Washington State Department of Commerce

Rural Clean Energy Economics and Community Engagement Study and Report

Pursuant to Sect. 307(2) of Chapter 230, Laws of 2023

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Report to the Legislature

Director Mike Fong

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Acknowledgments

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Table of contents

Executive summary

The 2023 Washington State Legislature directed the Washington State Department of Commerce (Commerce) to develop and submit a study and legislative report addressing direct and related issues and concerns across rural Washington regarding clean energy development in Sect. 307(2) of Chapter 230, Laws of 2023 (HB 1216).[1]

The Rural Clean Energy Economics and Community Engagement Report (Rural Clean Energy Study) included community engagement with rural communities from January through July 2024, and an analysis of the economic and financial impacts of utility-scale clean energy projects in rural communities.

The community engagement process included 44 individual and small-group conversations; three focus group interviews; three in-person, community-based public meetings; one statewide virtual public meeting; and collection of public comment through an online portal. The consultant team also reached out to several tribes for their perspectives on clean energy development. Feedback was compiled, analyzed, and thematically synthesized to reflect what communities said about the opportunities and challenges of clean energy development.

The economic and financial impacts analysis reviewed existing and planned utility-scale clean energy projects larger than one megawatt (MW) constructed in rural Washington communities since 2019. The analysis quantified the distribution and magnitude of the economic impacts of these projects to inform recommendations for how costs and benefits could be more equitably distributed to, among, and within rural communities.

Eight recommendations are provided here reflecting the results of this community engagement and economic analysis. These actions could reduce concerns expressed about development of the clean energy resources that Washington needs to meet its climate requirements and serve its growing economy.

Community engagement – what we heard from communities

Rural clean energy development

Rural community members and representative interests[2] offered these perspectives as challenges and concerns about clean energy development:

- **Lack of local control and input on decision-making:** Decision-making about utility-scale clean energy projects is not transparent and occurs outside of the local community and without adequate community involvement.
- **Skepticism about decarbonization in Washington:** The state's contribution to global emissions reductions is miniscule, and communities have other competing priorities.
- **Lack of sustainable, direct local benefits:** Large-scale projects bring very few lasting local benefits; benefits are "exported" along with the energy that is generated to other parts of the state and country at the expense of local communities.

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[1] "Concerning Clean Energy Siting.," Chapter 230, Laws of 2013 (HB 1216).
[2] The term "representative interests" is used throughout this document and refers to persons with a technical, jurisdictional, and/or representative role in clean energy development in rural Washington communities.

- **Quality of life and environmental impacts:** Large-scale clean energy projects harm the natural landscape, tourism, and recreation. Negative environmental impacts over the lifecycle of clean energy infrastructure outweigh the benefits.
- **Unrealistic expectations:** Washington, and rural communities in particular, lacks the resources, infrastructure, and technical expertise to meet increased future energy demands with clean energy resources within the timeline set by the Legislature.

Along with challenges and concerns, rural community members and representative interests highlighted perceived benefits and opportunities:

- **Independence, reliability, resilience, and affordability:** Clean energy, especially community-scale projects, can increase energy independence, reliability, and resilience and has the potential to decrease energy costs.
- **Agricultural community opportunities:** Clean energy projects can support farmers by providing additional income to supplement farming operations.
- **Leadership on clean energy and climate change:** Leadership on clean energy and innovation positions the state to attract investment and provide economic opportunity.
- **Improved health:** Switching to cleaner forms of electricity cleans the air and reduces harmful waste and pollution.

Community members and representative interests offered several suggested solutions related to the challenges and concerns of clean energy development:

- **Emphasize community-scale clean energy:** Focus clean energy development and state support on smaller community-scale projects, including micro-hydro and co-generation.
- **Revise energy permitting and grant application processes:** Create more efficient and inclusive processes for siting and permitting.
- **Streamline grant application processes:** Support rural communities' ability to secure funding for community-scale clean energy projects.
- **Increase collaboration with rural communities:** Increase collaboration between the state, counties, and local communities to determine where clean energy projects could be most effectively sited to reduce negative local impact.
- **Provide greater opportunities for community engagement:** Create opportunities for engagement to increase community agency, education, participation, and transparency.

Economic and financial impacts

When asked about the economic and financial impacts of clean energy development, community members and representative interests raised the following challenges and concerns:

- **Taxes and revenue:** When taxes are levied at the local level, property tax revenues from clean energy projects are inconsistent over time as their assets depreciate. The increase and later decrease can leave communities with ongoing fiscal obligations.
- **Employment:** Most employment benefits occur at the beginning of the project during the construction phase and diminish over time. Lack of training opportunities for the local workforce could preclude them from participating in clean energy development activities at all.
- **Loss of agricultural land and farms:** Conversion of agricultural lands and loss of farm jobs and revenue from clean energy projects can have significant negative impacts on rural communities.

Community members also associated economic and financial benefits with rural clean energy development:

- **Community economic benefits:** There is the potential for increased local tax revenue, mitigation payments, community benefits associated with a developer's engagement in rural communities, and creation of some longer-term jobs associated with post-construction employment.
- **Developing a clean energy industry:** A growing clean energy industry could attract additional investments in community services and infrastructure.
- **Individual economic benefits:** There could be more affordable energy costs for all, and benefits to landowners who receive lease payments from clean energy developers.

Community members and representative interests expressed several solutions to address the challenges and concerns related to the economic and financial impacts of clean energy development:

- **Create Community Benefits Agreements (CBAs):** More needs to be done to ensure that local communities receive the benefits of the clean energy projects in their areas, and developers should use CBAs as a tool in negotiations with rural communities.
- **Update tax structures:** Explore alternative tax or payment designations for clean energy development that advantage rural communities.
- **Guarantee local employment:** Address community concerns about job displacement and sustained local economic benefit with local labor agreements.

Tribal considerations

The Legislature, in enacting the 2023 clean energy siting law, recognized the high priority of protecting the interests of federally recognized Indian tribes when developing clean energy projects. The law includes multiple specific provisions addressing tribal interests. However, the scope of thisTribal interests in clean energy siting have been conveyed to state officials in a variety of tribal engagement processes and government to government meetings including the Centennial Accord over the last three years. However, the scope of this particular community engagement project and report does not include a comprehensive assessment of those tribal interests and concerns. The consultant team heard several comments during workshops and focus groups suggesting actions to strengthen protections of tribal interests, and some tribal citizens participated in workshops or focus groups. However, the scope of this project included neither comprehensive engagement nor formal consultation with federally recognized Indian tribes. We understand tribal governments to be leaders in clean energy work and request the opportunity to complete targeted engagement and listening sessions so that tribal experience and insights can be included in energy siting work.

Economic analysis

Geographic distribution of large energy projects

The Rural Clean Energy Study evaluated the geographic distribution of clean energy development by mapping operating and planned projects and identifying how projects varied by technology, size, and acreage. Key findings include:

- **Since 2019, 20 utility-scale clean energy projects were developed or are planned in Washington.** The majority are solar energy (65%) and onshore wind energy (30%).
- **Of these 20, 10 utility-scale projects were developed and are operating.** Four of these are west of the Cascades, and six are in the southern portion of the state east of the Cascades.

- **The total operating capacity of these 10 operating utility-scale projects is 823 MW, with four projects that are over 100 MW of capacity each.** The four largest projects are Rattlesnake Flat Wind in Adams County, Lund Hill Solar in Klickitat County, Skookumchuck Wind in Lewis/Thurston County, and Tucannon Wind in Columbia County. Clusters of both recently sited and older wind projects are in Klickitat County along the border with Oregon and in the southeast in Columbia and Garfield counties.
- **10 utility-scale projects are planned, proposed, or currently under construction.** All 10 projects are in central or eastern Washington. Seven have the capacity to produce over 100 MW each. Douglas County would have its first utility-scale clean energy project. Yakima County has two planned clean energy projects and one solar photovoltaic project (Goose Prairie Solar) currently under construction.
- **Recent clean energy projects are in communities with higher populations identifying as white and non-Hispanic** and lower percentages of the population that have received a high school diploma or equivalent compared to Washington state averages.

Effects on other rural land uses

Some community members expressed concern that clean energy projects could adversely affect local communities' economies, both in terms of losing productive agricultural lands, and potentially reducing the area's attractiveness for tourism, recreation, or other development activities. This study evaluated the impacts of recent utility-scale clean energy projects on local land uses, including agriculture, and examined whether these developments negatively affected tourism or recreational activities.

Key findings include:

- Case studies suggest that onshore wind energy development projects in Washington have a relatively small footprint on surface lands, typically requiring approximately 2% of the total project area for project operations, with the remainder retaining its original land use.
- Wind projects sited primarily on agricultural lands resulted in negligible observable changes pre- and post-construction in harvested crop acreage within the project area. The infrastructure for the utility-scale wind projects examined occupied between 2-4%, or between 390 and 480 acres, of total project acreages that ranged from 10,000 to 25,000 acres.
- Due to the density of required infrastructure, the solar energy projects among these case studies required conversion of most pre-existing land uses in areas inside the established project fence lines for solar development. Other land uses are precluded by the presence of the solar panels as well as fences erected around the panels. The area converted to solar energy development for the case study solar projects ranged from 73 to 1,700 acres of total project acreage, which ranged from 73 to 3,200 acres.[3] Prior land uses for developed solar projects typically included grazing. However, some planned projects would be located on active farmland.

Financial returns to property owners

Community members and lawmakers asked whether leasing lands for clean energy projects is beneficial or harmful to landowners. Primary concerns include both short- and long-term community impacts, as well as whether adjacent landowners could be affected by these projects. This study evaluated how clean energy development affects financial returns for landowners.

[3] One small site (73 acres) was considered entirely developed.

Landowners have several factors to consider when deciding to lease their land for clean energy development. The key decision for property owners is whether lease payments outweigh the potential revenues from existing land uses, most commonly agriculture and timberland.

Key findings include:

- **Both wind and solar energy development project lands are typically leased by project developers rather than purchased outright.** Property owners within leased areas usually enter into lease agreements with the project owners for a pre-development period (typically ranging from two to five years). After the design of the project is established, landowners of parcels on which physical infrastructure is developed are further compensated on a per acre basis at an established fee.
- **Lease payments are often distributed on a per acre or per MW basis (or both).** Lease payments can take many forms and may vary in magnitude by project phase. The size of payments depends on the size (i.e., acreage) of the lease for solar, or the number or size (i.e., MW capacity) of sited turbines for wind. Average lease rates identified through public sources range from approximately $200 to $1,000 per acre for solar leases and $3,000 to $4,000 per MW capacity for wind leases. Landowners may receive additional payments such as a bonus, access (e.g., roads or transmission lines), or a combination of such payments and lease payments. These agreements are generally confidential to the parties engaged, although agreements with public entities are sometimes made public.
- **Lease payments are likely to exceed the agricultural crop revenue on a per acre basis after adjusting for the costs of production.** This was true for wind and solar case study projects with agricultural or grazing activity, though, as noted above, wind energy leases have a relatively small footprint and allow continued agricultural crop farming around the turbines, while solar projects in the case studies do not.
- **Based on a literature review, adverse effects on property values ranged from 0-6% between pre- and post-construction**, regardless of property location and project type. The consultant team assessed property values and conducted a literature review of recently published research on property values and large clean energy projects from across the U.S., finding the compared assessed values consistent with published literature.

Effects on local tax revenues and public services

While clean energy projects bring tax revenues to counties and other local jurisdictions, questions were raised about whether the additional revenues are sustained over time and how the changes to tax payments affect the jurisdictions in which they are located, particularly as projects depreciate.

This study examined effects on local tax revenues and public services, with key findings that include:

- **State and local taxes are collected from clean energy projects in three primary methods:** Real property tax (land and buildings), personal property tax (equipment and machinery), and sales tax.
- **Across case study projects, clean energy projects contributed far more to total county personal property taxes than real property taxes due to the high values of equipment assessed at these sites.** For the six operating projects, estimated payments in year one of operations ranged from $140,000 to $2.1 million for personal property, while real property payments ranged from $5,600 to $67,000.
- **While assessed values for equipment are high following project construction, they depreciate over time, which reduces local taxes collected over time, all else equal.** In the case studies, additional project investments resulted in slower depreciation in taxes over time than would otherwise be expected from the depreciation schedule.

- **Sales tax is collected on all labor and materials purchased for a project, which primarily occurs during the construction phase.** Sales tax is levied separately from property tax, with a statewide sales tax rate of 6.5%, plus an additional county and local sales tax, which is typically 2%.
- **All counties with operating projects experienced an increase in local tax revenues relative to previous land uses.** The additional collections represented nearly half of countywide tax collections for several years following project construction in some smaller counties. For counties with a smaller tax base, clean energy projects comprise a larger share of total property taxes (inclusive of real and personal property). Potential increases in tax revenues can also benefit school funding and local services.
- **While counties have authority to assess parcels that contain clean energy development, some county officials noted** that they lack the expertise to conduct these assessments or advocate for themselves upon appeal by developers.
- However, **a drawback of central assessment is that county officials may not be able to anticipate changes in assessed values from year to year.** Officials noted that they often receive updated assessments from the state Department of Revenue (DOR) close to the end of the budget development period, offering little time for budget adjustments in response to changes.
- **County officials also expressed concern about the 2023 law (Chapter 82.96 RCW)[4] that allows projects to be exempt from state personal property tax in favor of a new clean energy production excise tax.** Assessors noted that the law dictates the taxing districts may receive funds distributed to counties from the excise taxes, which may adversely affect some districts. As written, the bill is intended to solely apply to the state portion of personal property taxes. However, county officials fear that the law may be updated to include both state and county tax collections, which could substantially alter how funds are distributed within the county taxing districts.

