexagon team engaged in multiple forms of community engagement, including door-knocking, multiple community meetings–both in-person and virtually–and site tours with local organizations and community members. In total, Hexagon estimates they engaged with more than 10 local organizations/entities and between 30 and 40 individuals.[11] These community members requested that the solar panels be removed from Eyeland Drive and that the project be certified through the Virginia Pollinator-Smart Program. Both community directives will be followed. Additionally, the project is working hard to allow members of the community, namely the Hunt Club, to maintain access to the property for recreation and food cultivation.

In the case of the Woodridge solar development, our view is that potential stakeholders include, at a minimum, all the members of Albemarle County and the surrounding communities. For Albemarle, roughly 12% of its population speaks a language other than English at home,[12] which translates to over 13,000 people. Therefore, considering only the language spoken by the project's surrounding farmers and neighbors could exclude other potential stakeholders from participating in the process. Ideally, all potential stakeholders ought to be well-informed in a culturally appropriate manner to be given the opportunity to self-select into the engagement.

Distributive Justice

Hexagon is attempting to distribute the benefits and harms of the Woodridge project in a manner that does not perpetuate existing harms, and the project scored full points in Distributive Justice.

In siting solar PV projects, especially greenfield projects, there is a concern that historic inequalities are being repeated. The concern is often based on the assumption that rural and often lower-income communities will be forced to bear the burdens of energy generation that would be mostly consumed by urban centers. For the Woodridge Solar project, we assess that this is not the case. Conversely, the project is expected to increase the overall environmental condition of the land compared to the existing land-use type.

While the end result of this project will provide environmental benefits, we acknowledge there will likely be some disturbance during the initial phases (e.g., construction) of the project. Such disturbances might range from construction noise/dust to land degradation from grading. Hexagon plans to mitigate these by maintaining a wide forest buffer between the panel sites, roads, and creeks.[13]

Restorative Justice

Renewable energy projects have the potential to correct historic harms in two major ways: (1) by redistributing the benefits of new projects along more equitable lines, and (2) by closing existing fossil-fuel-powered plants.

The Woodridge project is expected to improve the land and therefore correct some of the harms created by the timber farm. The project did not receive full points in this category because the proposal lacks a job re-training plan. While there has been no commitment to include job retraining in this development plan, according to Hexagon staff, the Woodridge site is a great candidate for a low- to no-cost job training program that was created in partnership between SHINE and PVCC.

Producing more renewable energy allows for the closure of fossil fuel power plants, which have disproportionately been located in EJCOC neighborhoods. In the PJM grid, where the Woodridge project is proposed, a considerable percentage of energy is still generated using fossil fuels, including coal. By approving the Woodridge project, there is a possibility of closing these dirty power plants.

Other Socio-Economic and Environmental Factors

The project scored an eight out of 10 for the Other Socio-Economic and Environmental Factors. It is located near an existing transmission line (more information on this below), and the developer worked with community groups to minimize the environmental damage of the project. Given the historical use of the property for timber production, the developer's plans to restore the underlying soil are expected to be net beneficial in this particular case.

Information for the economic analysis was collected from the project's special-use permit and County employment information. Table 6 was constructed using information from Hexagon, and Table 7 was constructed using a combination of data from Hexagon and outside sources.

See calculations below:

Projected Economic Stimulus From Temporary Job Creation	
(J) direct, temporary construction jobs created (provided by Hexagon)[v] [14]	206–290[vi]
(K) associated labor income from the temporary construction jobs ($)	52,988
(L) total wages from direct jobs during the construction period: (L) = (J x K)	**10,915,528–15,366,520**
(M) indirect jobs for the period of construction[vii]	250--609
(N) total direct and indirect jobs during the construction phase (J + M)	**250–899**

Developer's Score - Type Specific

Off-Site Questions

The project's Vegetation Management Plan[15] attempts to minimize the impact to the local environment and even repair previous environmental damage. This part of the methodology explains the local environmental actions and the broader climate change implications of the project.