Due to these concerns and others, such as the depreciation of projects over time, some county officials suggested taxing clean energy projects as a standalone tax category instead of as personal property.

Direct, indirect, and induced jobs in construction and operations

Clean energy projects can generate jobs during construction and annual operations. In Washington, there are no public data sources that report total project development costs or total local employment generated by clean energy projects, and developers are not required to submit these statistics. In the absence of project-specific data, this study uses regional economic models to estimate the total costs of projects and their regional economic impacts, including both construction and operations-related jobs.

- **Clean energy projects provide a substantial number of jobs during construction, but relatively few direct construction jobs for local hires.** Most clean energy equipment is manufactured outside Washington, and the required technical expertise limits the extent of local employment during construction and operations. Companies prefer to deploy specialized crews for constructing clean energy infrastructure, which are often mobile crews from outside the state. However, some local general construction labor was reported to have been used for clean energy project development. Construction jobs in the state are estimated to range from two to 10 jobs per MW.
- **Clean energy projects provide a modest number of permanent jobs during project operations.** Operations jobs are typically local because of the need for frequent site visits. One county representative said that during project operations, employees typically live nearby, and agreed with the

[4] https://app.leg.wa.gov/billsummary?BillNumber=1756&Initiative=false&Year=2023

modelled job creation estimates that project operation requires approximately one quarter of a full-time equivalent job per MW.

- **There are some incentives to increase use of local employment, but little evidence of their effectiveness.** The state tax exemption encourages projects to hire local workforces to receive reduced state sales and use taxes owed on machinery and equipment. While one project had such an agreement (Rattlesnake Flat), data were not available to confirm whether the agreement resulted in additional use of local labor.

Recommendations

The following recommendations are informed by and emerged from the community engagement and the economic and financial analysis documented in this study. They are explained in more detail in the Recommendations section of this report.

- Strengthen local involvement in clean energy siting and project development processes to ensure that rural communities are informed and have a meaningful role in the decision-making process.
- Ensure increased rural community benefits and mitigate potential harm from clean energy projects.
- Safeguard and enhance the quality of life in rural communities as clean energy projects are developed.
- Improve transparency in the planning, development, and operation of clean energy projects.
- Explore an alternative taxation approach for large clean energy projects.
- Improve communication about sales taxes and clarify expectations about payback timelines for developer rebates.
- Increase transparency of economic and financial data reporting.
- Improve documentation of federal and state incentives.

Introduction

Background

The Legislature directed Commerce to prepare a report addressing direct and related issues and concerns across rural Washington regarding clean energy development in Sect. 307(2) of Chapter 230, Laws of 2023 (HB 1216). This study would address direct and related issues and concerns across rural Washington regarding clean energy development.[5]

Commerce contracted a consultant to provide third-party neutral services for the design and implementation of the rural engagement and economic analysis required by this legislation. Ross Strategic[6] led the consultant team, partnering with Industrial Economics, Inc. (IEc),[7] and the Clean Energy Transition Institute (CETI).[8] The Rural Clean Energy Economics and Community Engagement Report (Rural Clean Energy Study) is not affiliated with or in support of any clean energy development project. The timeline to complete all aspects of the Rural Clean Energy Study is in Table A1 in Appendix A.

Legislative mandate

The Legislature directed Commerce to prepare a report addressing direct and related issues and concerns across rural Washington regarding clean energy development in Sect. 307(2) of Chapter 230, Laws of 2023 (HB 1216):

> (2)(a) The department must complete a report on rural clean energy and resilience that takes into consideration the consultation with rural stakeholders as described in subsection (1) of this section. The report must include recommendations for how policies, projects, and investment programs, including energy facility siting through the energy facility site evaluation council, can be developed or amended to more equitably distribute costs and benefits to rural communities. The report must include an assessment of how to improve the total benefits to rural areas overall, as well as the equitable distribution of benefits and costs within rural communities.
>
> (b) The report must include a baseline understanding of rural energy production and consumption, and collect data on their economic impacts. Specifically, the report must examine:
>
> > (i) Direct, indirect, and induced jobs in construction and operations;
> >
> > (ii) Financial returns to property owners;
> >
> > (iii) Effects on local tax revenues and public services, which must include whether any school districts had a net loss of resources from diminished local effort assistance payments required under chapter 28A.500 RCW and impacts to public safety, the 911 emergency communications system, mental health, criminal justice, and rural county roads;
> >
> > (iv) Effects on other rural land uses, such as agriculture, natural resource management and conservation, and tourism;

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[5] This study does not rely on a specific definition of clean energy projects, using the term more generally to include projects that produce electricity without burning fossil fuels. Rural areas are identified in **Table A6** and **A7** in Appendix A.
[6] "Ross Strategic," n.d., https://www.rossstrategic.com/.
[7] "Industrial Economics Inc.," n.d., https://indecon.com/.
[8] "Clean Energy Transition Institute," n.d., https://www.cleanenergytransition.org/.

(v) Geographic distribution of large energy projects previously sited or forecast to be sited in Washington;

(vi) Potential forms of economic development assistance and impact mitigation payments; and

(vii) Relevant information from the least-conflict priority solar siting pilot project in the Columbia basin of eastern and central Washington required under section 607, chapter 334, Laws of 2021.

(c) The report must include a forecast of what Washington's clean energy transition will require for siting energy projects in rural Washington. The department must gather and analyze the best available information to produce forecast scenarios.

(d) By December 1, 2024, the department must submit a final report on rural clean energy and resilience to the joint committee on energy supply, energy conservation, and energy resilience created in RCW 44.39.010 and the appropriate policy and fiscal committees of the legislature.

Purpose

This study is designed to help Commerce meet the state's clean energy and climate laws by:

- Increasing mutual understanding between rural communities, representative interests, government agencies, and policymakers about the potential opportunities and impacts of clean energy development in rural communities.
- Developing detailed analysis of the direct and indirect economic and financial impacts of clean energy projects.
- Engaging with representative interests and rural communities.
- Informing policies and programs.

Community engagement

Methodology

The consultant team prepared a detailed Community Engagement Plan for the study outlining goals, audiences, and engagement methods. The plan was updated as new information emerged throughout the process. The goal of the rural community engagement was to focus on the interests of rural communities and to provide Commerce and the Legislature with actionable information to understand the opportunities, challenges, and potential impacts of rural clean energy development. The results of this engagement will inform rural clean energy development policies and programs.

Throughout this process, the consultant team was clear about the purpose of the engagement, employed a consistent and focused set of topics and questions, and described how qualitative and quantitative data would be used to inform future decisions.

Engagement process

The engagement process included individual and small-group conversations through interviews, three community-based public meetings, three focus groups, and one statewide virtual public meeting. The consultant team also collected comments online through a public-facing project website. Interviewee and focus group affiliations are detailed in **Table A2** in Appendix A, and the number of online comments by county of origin is in **Table A3** in Appendix A. The consultant team provided opportunities for representative interests to review and comment on the design of the study and the draft report, and selected tribes potentially engaged in community and utility-scale clean energy development to participate in an interview and/or review the draft report

Public-facing website

The consultant team collaborated with Commerce to develop a public-facing website for the Rural Clean Energy Study.[9] The consultant team regularly posted education and outreach materials about the state's energy laws, the role of clean energy, and key information about engagement opportunities and outcomes for rural engagement throughout the study period.

Interviews

The consultant team conducted 44 interviews from April through July 2024.[10] The consultant team worked with Commerce to identify individuals and an interview strategy to gain insights into key rural clean energy issues. The team also worked with Commerce's regional Community Engagement unit staff to identify local contacts and develop interview questions.

With assistance from Commerce, the consultant team conducted outreach to key contacts, providing relevant background information for the project, including the legislative requirement for this study, the goals for engagement, and how the interview findings would be used.

The consultant team synthesized interview findings with written summaries of key discussion points, insights, and action items from all group and community meetings, all of which were shared with Commerce.

Focus group meetings

In consultation with Commerce, the consultant team identified and met with three focus groups (21 people). These included county commissioners, non-governmental organizations, the Washington Energy Facility Site Evaluation Council (EFSEC), and county assessors.

Public meetings

The consultant team held three in-person community public meetings in rural western, central, and eastern Washington, plus one virtual statewide meeting. The team selected locations, dates, and times in consultation with Commerce. Simultaneous Spanish-language interpretation services were provided at each meeting. See Table 1.

Table 1. Summary of public meetings

Meeting Location	Date and Time	Number of Attendees
Dayton	May 14, 2024: 6:30 - 8:30 P.M.	49
Zillah	May 15, 2024: 6:30 - 8:30 P.M.	12
Mount Vernon	May 16, 2024: 6:30 - 8:30 P.M.	20

[9] Washington State Rural Clean Energy Study, n.d., https://ruralcleanenergywashington.org/

[10] Tribal Nations not included in the interviews were invited to review the draft report and advise the consultant team on any key missing issues.

Meeting Location	Date and Time	Number of Attendees
Virtual	June 5, 2024: 6:30 - 8:30 P.M.	148
Total attendees		**229**

The consultant team shared summaries of each meeting on the study website.[11]

Online comments

The consultant team provided an online comment option on the project website. There were 143 comments received during the study. The consultant team incorporated these online comments in the final report.

Tribal considerations

The Legislature, in enacting the 2023 clean energy siting law, recognized the high priority of protecting the interests of federally recognized Indian tribes when developing clean energy projects. The law includes multiple specific provisions addressing tribal interests. Tribal interests in clean energy siting have been conveyed to state officials in a variety of tribal engagement processes and government to government meetings including the Centennial Accord over the last three years. However, the scope of this particular community engagement project and report does not include a comprehensive assessment of those tribal interests and concerns. The consultant team heard several comments during workshops and focus groups suggesting actions to strengthen protections of tribal interests, and some tribal citizens participated in workshops or focus groups. However, the scope of this project included neither comprehensive engagement nor formal consultation with federally recognized Indian tribes. We understand tribal governments to be leaders in clean energy work and request the opportunity to complete targeted engagement and listening sessions so that tribal experience and insights can be included in energy siting work.

Engagement analysis

The consultant team compiled information collected from all interview phases, online engagement, and in-person/virtual meetings to support the analysis and synthesis of findings. The team reviewed these data to identify common themes and examples to support these themes, and then synthesized those themes to reflect rural communities' insights about the opportunities and challenges of clean energy development.

Findings: Community engagement

The findings from the Community Engagement process are grouped thematically under three broad headings: Clean energy development; and Economic and financial impacts.

The first two sections (Rural clean energy development and Economic and financial impacts) are organized by challenges and concerns, benefits and opportunities, and proposed solutions to challenges — including suggestions for improvements to outreach and engagement. The findings reflect the viewpoints of community members.

[11] Washington State Rural Clean Energy Study, n.d., https://ruralcleanenergywashington.org/

Community engagement – Clean energy development

Challenges and concerns

Lack of local control and input on decision-making

One of the consistent themes throughout the outreach and engagement process was concern with decision-making that occurs outside of the local community. This included the sentiment that the Governor's Office and Legislature are pursuing clean energy development regardless of rural concerns and considerations. Community members noted that efforts to preserve farmland are overridden by state decisions to site clean energy projects and energy infrastructure.

Many community members said that counties are unable to properly permit solar or wind facilities on agriculturally designated lands due to the Growth Management Act, while EFSEC has the authority to site clean energy projects on these lands.

Rural community members emphasized that interest in local control should be interpreted as an interest in having a role in the decision-making process, and not an attempt to block clean energy development. Community members at both the Dayton and Zillah meetings said that having a meaningful role in the decision-making process would increase the ability of counties to "get to yes."

Community members also mentioned a lack of transparency during clean energy project development, noting that project developers communicate directly with landowners but not with the broader impacted community. This results in a lack of information and ability to effectively provide input on potential projects.

Lastly, community members said that rural communities generally oppose government mandates or decision-making from outside of their communities: "People are feeling this downward economic pressure from legislation, so they are viewing this antagonistically…the west [of the state] is coming in and doing this to them."

Ideological opposition

Ideological opposition was more pronounced among the rural communities in Eastern Washington than Western Washington, which could be due to the greater number of existing and planned wind and solar projects in Eastern Washington.

Some individuals cited ideological differences between urban and rural communities as a significant challenge, with more rural communities generally opposed to clean energy development. Energy infrastructure build-out has historically not been a partisan issue.

Some commenters on the project website expressed strong ideological opposition to clean energy projects, including skepticism about the impact of climate change and distrust of government mandates.

In some areas, build-out of clean energy projects is considered a pretext for dam removal, particularly in communities around the lower Snake River dams, which people mentioned several times. Some interviewees said that this Rural Clean Energy Study does not include analysis of hydroelectric projects and is therefore biased against such projects as part of a clean energy economy.[12]

Skepticism about decarbonization
Another theme that emerged related to ideological opposition was general skepticism about the need to decarbonize the state's energy system. According to some interviewees and comments, Washington's grid is already mostly 'green' from hydropower, which makes additional wind and solar energy (and other clean energy sources) unnecessary: "Our PUDs [Public Utility Districts] are 80-90% clean to begin with – mostly hydro, either Bonneville, or projects owned by PUDs."

Individuals noted that even assuming the need to decarbonize the energy system, rural communities question whether the Clean Energy Transformation Act (CETA) timelines are realistic. Some community members noted a related sentiment that wind and solar potential is greater in other areas or neighboring states (e.g., there is more wind potential in Montana), so "why are we developing here?"

Some commenters suggested that clean energy projects are unnecessary and a misuse of taxpayer money, advocating instead for continued investment in fossil fuels. Commenters also raised concerns about the influence of high-tech companies and foreign entities on clean energy policies.

Some community members attributed skepticism to a general lack of information and understanding of the state's climate commitments. They noted a lack of information about the state's overall climate strategy, future energy needs, what is required of utilities, and what incentives are available to utilities, ratepayers, and communities in the clean energy transition.

Lack of direct, sustainable local benefits
Some individuals said that rural communities were concerned about clean energy projects built locally when the energy they produce is sent to serve population centers in Western Washington. As one interviewee stated, Eastern Washingtonians have a sense "of being an energy colony, where Western Washington uses all the energy and Eastern Washington has to produce it."

An additional concern is that energy produced in Washington is often exported to other states, undermining the argument that more clean energy production is needed to meet Washington's decarbonization goals.

Interviewees also cited government programs designed to create economic opportunities, such as the American Recovery and Reinvestment Act (ARRA) that provided a one-time infusion of funding for weatherization, as an unsustainable investment model, emphasizing that programs should ramp up and down gradually, not "boom and bust."

Quality of life impacts
Many individuals commented on the impacts to quality of life in rural areas resulting from clean energy development. Some community members noted that people living in rural communities value the natural landscape and are opposed to large energy projects that would disrupt it. Website commenters frequently

[12] The economic analysis for this study is focused on utility-scale (greater than 1 megawatt (MW)) clean energy projects constructed or proposed in Washington since 2019. For this analysis, the consultant team considered a wide range of clean energy technologies, including hydropower. However, there have not been any hydropower projects constructed since 2019 and thus no hydropower projects were evaluated in detail.

mentioned concerns about the visual impact of large wind and solar projects, the loss of natural landscapes, and potential negative effects on tourism.

> **Horse Heaven Clean Energy Center**. Several interviewees mentioned the challenges associated with the Horse Heaven clean energy project. For instance, they mentioned a lack of information about project maintenance and longevity, lack of public outreach, and the size of the project relative to its anticipated energy production. Overall, the project was seen by local communities as pre-determined regardless of public input.

There were also comments about noise, light pollution, and the general aesthetic degradation due to these projects, ruining the "desolate beauty" of rural areas.

Some individuals expressed concern that siting solar or wind farms might conflict with efforts in their communities to diversify their economies through tourism. Some of these impacts are quantifiable, such as tourism revenue and property values, while others are qualitative, such as the effect of light flickering from spinning wind blades (also known as wind turbine shadow flicker).

Environmental impacts

Throughout interviews, public meetings, and comments submitted through the website, several individuals raised the topic of environmental issues associated with clean energy development. Concerns ranged from impacts of wind turbines on avian populations to groundwater contamination from solar farms. In one case, an interviewee reported both: "People say solar kills birds, and the chemicals used to clean them [solar panels] get into groundwater." A community member said that farming is heavily regulated to avoid impacts on endangered species, whereas clean energy developers do not receive a commensurate level of scrutiny.

Water use and water rights were also areas of concern. Water is used for project dust abatement and cleaning, and any additional water use increases pressure in areas where water is a scarce resource. One individual also expressed concern over the impacts of groundwater recharge associated with large solar farm installations.

Communities were also concerned with increased wildfire risk from clean energy projects, with battery storage facilities specifically mentioned as a source of fire hazard. This concern extended to the ability of firefighters to effectively contain wildfires in areas with wind and solar farms, and the lack of firefighter training around electrical and battery fires. Individuals mentioned the potential cost increase for homeowners' fire insurance and noted that some California communities are losing fire insurance coverage entirely.

Many individuals suggested that developers should pay for the equipment and training that first responders need to ensure a proper response and minimize the potential for loss of property and life if there is an emergency at an energy facility.

Lifecycle impacts

Community members noted that the carbon footprint of clean energy projects, when analyzed through the entire lifecycle, is significant. The concrete, steel, and other materials that make up a clean energy project, combined with the carbon impacts from transporting the equipment and installing it, cast doubt on the actual greenhouse gas reduction benefits.

Additionally, communities were concerned with "who cleans up the mess," or ensuring that clean energy equipment is dealt with through end-of-life (e.g., ensuring proper disposal of used wind turbine blades).

Community members also commented that post-construction land restoration is inadequate, stating that concrete pads for wind turbines remain in perpetuity even after project decommissioning.

Energy demand, capacity, and technical constraints
Some individuals noted general concern with the ability of existing transmission and distribution to handle future electricity resources once they come online. Interviewees posed the question: If natural gas is eventually phased out of homes, how will the transmission and distribution system handle the additional demand from households for electricity?

Community members interested in increasing economic growth in rural counties were also interested in the ability of the energy system to support manufacturers or other economic contributors seeking to locate to their area.

A related theme from community members was that many rural counties and smaller utilities do not have the capacity and/or technical expertise to respond to grant opportunities for clean energy proposals. There is also a potential capacity constraint in the number of non-governmental organizations that operate in rural communities – there may be too few, and existing organizations are small and capacity-constrained.

Utility interviewees commented that residential and community solar and other distributed energy generation create additional costs for utilities to integrate with other generation sources. Utilities also noted that less reputable rooftop solar installation companies overpromise about benefits, such as increased home value from installing solar panels, energy savings, or claiming that battery backup is available. Utilities are often put in the position of responding to customer complaints about these practices.

Benefits and opportunities

Independence and resilience
Some rural community members noted that clean energy development can provide improved resiliency for the overall energy system, particularly in the face of increasingly extreme weather events, such as droughts, wildfires, and flooding.

Locating clean energy sources closer to demand or load centers with adequate distribution systems could provide an opportunity to reduce infrastructure costs. Furthermore, community-scale clean energy projects offer independence and resilience in the face of increasing grid failures and grid load pressure.

Reliability and affordability
Some community members said they would support clean energy if it could increase reliability and affordability of electricity, which is often more important than the environmental benefits of decarbonizing the energy system to rural areas. Many people noted reduced energy costs as a potential benefit to motivate rural support for clean energy projects.

Agricultural opportunities
Given the prevalence of agriculture in rural communities, many people noted opportunities to deploy clean energy in ways that benefit farmers and farmland. This included increasing the number of solar panels on farm buildings and using the energy produced to charge electric farm equipment instead of traditional fossil fuel-burning equipment. This could reduce exposure to fuel cost variability and improve the profit margins for farmers.

Rural community members supported other potential energy sources on farms, such as dairy digesters and methane capture. Leasing marginal croplands for solar or wind development can also help offset agricultural costs and allow farmers to remain on the land. As one interviewee noted, "In many cases it helps some farmers survive. I've seen that happen; some of them are able to whittle out a livelihood because of that [leasing their land for clean energy development]."

Some individuals mentioned agrivoltaics (agricultural production underneath or adjacent to solar panels) as a beneficial combination of agriculture and clean energy production. However, other feedback indicated that agrivoltaics has not moved beyond demonstration level in Washington. Additionally, some community members noted that the predominant crop types in Washington are not conducive to agrivoltaics.

Alternative clean energy sources
Generally, there was greater support for clean energy projects with a smaller land-use footprint. Many individuals noted the potential for clean hydrogen and nuclear power as part of the clean energy economy, stating that these sources would be preferable to wind and solar projects because of their smaller footprint. Community members acknowledged uncertainties around the maturity of clean hydrogen technology, and nuclear was mentioned in the context of small modular reactors (SMRs) rather than utility-scale reactors.

Other benefits and opportunities
Some individuals commented that the transition to a clean energy economy is an opportunity to demonstrate leadership around the threat posed by climate change and show that rural communities can play a vital role in this effort. One commenter wrote: "Attract investment and create jobs and economic opportunity by showing that Washington is a leader in the clean energy transition."

An interviewee observed that emissions reductions resulting from clean energy projects that replace fossil-fuel facilities could improve air quality in communities.

Proposed solutions from study participants

Rural community members suggested several solutions related to the challenges and concerns that arise as clean energy projects are proposed, sited, and developed.

Oregon Community Renewable Energy Association (CREA). An interviewee suggested Washington should create a community-run nonprofit like Oregon's CREA to provide technical assistance, advocate for counties, and generally bolster local decision-making. CREA supports business and economic opportunities through clean energy development using free enterprise principles to create economically and environmentally responsible electric generation in Oregon.

Clean energy permitting and other processes

Rural community members suggested analyzing the entire permitting and siting process to identify inefficiencies, create opportunities for local engagement and participation, improve the process, and move toward a more equitable distribution of costs and benefits of clean energy development. Suggestions included helping counties navigate project permitting, such as utilities and developers providing funding support for county permit reviews. Some individuals suggested streamlining the application process for state grants related to clean energy projects and designating certain grants specifically for rural communities. Other suggestions included:

- Consult with Pacific Northwest National Laboratory and Washington universities to provide expertise in clean energy development.
- Limit the number of data centers that can be sited (due to their high energy use). Require data centers supply their own co-located clean electricity.
- Develop a financial instrument, such as a reclamation bond,[13] to pay for project decommissioning to resolve end-of-life and disposal issues.

Clean energy siting

Many rural community members suggested that opposition to clean energy projects would be less intense if projects were sited in less visible areas to reduce the impact on people's viewsheds. Other community members said that locating projects on federal lands could be a more efficient solution to clean energy siting.

In general, rural community members urged greater collaboration between the state, counties, and local communities to determine where clean energy projects would be most effective with the least amount of local impact. One participant referred to Washington State University's Least-Conflict Solar Siting Process[14] as an underused asset for proactively siting facilities.

Some individuals commented that concerns around battery storage facility safety could be addressed by developing standards for reasonable distances from population centers and other safety regulations, such as setbacks and first responder training.

Community-scale clean energy

Yakama Tribal Solar Canal & Hydropower Project. This project is intended to convert open-water irrigation canals into a solar and micro-hydropower irrigation system and is an example of a local clean energy project that provides energy and environmental benefits to a rural area while lowering residents' utility bills.

The consultant team heard consistent support for community-scale clean energy throughout the outreach and engagement process, with many individuals expressing that smaller scale projects, including micro-hydro and co-generation, should receive more state-level support.

Feedback reflected a theme that a significant quantity of clean energy is available by installing solar panels over paved areas such as parking lots, walkways, bike paths, as well as commercial buildings and irrigation canals. The state could, for example, enact requirements for solar installation on buildings over a certain flat roof square footage. A larger analysis by the state could determine how a network of community-scale clean energy and microgrids could provide clean power while minimizing environmental and social impacts.

Outreach and engagement suggestions

Throughout the outreach process, the consultant team received feedback on how to improve overall engagement with rural communities about clean energy development.

[13] "Community Renewable Energy Association," n.d., https://www.community-renewables.org/.
[14] Washington State University Energy Program, "Least-Conflict Solar Siting," n.d., https://www.energy.wsu.edu/RenewableEnergy/LeastConflictSolarSiting.aspx.

Communications strategies and channels

Rural community members said that, to address the issue of lack of local control, it is important to consider that solar siting is generally not a controversial use of land. However, if rural community members perceive development is being forced on them, they will oppose it for that reason alone. Typically, developers lead the development, which is often followed by (from many in rural communities' perspectives) an adversarial process at the EFSEC or county level.

Rural community members recommended increasing opportunities to bring communities into the process early and often. This should include ample opportunities for public engagement, such as listening sessions, and proactive information distribution so people have more complete knowledge and understanding of clean energy projects. Communities need to be more connected during the process, from solutions to benefits, and developers should work with communities and ask what benefits they want to see.

Another suggested example for engaging rural communities earlier is using mapping tools to assess a site's readiness in terms of cultural and environmental considerations. A mapping process with community members could make that site available for developers looking to site clean energy. It will be essential to consult with tribal nations prior to any mapping activities on or near tribal lands or Usual and Accustomed territories.

The consultant team also received suggestions from many individuals about communications channels to reach rural community members. Suggestions included partnering with local community and economic development organizations to convene meetings; setting up tables at local venues or hubs for communities, such as agricultural supply stores; working through local legislators' offices to advertise meetings; or inserting flyers in monthly utility bills.

In addition to social media and online surveys, traditional media, such as radio, is still an effective method for communicating information. One suggestion was to find community champions and work through them to communicate about clean energy projects: "Messengers matter — having the right people go in and promote these projects is crucial."

Meeting timing is also important, adhering to key considerations for agricultural communities, which means avoiding meetings during planting and harvesting seasons and holding meetings in the evening. Working with local organizations would also help, as they have insight into local events.

Feedback to the consulting team also included suggestions for how to best reach out to various communities and organizations, including engaging with Latino communities and ensuring that translated materials are culturally appropriate. Timber cooperatives and Farm Bureau organizations were also mentioned as important groups for engagement.

Messaging

The consulting team received multiple suggestions about the importance of realistic messaging that resonates with rural communities, such as remaining realistic about the potential for clean energy projects. Some community members noted that rural communities would be more supportive or willing to listen to wind energy developers if expectations around energy production and benefits were more realistic. This desire for realistic expectations extended to the need for transparency around lifecycle costs. Rural communities want clear answers about what will happen to photovoltaic cells and wind turbines (or other equipment) after reaching the end of their useful lives.

An interviewee from rural Western Washington stated that mentioning the "Green New Deal" on the Washington coast will not resonate; instead, messages should focus on the economic realities of working people and identifying allies in rural counties who have benefited from clean energy projects. Transparency about real job impacts is critical, including negatives, such as construction labor crews for clean energy projects likely coming from other areas, and positives, such as the potential for clean energy development to provide well-paid jobs that do not require a college degree.

Education
Several individuals suggested providing more public education about clean energy projects and installing signage at clean energy facilities demonstrating connections to institutions or indicating benefits, such as jobs. Utilities have a significant role in public education and can continue educating local governments and the public about the energy system and how energy — including clean energy — is used and generated.