Currently, the site is part of a larger Loblolly Pine plantation. Loblolly plantations are extremely commercially valuable and are typically used for pulp, timber, and mulch.[16] While they are important for the economy and modern life, timber plantations typically degrade land by depleting the soil of nutrients, acidifying the soil/water, and reducing native biodiversity.[17] [18] When the land is clear cut for harvest, the resulting exposed soil is vulnerable to intense scouring, which can erode hillsides and increase the turbidity of adjacent streams (Figure 2a). Comparing a timber plantation to a native landscape is not entirely fair, given that the site would likely have been another form of agriculture if not for the timber farm. However, there are opportunities in solar development to remedy the harms of timber plantations,[19] and the Woodridge proposal takes such steps. Given the numerous tributaries to the James River that flow through the site, maintaining high water quality is important for local and regional environmental health.

v According to calculations made by FreeingEnergy, using data from the Solar Foundation and SEIA, there are 2.1 jobs created for every 1MW of utility-scale solar. This would mean that the Woodridge project would yield 290 jobs. We decided to keep the estimate of direct jobs created from Hexagon in order to keep our estimates more conservative.

vi The estimate of 209 jobs is derived from an independent source, which estimates that for every 1MW of utility-scale solar developed, there are 2.1 jobs created. It did not specify if these were direct or indirect jobs. It is used here as an estimate of direct jobs.

vii This estimate is significantly higher than the estimate provided by Hexagon. Bivens, J. 2019. Updated employment multipliers for the U.S. Economy. Economic Policy Institute. Accessed on 09 Dec 2022 by https://www.epi.org/publication/updated-employment-multipliers-for-the-u-s-economy/

Given that the land's prior use was a monoculture timber farm, and therefore had relatively low biodiversity compared to a naturally occurring forest in the region, the solar farm is expected to increase biodiversity. The Vegetation Management Plan plans for native plantings between solar panel rows as well as the introduction of locally native pollinators.

Some soil management (adding lime to the site) will be needed to return soil pH closer to neutral. This is a standard process that is expected to have minimal impact on surrounding stream health.[20] The vegetation changes will provide more habitat for diverse insects and vertebrates. In addition to the natural increase in biodiversity, native pollinators will also be introduced to the site. The positive impacts of pollinators on the site (increased vegetative productivity) will likely also benefit neighboring sites. Given that agriculture is a major economic sector in the region, the vegetation management plan will likely also positively impact the local economy.

After the project's 35 year lease concludes, it is uncertain whether the land will continue to be operated as a solar facility, returned to timber production, or converted to another use. The site's current plan for decommissioning involves removing all materials and roads and adding topsoil to disturbed areas.[21] All vegetative buffers will remain in place.

Figure 2 (a) Site of recently clear-cut forest on the Woodridge proposed solar site. Note the scouring on the hillside. (b) Stand of loblolly trees shielding the proposed solar site from the road.

Climate Change Analysis

Calculations for the expected energy generated by this site were sourced from the literature and, where possible, independent numbers were used. In many cases, calculations were completed with information provided by Hexagon. See calculations for energy generated below:

How Much Electricity Will be Generated From This Site In One Year (in MWh)?	
MW AC (provided by Hexagon)	138
MWp (MW-AC * DC-AC conversion factor of 1.3)	179
Expected PVCF[22] [viii]	0.25
Electricity (Mwh) generated [MWp * PVCF * 8736] [23]	**392,886**

viii The PVCF stands for the PV Capacity Factor. While similarly named to the above number, it represents the percentage of energy generated throughout the year by accounting for things like shade, cloudy days, etc.

Step One: Determining how many homes are powered by the project

How Many Homes Could Be Powered By The Project?	
Electricity generated (in MWh)	392,886
Average household energy consumption, EIA 2021 (MWh/year) [24]	13.13078
Homes powered (HP)	29,920

Step Two: Convert the homes powered to analysis score

Off-Site GHG Mitigation Scoring Guide	
Number of Homes Powered	Score
≤ 100	0
101—5000	1
5001—10,000	2
10,001—25,000	3
25,001—50,000	**4**
> 50,000	5

On the topic of GHG mitigation, Hexagon scores a four out of five because it is expected to power 29,920 homes.