Educational opportunities extend to the agricultural community and the perception that solar farms will lead to irreversible conversion of agricultural lands. Interviewees suggested that real data about agricultural land conversion from clean energy, combined with education about the greater threat to agricultural production from climate change, could lead to increased acceptance of clean energy projects.

Community engagement – Economic and financial impacts of clean energy

Challenges and concerns

Taxes and revenue

Participants focused on taxes and revenue when discussing challenges and concerns around the economic and financial impacts of clean energy. An interviewee noted that in rural areas, most land is publicly owned and therefore clean energy projects developed on these lands are not subject to local taxes.

Where local taxes are collected, increased tax revenue during the early stages of a clean energy development project increases spending on schools, emergency medical services, flood control zones, and other infrastructure or services. However, as the accounting value of energy assets depreciates over time, property tax payments decrease; when this tax revenue decreases, communities are left with ongoing obligations.

For example, as wind turbines depreciate over time and wind energy companies pay less in property taxes, many rural community members feel the burden may be shifted to local taxpayers. Rural community members noted that clean energy project owners are aggressive in appealing[15] the assessed value of their equipment once the project construction phase is complete and the project is operational.

Concerns about local versus non-local control over taxes were paramount among multiple community members, with many referring to the potential impacts of centrally assessed projects versus locally assessed projects. During the Dayton public meeting, several attendees asked about the differences in taxes over time between state-assessed and county-assessed projects and whether there were differences in taxes for utility

[15] Washington State Association of Counties, "Washington State Association of Counties Exposes Property Tax Challenges in Clean Energy Development," December 21, 2023, https://wsac.org/washington-state-association-of-counties-exposes-property-tax-challenges-in-clean-energy-development/.

owned versus privately owned developments. Several individuals commented that counties are hesitant to assess project values locally due to potential appeals from project developers.

Sales taxes are also a concern for some because sales tax rebates take away funds that could otherwise be used to support local communities.

Employment

Employment impacts were also a primary concern for participants in interviews and public meetings, and many questioned the extent to which employment benefits accrue locally. Community members commented that tax and employment benefits mostly occur at the beginning of the project (during the construction phase) and diminish over time. Individuals also said that there are local economic benefits to having energy industry workers temporarily residing in the community during the project, but that those benefits only accrue during the construction phase.

Other participants expressed concern that labor gaps may exist and that local laborers may not have adequate training to participate in construction activities, especially due to the highly technical nature of some clean energy projects, which may create a high barrier to entry for local contractors.

Agricultural land conversion

Rural community residents expressed concern about losing local control over land use, and with it the weakening of the social fabric. Multiple interviewees, public meeting attendees, and website commenters expressed concern over losing agricultural and farmland to clean energy projects. Multiple participants spoke about the amount of farmland already converted to solar energy projects and expressed concern over continued conversion.

Individuals said that in addition to farmland conversion, other issues include the loss of farm jobs on a large scale, the inability of traditional farms to compete with clean energy projects, and the disparity in land values for traditional farms and neighboring areas with clean energy projects. Some individuals also noted concerns for farmers who do not own land and rent acreage for agricultural operations. These individuals suggested that tenant operators may not benefit financially from clean energy leasing agreements the way that landowners would and could risk losing their operations and any associated jobs if their land were leased for a clean energy project.[16] Community members expressed concern that the process today increases income inequality in rural areas and that the role of EFSEC in the system is counterproductive.

Energy costs and lack of local economic benefits

Some community members suggested that the state's energy system is not designed to provide lower energy costs for communities where energy is generated. Those who recognized that some communities are getting paid through direct payments or mitigation efforts have proposed that funds or mitigation payments may not address other concerns about impacts to local culture, ways of life, or environmental impacts, while other participants questioned the overall economic benefits of clean energy.

[16] In 2022, approximately 22% of state cropland acres were operated by tenant farmers who rent all the land they operate, 55% were part owners who operate part of their own land and rent additional land from a landlord, and the remainder (23%) were full owners who own all the land they operate. Pastureland had slightly lower rental rates: 9% of acres were tenant farmers, 41% were part owners, and 50% were full owners. Source: USDA. 2022 Census of Agriculture. Accessed via NASS at: https://quickstats.nass.usda.gov/results/95F07628-C0E0-37BB-A820-3833D22565BB

There was consistent concern among participants about private versus public investment, and tax dollars going to the development of clean energy projects. This was expressed by a Yakima resident, who said, "Our tax dollars are going to this project, and we see no benefit in it."

Multiple rural residents raised other concerns about schools losing levy money each year as tax values shift. Still others focused on the challenges the current model establishes for local, community-scale utilities. Several commenters noted the lack of training, preparation, and infrastructure in small towns and among local utilities, which often results in missing grant opportunities due to lack of staff or awareness.

Benefits and opportunities

Community benefits

Hydropower Relicensing – direct local benefits. An example of local benefits for energy projects is the Federal Energy Regulatory Commission (FERC) relicensing for federally operated dam projects. Relicensing requires dam operators to demonstrate real community benefits (recreation, employment, etc.).

Rural community members discussed a range of benefits from clean energy projects (i.e., benefits typically considered as within the county area, directly stemming from the project construction and operation). Some individuals discussed the potential for increased local tax revenue from clean energy projects, and how those could benefit the larger community through the support of tax levies (e.g., hospitals, emergency medical services). Others focused on potential mitigation payments and benefits associated with increased developer presence in rural communities. An individual suggested providing electric vehicle (EV) charging infrastructure as one avenue to economic development, particularly for attracting tourism. Some participants observed that areas around hydropower projects receive community benefits as part of these projects.

While many respondents did not think that there were many long-term jobs associated with clean energy projects, some discussed the socioeconomic impacts associated with longer-term post-construction jobs. An attendee at a public meeting in Dayton spoke about the ongoing local jobs that were created by wind farms. Additionally, one participant claimed that clean energy is the cheapest source of energy and is starting to become an economic reality. Others point to the benefit of local spending of lease payments by landowners in the communities in which they live.

Clean energy industry development
For some individuals, the embrace of clean energy development creates a fertile environment for start-up companies seeking to build a clean energy economy. Clean energy development, according to some feedback, attracts investments and jobs, making Washington more competitive during the transition to a clean energy economy. It also provides revenue and infrastructure improvements to rural communities seeking to diversify their economies.

Individual and family benefits
Some individuals mentioned the potential for reducing household energy costs, while others focused on landowner benefits from lease payments. Some attendees in Dayton echoed those sentiments, suggesting that landowners can benefit from clean energy leases, especially when clean energy projects complement, instead of replace, agriculture and ranching.

A participant stated that landowners hosting clean energy infrastructure benefit because they can keep the land for agricultural use and avoid other types of development. Solar panels and wind turbines can exist simultaneously with farming and ranching while providing additional revenue to the landowner. One landowner in Dayton spoke about wind turbines on their family's property that are 20 years old that have been repowered by exchanging original blades with larger ones. Their payments increased significantly with the larger blades due to added energy production.

Proposed solutions from study participants

Community benefit agreements

Interviewees and public meeting attendees provided multiple observations regarding the potential for positive and negative impacts of clean energy on rural communities. An overarching theme was that more work is needed to ensure that local communities receive benefits from the clean energy projects in their areas.

Community Benefit Agreements (CBAs) were consistently suggested as a tool for developers to use when negotiating with rural communities. CBAs are agreements signed by communities and a developer that identify a range of benefits the developer agrees to provide in return for project support. Multiple individuals mentioned that CBAs could be used to provide rural communities with investments they need to support clean energy projects.

Revising tax procedures and rates

According to many community members, one solution to challenges and concerns with clean energy in rural areas is to change the current taxation scheme, which many feel is unfair. Multiple ideas and proposals were discussed during interviews, focus groups, and public meetings, particularly from county assessors and treasurers.

Some of these proposals included a consistent assessment method in which the state would assess all large projects, changing the categorization of wind and solar equipment (currently considered "personal property" instead of "real property"), and alternative tax or payment designations altogether (e.g., a specific tax structure for projects, such as payments in lieu of taxes). Many individuals emphasized the desire for projection taxation to reflect the nature of equipment and structures, while allowing individuals and communities to rely on more consistent tax rates over a longer period (as opposed to personal property tax rates, which depreciate in assessed value annually).

Some community members mentioned that the voluntary production excise tax bill (Chapter 427, Laws of 2023) could address this issue and provide a local stimulus by exempting projects from the state portion of personal property tax and redistributing it to the applicable county, school district(s), and tribe(s). Some focus group attendees expressed concerns about the bill's language, saying that it takes agency away from counties for how to allocate funds.[17] There was also confusion about what portion of personal property taxes can be exempted; Washington Department of Revenue (DOR) confirmed it is solely the state portion.

An attendee at a public meeting suggested that the state could adopt a model established by Oregon that "requires the utility to provide a stable tax benefit to the community." The consultant team assumes this attendee was referencing Oregon's fee in lieu of property taxes for qualifying solar projects program, passed in 2015, in which solar projects pay an annual flat fee of at least $5,500 and up to $7,000 per MW instead of

[17] "Supporting Clean Energy through Tax Changes That Increase Revenue to Local Governments, Schools, and Impacted Communities," Pub. L. No. House Bill 1756 (2023), https://lawfilesext.leg.wa.gov/biennium/2023-24/Pdf/Bills/Session%20Laws/House/1756-S.SL.pdf?q=20240806153515.

property taxes.[18] The program expired on January 2, 2022. Oregon also has a Strategic Investment Program that offers a tax exemption on a portion of large capital investments (including those by clean energy developers) and requires businesses to pay a community service fee to the county instead.[19]

Clean energy jobs

As one community member said, "Jobs are number one." One interviewee compared the experience of rural communities with the timber economy, stating, "For years it was jobs versus environment, manufactured by resource extraction companies. It was a trick – the timber industry left us with neither jobs nor the environment." The individual suggested avoiding this choice and instead illustrating that a clean energy economy can benefit both people and the environment. Several community members emphasized the potential for increased local employment during project construction and operation if developers and communities could agree to require — or at minimum favor — hiring from the local labor pool.

Others spoke about the expectations of job creation for people in the region. They emphasized that people would expect that if a clean energy project converted land that would otherwise be a source of employment (primarily agricultural land), the number of jobs created for clean energy should at least equal the number of jobs displaced.

One individual suggested that a way to support local jobs is to support trade school programs to help people work in the clean energy industry. They also suggested that the state should encourage clean energy manufacturing in rural areas (e.g., a solar panel fabrication plant) so there is local economic value.

Another community member suggested establishing a program where people can see a clear career path, without need for previous experience or training, as part of the effort to combat climate change and establish a clean energy economy.

Finally, during the public meeting in Zillah, the consultant team received feedback that many decisions are made without farmworkers' voices. Attendees suggested that it would be beneficial to talk to the farmworkers about developing a clean energy labor force. They also suggested that organizations that have relationships with the farmworker community should be a link between farmworkers and decision makers on clean energy projects.

Economic analysis

Methodology

The consultant team analyzed the economic and financial impacts of utility-scale clean energy projects developed and operated in rural communities in Washington since 2019. The analysis quantified the distribution and magnitude of economic impacts of these activities to inform recommendations for how the costs and benefits could be more equitably distributed to, among, and within rural communities.

This analysis examined:

- Direct, indirect, and induced jobs in construction and operations

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[18] "Relating to Taxation of Solar Projects; and Prescribing an Effective Date.," Pub. L. No. HB 3492 (2015).
[19] Business Oregon, "Strategic Investment Program," n.d., https://www.oregon.gov/biz/programs/sip/pages/default.aspx.

- Financial returns to property owners
- Effects on local tax revenues and public services
- Effects on other rural land uses, such as agriculture, natural resource management and conservation, and tourism
- Geographic distribution of large energy projects previously sited or forecast
- Potential forms of economic development assistance and impact mitigation payments
- Relevant information from the 2023 Washington State University Least-Conflict Solar Siting project in the Columbia Basin area

The Rural Clean Energy Study details the evaluation of the economic and financial effects of siting large energy projects in rural areas. This section provides information on methods and scope. The consultant team undertook a case study approach and examined nine projects in depth, along with state-level data for additional tasks where applicable. The case study approach was vetted with representative interests during individual and group interviews prior to full implementation.

The study also provides recommendations for how policies, projects, and investment programs, including energy facility siting through EFSEC, can be developed or amended to distribute costs and benefits more equitably to rural communities.

Appendix A provides additional detail on data sources. Appendix B presents all of the individual case studies.

Analytical process

In Appendix A, Figure A2 provides a visual illustration of the general economic analysis process, and Table A4 provides a summary of the analysis, including key data sources and analytic steps. The analysis prioritized developing quantified estimates, where feasible. When data limitations (as described in Table A14 in Appendix A) prevented quantifying impacts, the analysis describes impacts qualitatively.

Temporal scope

The temporal scope of the economic and financial analysis is generally 2019 through 2029. Projects that are currently operating, progressing towards operation, or planned to be developed within this range were considered. The consultant team also included the Tucannon River Wind Farm, constructed in 2014, as a case study project, because it was identified as a key example project by Commerce and collaborators.

Geographic scope

The geographic focus of the economic analysis was rural Washington. To define rurality, the consultant team used the United States Department of Agriculture's (USDA) 2010 Rural Commuting Area (RUCA) Codes and all areas within the Columbia Plateau.[20]

Under the RUCA Codes, rural and urban areas are defined at the census tract level based on commuting patterns of residents, specifically by the size and direction of the primary (largest) commuting flows.[21] For purposes of this analysis, rural areas are defined as census tracts with a RUCA code higher than 3 (i.e., any non-metropolitan area). Based on RUCA data, approximately 13% of the population of Washington (or slightly below one million people) reside in rural census tracts, and 66% of the land area in the state falls within these

[20] United States Department of Agriculture (USDA), "Rural-Urban Commuting Area Codes," July 2010, https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/.

[21] The USDA also publishes Rural Urban Continuum Codes (RUCC). These are available at the county level and produce similar results to the RUCA codes. However, the RUCA data is available for census tracts, which makes it more applicable for this analysis.

rural census tracts. See **Table A6** and **Table A7** in Appendix A for the USDA RUCA codes and their corresponding definitions as well as the breakdown of counties by code.

Energy project scope

This analysis is generally focused on utility-scale (greater than 1 megawatt (MW) of installed capacity) clean energy projects constructed or proposed in Washington since 2019. The analysis considered a wide range of clean energy technologies, including solar photovoltaic (PV), on- and off-shore wind, battery energy storage system (BESS), biomass and biofuels, hydropower, and nuclear.[22] However, a number of these technologies (nuclear, hydropower, and offshore wind) have not had projects constructed since 2019 and thus no projects using those technologies were evaluated in detail.

The consultant team identified clean energy projects using data from two primary sources, U.S. Energy Information Administration (EIA) Form 860 and EFSEC project websites, supplemented by additional projects identified from the Bonneville Power Administration (BPA) Interconnection Queue[23] and Northwest Power and Conservation Council Power Plant Database.[24] In total, our review identified 20 study projects, including 10 operating and 10 planned or proposed projects. The consultant team then consulted with Commerce to select a subset of nine projects for detailed assessment based on the criteria in **Table 2**.

[22] The analysis does not include transmission infrastructure projects, regardless of size.

[23] Review of the BPA Interconnection Queue yielded two operating projects: Juniper Canyon 2 Solar and Qualco Biofuel Project, however, it is possible that this list includes additional planned projects not included in this analysis. For example, there were 117 existing interconnection requests associated with clean energy technologies submitted to the BPA between August 2018 and August 2024 with an aggregate capacity of almost 50,000 MW. **Tables A8** and **A9** in Appendix A summarize the total number of BPA interconnection requests and total requested capacity by county and technology. However, while some submitted interconnection requests identify the point of interconnection, capacity, and technology, the majority of requests do not include the project name, the requesting utility and/or developer, project acreage, or geographic location beyond the project county. In addition, there also may be duplicate requests associated with multiple interconnection requests that contain the exact same project information. With these limitations in mind, the consultant team was able to identify two projects from the BPA Interconnection Queue (Juniper Canyon 2 Solar and Qualco Biofuel Project) with a sufficient level of project-specific information to include in the list of 20 study projects.

[24] NW Power and Conservation Council Power Plant Database, n.d., https://www.nwcouncil.org/energy/energy-topics/power-supply/map-of-power-generation-in-the-northwest/

Table 2. Project inclusion criteria for detailed economic and financial analysis

Criteria	Consideration and rationale
Geographic and Temporal Scope	Projects must meet the geographic (rural areas) and temporal scope (2019-2029).
Data Availability	Projects without adequate data (e.g., potential project acreage) will not be feasible to consider the potential economic and financial impacts.
Size	Projects must be utility-scale and at least 1 MW or less than 1 MW with storage.
Geographic Distribution	Projects should represent a diverse and dispersed number of areas across the state.
Technological Diversity	Projects will represent a diverse set of technologies.
Rurality	Projects will be sited in a rural area, or the Columbia Plateau. (Note: most projects in the inventory were screened for this prior to determining their inclusion in the analyses.)
Specific Major Projects	Projects identified by Commerce or other collaborators that are specifically highlighted for inclusion.

Table 3 presents the list of 20 study projects, with the nine clean energy projects selected for detailed economic and financial analysis bolded.

Table 3. Selected Projects for Detailed Economic and Financial Analysis

Project	Technology	Capacity	Status	Year	County
Arlington Microgrid	PV+BESS	1.5 MW	Operating	2019	Snohomish
Badger Mountain Solar	PV+BESS	400 MW	Planned	2025	Douglas
Carriger Solar Project	PV+BESS	160 MW	Planned	2025	Klickitat
Columbia Solar	PV	15 MW	Operating	2022	Kittitas
Desert Claim Wind Power Project	Wind	100 MW	Planned	2028	Kittitas
Goose Prairie Solar	PV	80 MW	Under construction	2024	Yakima
High Top Solar	PV	80 MW	Planned	2025	Yakima
Hop Hill Solar	PV+BESS	1,000 MW	Planned	2025	Benton
Horn Rapids Solar, Storage and Training	PV+BESS	4 MW	Operating	2020	Benton
Horse Heaven Clean Energy Center [a]	Wind, PV+BESS	975 - 1,150 MW	Planned	2025	Benton
Juniper Canyon 2 Solar	PV	90 MW	Operating	2020	Klickitat
Lund Hill Solar	PV	150 MW	Operating	2022	Klickitat
McKinley Paper Company – Washington Mill	Biomass	13 MW	Operating	2022	Clallam
Ostrea Solar	PV	80 MW	Planned	2025	Yakima
Qualco Project	Biofuel	3 MW	Operating	2021	Snohomish
Rattlesnake Flat	Wind	144 MW	Operating	2020	Adams
Saddle Mountain East Wind Farm	Wind	126 MW	Planned	2025	Adams
Skookumchuck Wind Facility	Wind	136 MW	Operating	2020	Lewis
Tucannon River Wind Farm [b]	Wind	267 MW	Operating	2014	Columbia
Wautoma Solar	PV+BESS	940 MW	Planned	2025	Benton

[a] As of July 2024, the total capacity of the proposed Horse Heaven Clean Energy Center project was unclear. To reflect this uncertainty, the consultant team performed its analysis for a range of proposed project sizes discussed between EFSEC and Washington state governmental officials.
[b] While the Tucannon River Wind Farm was constructed before 2019, the project was identified as a key example project by Commerce and collaborators and is included as a case study project.

Findings: Geographic distribution of large energy projects

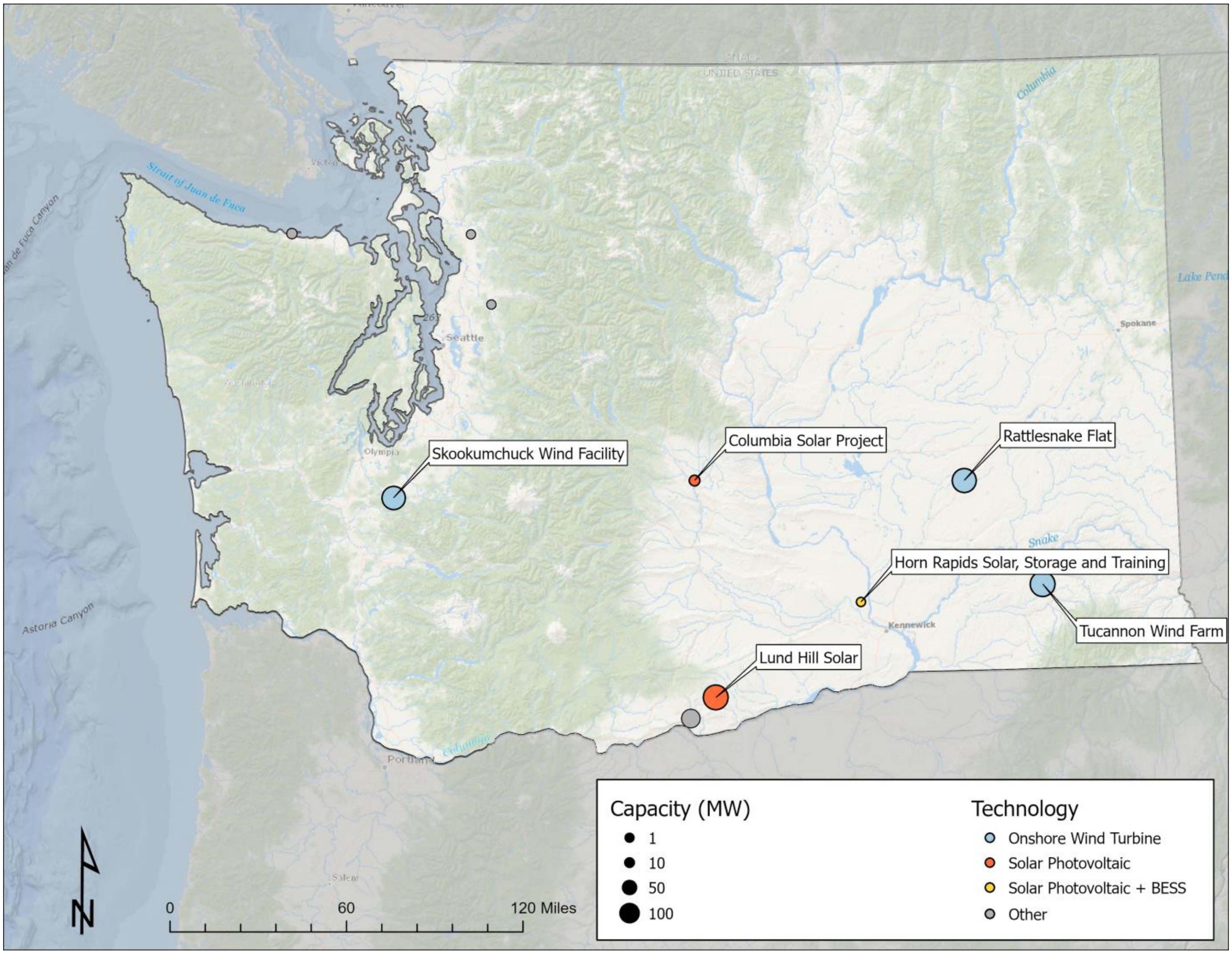
Background

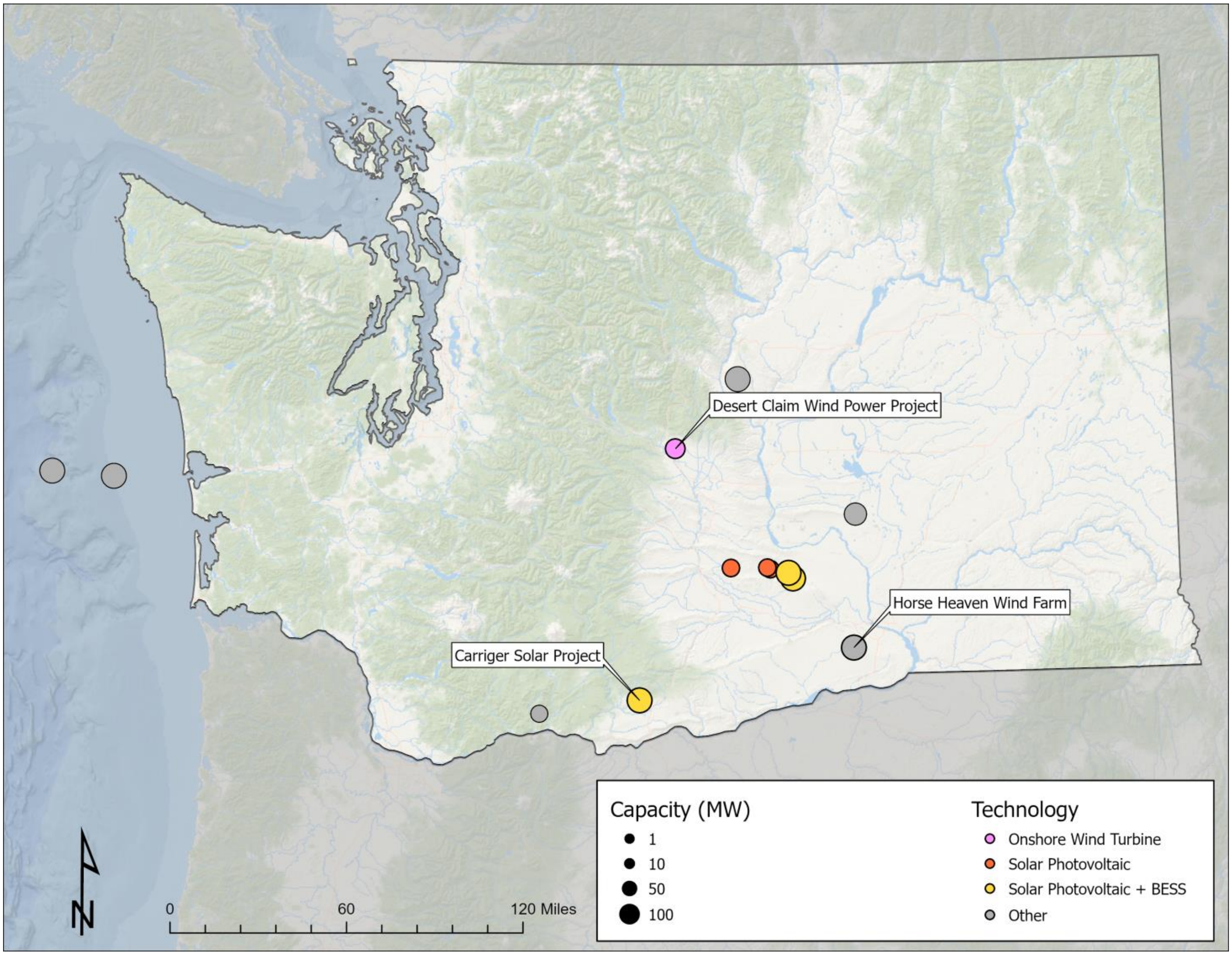
Rural communities affected by clean energy development in Washington raised concerns that projects are disproportionately located in rural areas and that such projects may unfairly increase the economic burden placed on residents of these communities without providing many local benefits. This section describes the location of existing and planned clean energy projects in Washington and evaluates how these projects vary by characteristics including technology, size, and acreage.