Additional (Optional) Analysis

GHG Emitted from Manufacturing Panels
The embodied carbon in the panels is estimated in the table below:

GHG Emissions From PV Panel Manufacturing	
(A) GHG emissions from manufacturing (g per kWh) [25]	49
(B) Number of grams in one ton	907,184
(C) Number of kWh in one MWh	1,000
(D) *GHG emissions from manufacturing (tons per MWh)*	0.54
(E) Energy generated from the site (MWh)	392,886
GHG emitted from manufacturing PV panels for the site: (D) x (E) =	**21,221**

GHG Emitted from Clearing Site

According to Hexagon's GHG calculations, there are approximately 23,413 tons of CO2 stored within the trees in the project footprint. Given that this site is a timber farm, the trees on the proposed project footprint are expected to be felled, regardless of the solar PV project, within the next 20 years.[26] The proposed solar site is therefore not changing the carbon emissions from the land significantly; however, we still included the GHG emitted from logging as part of the emissions to maintain a conservative estimation of the benefits of the site.

GHG Emitted from Clearing Land for Transmission Lines

New and/or expanded transmission lines result in the potential clearing of approximately 9.1-24.2 acres of land (and the potential logging of between roughly 5,454 and 14,545 trees) per mile of transmission line saved (Table 4). Preventing both the GHG emissions from that logging (which contributes to the net positive GHG mitigation of the project) and protecting the area for better-suited/purposed land usage.

The number of logged trees avoided per mile of tranmission line	
Width of a transmission line "right of way" (ROW) cooridor (ft)	75-200 [27]
Number of trees that grow per acre	600
Number of square feet in an acre	43,560
Number of feet in a mile	5,280
Number of acres per mile of ROW	9.1-24.2
Number of trees not logged (trees)	**5,460–14,520**

GHG Mitigation from Energy Generation

The analysis here considers only the GHG emissions reduced from the first year of energy generation.

GHG Emissions Were Avoided By The Project In The First Year.	
(A) Projected annual energy generation (see calculations in table 1) (MWh/year)	392,886
(B) Virginia output emission rates, eGRID2020 (CO2e lb/MWh) [ix]	644.8
GHG avoided in Year 1 ((A) x (B) / 2000) (in U.S. tons)	**126,676**

ix It's important to observe that the "lbs/MWh" factor is frequently changing as our region's grid gets cleaner. Particularly, in view of the Virginia Clean Economy Ac (VCEA), this factor is expected to approach "zero" over the next decades, potentially reducing the climate change mitigation benefits of individual clean energy power plants.

External Factor Score

The Woodridge Solar project is expected to generate considerably more tax revenue than the existing land-use type (see Economic Benefits section). With this increase in tax revenue comes the opportunity to actualize restorative justice by using the tax revenue on projects that particularly benefit historically energy-burdened or polluted communities. The tax rate and structure of the Hexagon site are not finalized, which might provide the opportunity to build additional restitution into the project.

Adding solar to the property will increase the property tax revenue of the project to be between $12.4-13.8 million in total across the next 35 years.[28] This is a significantly higher tax rate than the business-as-usual (BAU) scenario would lead, which would produce tax revenue of $137,000 totaled over 35 years.[29] Given the increase in temporary employment, expected stability of utility rates, and a long-term increase in tax revenue, this project achieves a high score in external questions that relate to economic benefits.

Even though the electrons from this solar PV project will flow into the same grid that Albemarle County residences and businesses draw from, it is likely that their carbon credits from the project will be awarded to a corporation that purchases the offsets as part of a Power Purchase Agreement (and, therefore, not necessarily contributing to the County's climate change mitigation goals).[30]

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