Project characteristics and geographies

As discussed in the previous section, the consultant team identified 20 projects developed since 2019, including 10 operating and 10 planned or proposed projects. In this section, the consultant team examined the geographic distribution of these 20 clean energy projects by mapping operating and planned projects based on the criteria described in **Table 2 (above)**. The consultant team catalogued project characteristics and used U.S. Census American Community Survey (ACS) data to observe any differences in community characteristics where projects are located. Recent utility-scale projects have generally been located east of the Cascades with clusters in the south-central area. **Figure 1** shows the location of the projects considered in this analysis. Only the nine case study projects, which include both planned and operating projects, are labeled.

Figure 1. Geographic distribution of operating (top) and planned (bottom) study projects





To date, wind projects have been more common in Washington than solar energy projects; however, recent years have seen an increase in siting and development of solar energy projects. As shown in **Table 4**, the majority of the study projects (12 of 20) are or will be sited in rural areas. Notably, most of the solar projects include or plan to include battery storage as well. Batteries appear less common for wind projects. The planned or proposed projects do not appear to be sited in distinctly different or new geographic areas compared to existing operating projects. As shown in **Table 5**, four counties host projects with over 100 MW already operating.

Table 4. Study project characteristics

Technology	Number of Operating Projects	Number of Planned or Proposed Projects	Total Number of Projects	Number of Rural Projects [a]	Average Capacity (MW)	Average Gross Acreage
Solar Photovoltaic	3	3	**6**	3	83	1,016
Solar Photovoltaic + BESS	2	4	**6**	4	428	3,018

Technology	Number of Operating Projects	Number of Planned or Proposed Projects	Total Number of Projects	Number of Rural Projects [a]	Average Capacity (MW)	Average Gross Acreage
Onshore Wind Turbine	3	2	**5**	4	155	15,975
Solar Photovoltaic + Onshore Wind Turbine + BESS	-	1	**1**	--	1,450	72,000
Other technology b	2	0	**2**	1	8	--
Total	**10**	**10**	**20**	**12**	**--**	**--**

[a] As described above, rural is defined using USDA RUCA codes.
[b] The "Other" category includes one operating biomass project (McKinley Paper Company – Washington Mill) and one operating biofuel project (Qualco Project).
Source: IEc analysis of projects identified in EIA Form 860 (Annual Electric Generator Report 2023, https://www.eia.gov/electricity/data/eia860/), EFSEC project websites (https://www.efsec.wa.gov/energy-facilities) and other data sources including regional electrical planning documents (e.g., Bonneville Power Administration Interconnection Queue, NW Council Power Plant Database).

Table 5. Utility scale projects by county (in-scope projects only)

County	Number of Operating Projects	Number of Planned or Proposed Projects	Total Number of Projects	Total MW Capacity (Operating)	Total MW Capacity (operating and planned)
Adams	1	1	**2**	144	270
Benton	1	3	**4**	4	3,400
Clallam	1	--	**1**	13	13
Columbia	1	--	**1**	267	267
Douglas	--	1	**1**	--	400
Kittitas	1	1	**2**	15	115
Klickitat	2	1	**3**	240	463
Lewis	1	--	**1**	136	136
Snohomish	2	--	**2**	5	5
Yakima	--	3	**3**	--	240
Total	**10**	**10**	20	**823**	**5,302**

[a] This table only includes counties in Washington with at least one clean energy project within the scope of the study; 29 counties have zero.[25]
Sources: IEc analysis of projects identified in EIA Form 860 (Annual Electric Generator Report 2023, https://www.eia.gov/electricity/data/eia860/), EFSEC project websites (https://www.efsec.wa.gov/energy-facilities) and other data sources including regional electrical planning documents (e.g., Bonneville Power Administration Interconnection Queue, NW Council Power Plant Database).

Community context

Table A10 in Appendix A compares the demographic characteristics of census tracts that intersect case study projects, all in-scope projects (i.e., projects built or planned since 2019) and the state. Examined census tracts

[25] Washington State Office of Financial Management, "County and City Data," September 6, 2023, https://ofm.wa.gov/washington-data-research/county-and-city-data.

had a slightly higher median income ($91,806) compared to the state median income ($90,325), along with a lower percentage of the population below the poverty line (7.2% vs. the state's 9.9%) and or unemployed (2.8 percent compared to the state's 3.2 percent).

Residents of the census tracts containing projects had a different racial and age distribution than the rest of the state. Of residents within project census tracts, 17.7% were over 65 years old (compared to the state at 16%) and only 21.1% of the population identified as other than white and non-Hispanic (vs. the state's 34.5%).

The census tracts in the study area also exhibit higher percentages of the population with less than a high school diploma or equivalent (9.9%) and without health insurance (12.0%) compared to the state (7.9% and 9.2%, respectively). The study area census tracts experienced more population growth from 2012 to 2022 (47.8%) relative to the state average (14.1%).

Finally, residents of the study census tracts were more likely to spend a greater percentage of their income on energy costs; the population-weighted average energy burden for the study area census tracts was 2.2%, while the state average is 1.5%.

Forecast of projects needed to meet clean energy goals

The consultant team relied on CETI's deep decarbonization pathways study Net-Zero Northwest: Technical and Economic Pathways to 2050 (NZNW), released June 2023,[26] for a forecast of the potential requirement for siting clean energy projects in rural areas of the state. The NZNW analysis uses a modeling approach consistent with the Washington 2021 State Energy Strategy[27] and incorporates more recent information on costs and technologies. The consultant team also referenced technical potential and supply curve data from the National Renewable Energy Laboratory (NREL)[28] to examine solar and wind capacity by county.

Additional solar and wind capacity to meet growing electricity demand

The NZNW study modeled energy pathways to meet net-zero emissions by 2050 in Idaho, Montana, Oregon, and Washington. The study incorporated state-specific policies, including Washington's interim 2030 emissions target (45% reduction by 2030 from 1990 levels), and CETA for the state's electricity sector (greenhouse gas emissions neutral by 2030 and 100% clean by 2045).

The NZNW study — as with other deep decarbonization studies — found that using clean electricity to power as many buildings, transportation, and industrial processes as possible is the most efficient and economical way to decarbonize. This is because electricity is inherently more efficient than fossil fuels in many applications in the economy, notably vehicle motors and heating in buildings.

New loads from electrification and fuels production would drive large investments in clean energy resources to generate electricity. **Table 6** below shows the NZNW results for electricity generation capacity in Washington in 2021 (the study's baseline year), 2030, and 2050. **Figure 2** shows the generation graphically in 2021-2050.

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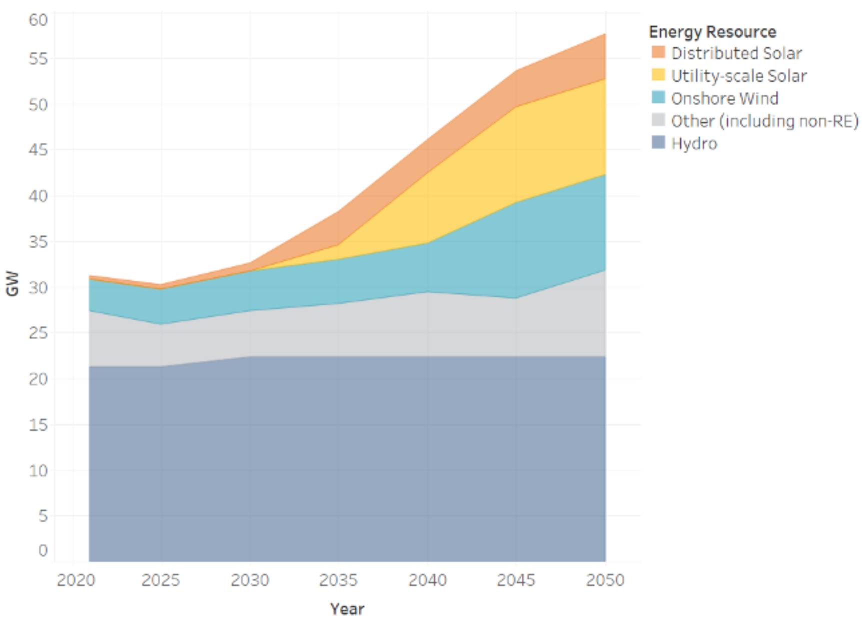
[26] Clean Energy Transition Institute, "Net-Zero Northwest: Technical and Economic Pathways to 2050 (NZNW)," June 2023, https://www.nznw.org/.
[27] Washington State Department of Commerce, "Washington 2021 State Energy Strategy" (Washington State Department of Commerce, 2020), https://www.commerce.wa.gov/growing-the-economy/energy/2021-state-energy-strategy/.
[28] "National Renewable Energy Laboratory (NREL)," n.d., https://www.nrel.gov/.

Table 6. Electricity generation capacity (GW) in Washington on the path to net-zero emissions

Resource	2021	2030	2050	Change 2021-2050
Nuclear	1.2	1.5	1.1	0.0
Hydro	21.3	22.4	22.4	1.1
Gas	3.3	3.0	7.9	4.6
Other	1.4	0.1	0.1	-1.3
Grid-scale PV Solar	0.0	0.0	10.4	10.4
Distributed PV Solar	0.4	1.0	4.9	4.4
Onshore wind	3.4	4.3	10.4	7.1
Storage	0.3	0.3	0.3	0.0
Total	**31.3**	**32.6**	**57.6**	**26.4**

Source: Net-Zero Northwest: Technical and Economic Pathways to 2050, June 2023. https://www.nznw.org/energy

Figure 2. Electricity Capacity in Washington on the Path to Net-Zero Emissions



Source: Net-Zero Northwest: Technical and Economic Pathways to 2050, June 2023. https://www.nznw.org/energy

According to the NZNW study, Washington would need to build approximately 15 GW of solar (10.4 of grid-scale and 4.4 of distributed), as well as 7 GW of onshore wind. For context, the NZNW study found that other states in the Northwest would also build significant clean energy capacity, as seen in **Table A11** and **Table A12** in Appendix A. For example, Oregon would build approximately 15 GW of solar, and Idaho, Montana, and Oregon would all build more wind generation capacity than Washington (11 GW, 55 GW, and 10 GW respectively).

Potential capacity, capacity factor, and levelized cost of energy (LCOE) for solar and wind resources

The NZNW study identified the amount of wind and solar resources that would need to be developed in Washington to meet the state's climate and energy transition requirements at lowest cost, but the study did not identify the level of development in specific locations or regions in the state. To provide a rough estimate of development potential in individual areas, the study team referenced datasets from the National Renewable Energy Laboratory (NREL) that characterize the quantity and quality of various energy resources to examine the potential available capacity of distributed solar, utility-scale solar, and land-based wind capacity by county.

The analysis presented here does not attempt to predict or assign the specific locations where wind and solar resources would be built to meet the NZNW amounts. Many factors would figure in those siting selections.

The figures in the section below present the following for solar and land-based wind:

- **Potential capacity:** Maximum amount of electricity (in MW) that could be generated.
- **Average capacity factor:** The ratio of actual energy output to the maximum theoretical energy output. A higher capacity factor means a higher quality clean energy resource (e.g., a stronger wind resource in a particular area).
- **Levelized Cost of Energy (LCOE):** A summary metric that combines technology cost with capital and operations expenditures, as well as capacity factor. LCOE is a way to measure the average cost of generating energy over the lifetime of a resource. In the following calculations, the consultant team excluded data for which the LCOE was above $100/MWh, as that cost would likely be prohibitive to development.

Additionally, the NREL datasets include two access levels that vary the land use restrictions for onshore wind and utility-scale solar, as seen in Figures 4 through 7 below:

- Reference access: Applies a range of land area exclusions and is used by default in NREL's capacity expansion modeling.
- Limited access: Applies multiple additional exclusions of locations of geographic locations to reflect a more restrictive approach to siting clean energy facilities.[29]

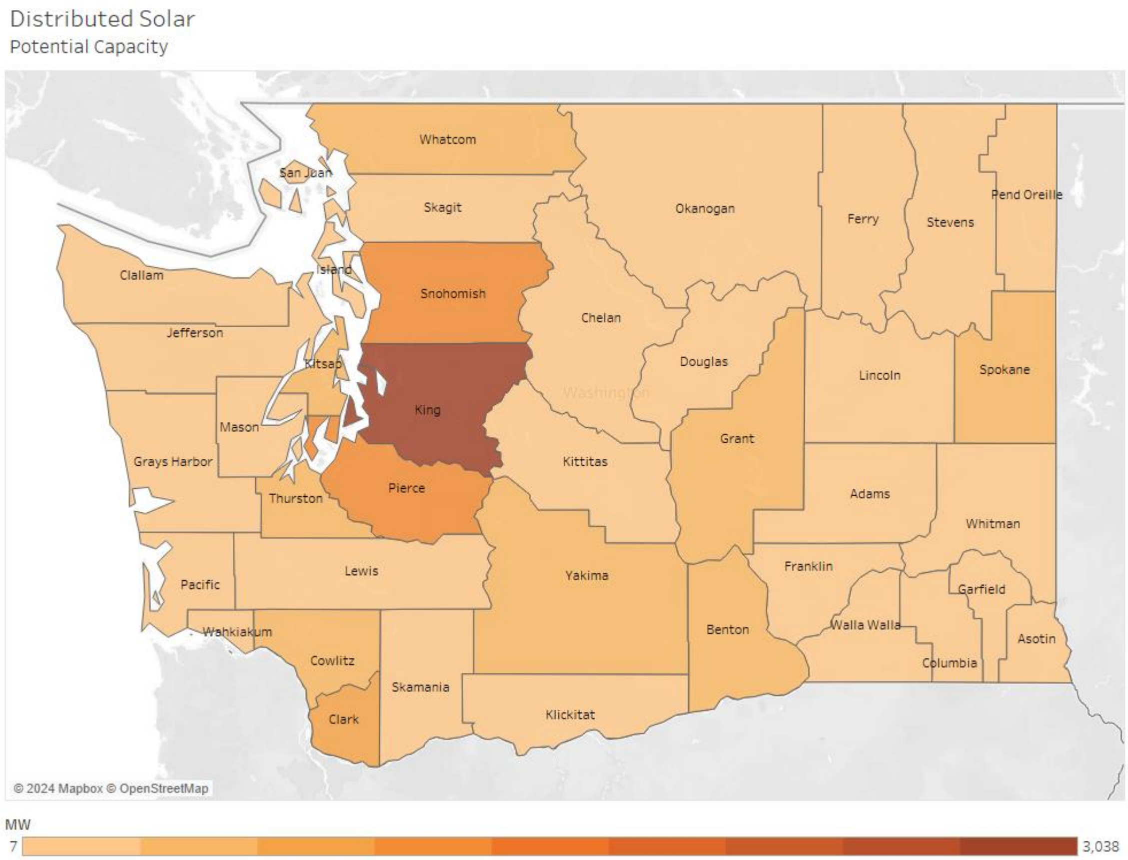
Distributed solar

Figure 3 shows the potential capacity for distributed solar (i.e., rooftop solar), in megawatts (MW), in Washington counties.[30] In this map, residential and commercial rooftop solar are combined for approximately 12,500 MW of potential distributed solar capacity in the state. Since the potential capacity depends on the number of available rooftops, there is higher capacity shown in more densely populated counties, such as King, Pierce, and Snohomish counties.

[29] Land Use and Turbine Technology Influences on Wind Potential in the United States, Energy (2021), section 2.4, https://doi.org/10.1016/j.energy.2021.120044

[30] The consultant team calculated potential capacity for distributed solar based on two NREL datasets. Technical generation potential data are from the State and Local Planning for Energy tool (https://maps.nrel.gov/slope), and capacity factors are taken from the NREL Solar Supply Curve (reference access) at county-level averages (https://www.nrel.gov/gis/solar-supply-curves.html). One caveat for this approach is that capacity factors for distributed solar photovoltaics are typically below factors for utility-scale photovoltaics. Thus, the estimates of potential capacity for distributed solar may be underestimated.

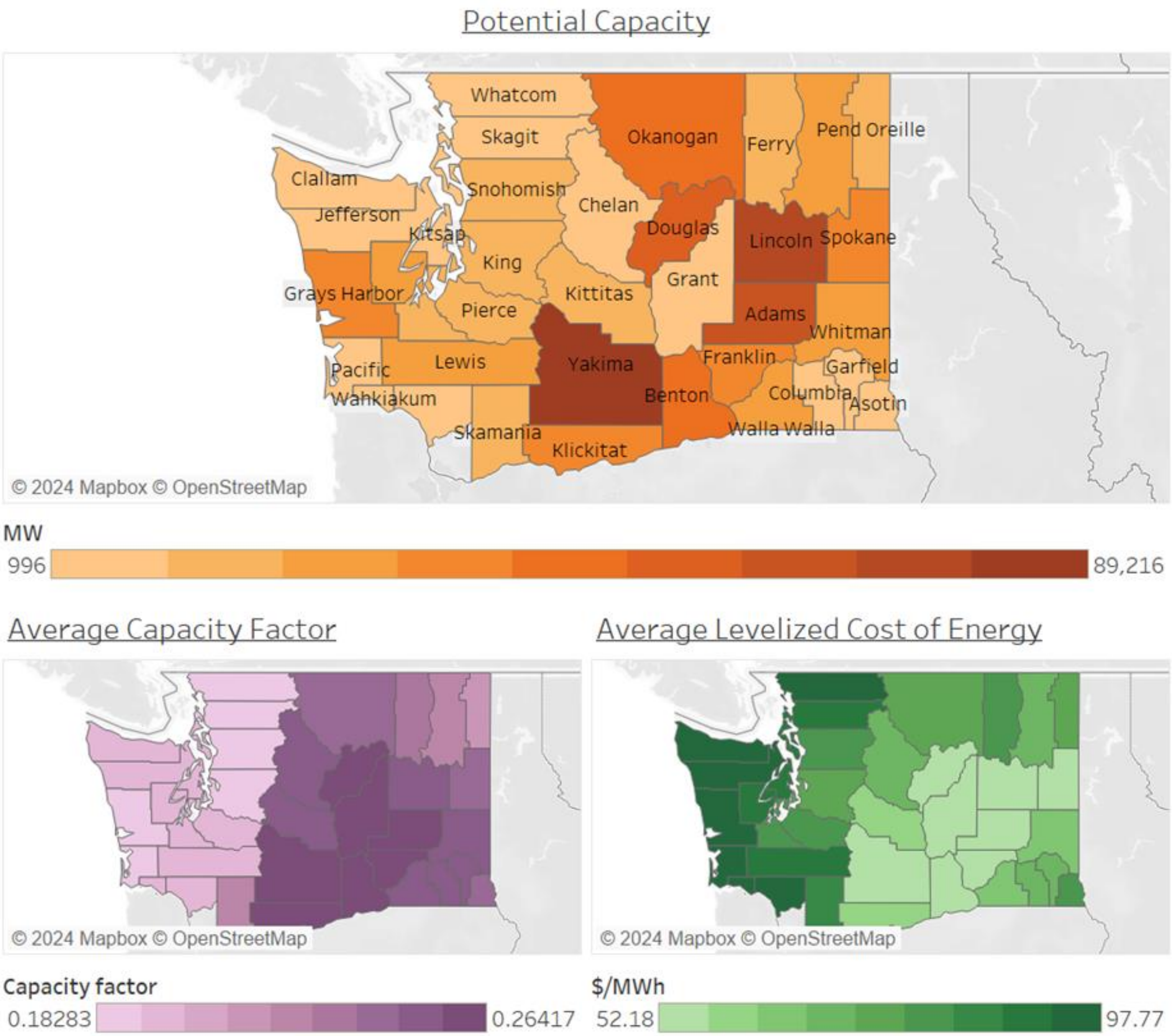
Figure 3. Distributed Solar Potential Capacity



Source: National Renewable Energy Laboratory. "Residential Rooftop PV" and “Commercial Rooftop PV,” State and Local Planning for Energy, accessed 9/17/2024, https://maps.nrel.gov/slope.

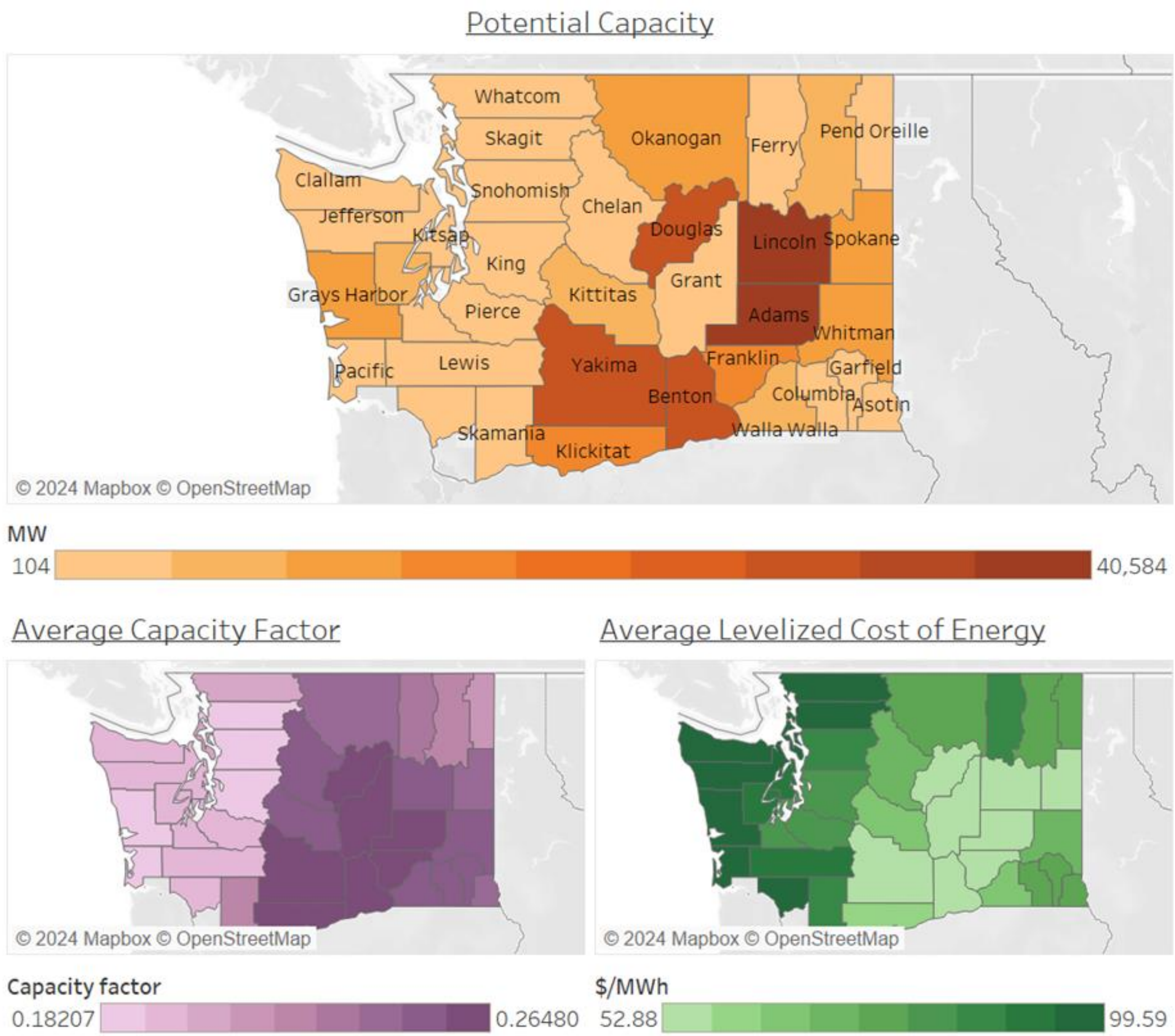
Figures 4 and **5** show the potential capacity, average capacity factor, and LCOE for utility-scale solar in the Reference and Limited Access levels. The Reference Access level finds nearly 817,000 MW of potential utility-scale solar capacity in the state, while the Limited Access level finds approximately 308,000 MW. Both figures highlight the higher-quality wind resources located in the eastern part of the state.

Figure 4. Utility scale solar potential capacity, capacity factor, and average LCOE: Reference Access Level



Source: NREL (National Renewable Energy Laboratory). Solar Supply Curve. n.d., https://www.nrel.gov/gis/solar-supply-curves.html

Figure 5. Utility scale solar potential capacity, capacity factor, and average LCOE: Limited Access Level

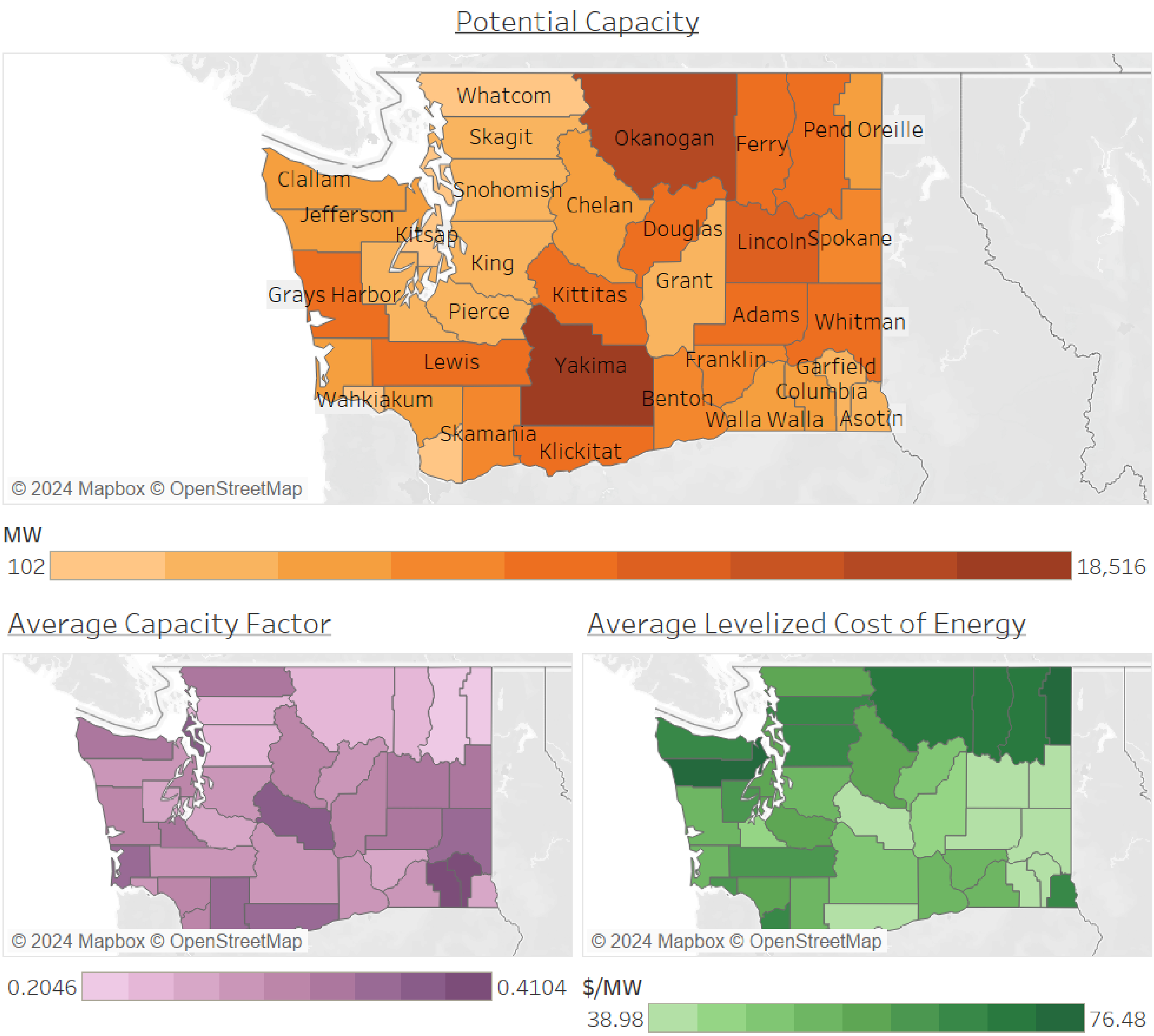


Source: NREL (National Renewable Energy Laboratory). Solar Supply Curve. https://www.nrel.gov/gis/solar-supply-curves.html

Land-based wind

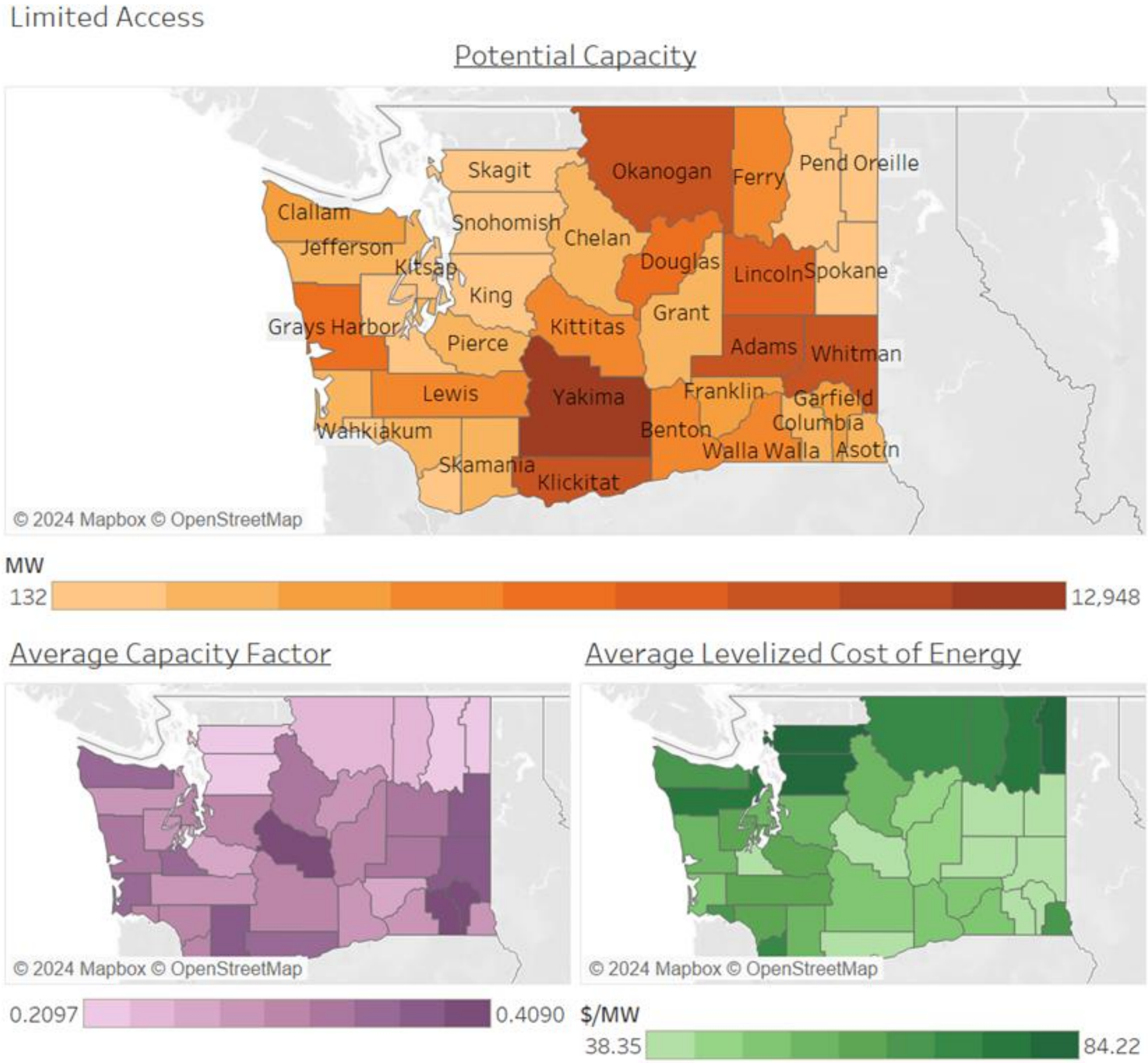
Figures 6 and **7** show the potential capacity, average capacity factor, and LCOE for land-based wind in the Reference and Limited Access levels. The Reference Access level finds approximately 397,000 MW of potential land-based wind capacity in the state, while the Limited Access level finds approximately 376,000 MW.

Figure 6. Land-based wind potential capacity, capacity factor, and average LCOE: Reference access level



Source: NREL (National Renewable Energy Laboratory). Wind Supply Curve. n.d., https://www.nrel.gov/gis/wind-supply-curves.html

Figure 7. Land-based wind potential capacity, capacity factor, and average LCOE: Limited Access Level



Source: NREL (National Renewable Energy Laboratory). Wind Supply Curve. https://www.nrel.gov/gis/wind-supply-curves.html

Comparison of available and required capacity

Table 7 compares the amount of solar and wind capacity identified in the NZNW study to the technical potential for each resource type. It shows that even with the Limited Access level of restrictions on renewable energy siting, the total potential capacity for each energy resource is higher than the target capacity required by 2050 in the NZNW study. The technical potential for distributed solar is almost three times the required amount identified in the NZNW study, and in the Limited Access case, the technical potential for utility-scale solar and land-based wind are each about 30 times the NZNW amount.

Table 7. Comparison of required solar and wind capacity from net-zero northwest with potential capacity

Resource	NZNW Target Capacity (2050) [MW]	Reference Access: Total Potential Capacity [MW]	Limited Access: Total Potential Capacity [MW]
Distributed Solar	4,872	12,479	n/a[31]
Utility-scale Solar	10,448	816,947	308,268
Land-based Wind	10,442	396,720	375,840

Sources: Net-Zero Northwest: Technical and Economic Pathways to 2050, June 2023. https://www.nznw.org/energy; National Renewable Energy Laboratory. "Residential Rooftop PV" and "Commercial Rooftop PV," State and Local Planning for Energy, accessed 9/17/2024, https://maps.nrel.gov/slope; NREL (National Renewable Energy Laboratory). Solar Supply Curve. https://www.nrel.gov/gis/solar-supply-curves.html; NREL (National Renewable Energy Laboratory). Wind Supply Curve. https://www.nrel.gov/gis/wind-supply-curves.html

Summary of findings

The consultant team identified 10 large-scale clean energy projects developed since 2019 and 10 projects in various planning stages, of which 90% (18 out of 20) are onshore wind or solar projects that are sited or planned to be sited in rural parts of the state. Recent clean energy development is typically located east of the Cascades with additional projects in south-central Washington. There are three rural counties that hosted recently constructed projects with over 100 MW of existing capacity. Proposed future capacity projects are in generally similar areas as currently operating projects.

Altogether, the economic analysis indicates that the populations of interest are not significantly different from the average state population in most ways. The more dissimilar statistics (e.g., percent of the population identifying as white and non-Hispanic, percent of the population with less than a high school diploma or equivalent) are generally reflective of the rural nature of most of the examined census tracts and are in line with other studies that have examined clean energy development across the country between urban and rural communities.[32]

However, the fact that these statistics are expected in rural areas does not detract from the social vulnerability they may signal; populations with less health insurance coverage, more aging populations, or higher energy burden may experience increased social vulnerability compared to communities without these characteristics.

[31] Rooftop solar would be installed on existing structures and therefore is not impacted by land area exclusions in the NREL Limited Access case.
[32] Kim Parker et al., "What Unites and Divides Urban, Suburban and Rural Communities," May 22, 2018, https://www.pewresearch.org/wp-content/uploads/sites/20/2018/05/Pew-Research-Center-Community-Type-Full-Report-FINAL.pdf.

In addition to examining recently developed and planned projects, the consultant team referenced the NZNW deep decarbonization pathways study, along with technical potential and supply curve data to forecast the potential requirement for siting clean energy projects in rural areas of the state.[33] The NZNW study found that by 2050 Washington would need to build approximately 15 GW of solar (10.4 of utility-scale and 4.4 of distributed renewable energy) and 7 GW of onshore wind to achieve net-zero emissions in the Northwest. There are many factors that dictate where within the state these resources would be located, and maps presented in this section illuminate the relative capacity in each county for distributed solar, utility-scale solar, and land-based wind.

[33] "National Renewable Energy Laboratory (NREL)."

Findings: Land use

Background

Some community members and other representative interests expressed concerns that clean energy projects may adversely affect local communities, both in terms of losses to productive lands for agriculture, as well as reductions in the attractiveness of the area to tourism, recreation, or other development activities. This section evaluates the impacts of clean energy development on land uses within the project lease areas for case study projects and discusses the likelihood of other effects on nearby land uses.

Changes in land use

Examining how land use has changed inside and outside leased areas for utility-scale clean energy projects can illuminate financial impacts on individuals, economic impacts on regional economic activity, and changes to an area's aesthetic appeal and character. The consultant team analyzed satellite imagery and USDA crop data to assess land use in project lease areas before and after development of utility-scale clean energy case study projects. This evaluation identified differences across projects, as well as important differences between impacts on land use within project lease areas for utility-scale wind versus solar energy projects.

Prior land uses

Prior to construction, case study project lease areas showed a variety of land uses, including crops, forest, pasture, and development. Half of the six operating case study projects – Rattlesnake Flat, Tucannon River Wind Farm, and Columbia Solar – are located on land that was primarily used for agriculture before construction. Of the 38,629 crop acres within the combined project lease areas across these three projects, USDA data suggests that 62.5% were active cropland producing winter wheat, spring wheat, peas, and small quantities of other crops.[34,35]

The land currently occupied by Tucannon River Wind Farm, while primarily used for agriculture, was open to public access for hunting, birdwatching, and other recreational activities, but with special rules and permits in place to ensure the safety of visitors.[36,37]

The land occupied by the Skookumchuck Wind Facility was used primarily for timber production. It is sited in a forest resource zone owned by Weyerhaeuser Timber, which farmed and harvested the area for lumber. These forested areas also provided recreational value through permits for non-motorized use.[38]

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[34] United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS), "2022-2023 Cropland Data Layer," January 31, 2024, https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.
[35] 2016 Land Cover, National Land Cover Database (NLCD), Multi-Resolution Land Characteristics (MRLC) Consortium. Accessed on May 23, 2023 at https://www.mrlc.gov/.
[36] "Register to Visit Tucannon," Portland General Electric. Accessed on April 24, 2024 at https://portlandgeneral.com/hunting-at-tucannon/register-to-visit-tucannon.
[37] "Access rules: Tucannon River Wind Farm, Hopkins Ridge Wind Facility & Marengo Wind Facility," Portland General Electric. Accessed on April 24, 2024.
[38] "Vail Permit Area Details," Weyerhaeuser. Accessed on April 24, 2024 at https://recreation.weyerhaeuser.com/Permits/Search/c15e15be-08df-4621-a09a-9abb827a8869.

Some projects, such as Lund Hill Solar[39] and Horn Rapids Solar, Storage, and Training, were sited on land that was considered unattractive for agriculture, forestry, and recreational uses, which helped avoid significant impacts to economically productive activities.

Post-construction impacts on land use

Once constructed, the studied wind and solar projects had very different levels of impact on land use within the project lease area with different changes in measured "developed" land (as shown in **Table 8**).

The case study analyses suggest that utility-scale wind energy development projects in Washington have had a relatively small footprint on surface lands, typically requiring usage of 2-4% of the total project area for project operations, with the remainder retaining its original land use.

Specifically, the study found that the infrastructure for the utility-scale wind projects in the study occupied between 390 and 480 acres, out of total project acreages that ranged from 10,000 to 25,000 acres. All three projects had relatively low percentages of previously developed land within the project footprint (1.4%, 0.6%, and 4.5%, respectively). Following construction, project infrastructure only occupied an additional 108 acres across all project footprint areas combined.

Land use changes pre- and post-construction were small given the small footprint of wind projects. Both wind projects sited on agricultural land experienced minimal reductions in harvested crop acreage. Skookumchuck Wind Facility, which is located on forested land, continues to allow timber harvest. Recreational activities within the project areas continue, with special rules and permits in place to ensure the safety of visitors and the projects themselves.[40,41]

In the case study analysis, solar projects required more land be developed than wind projects. Due to the density of required infrastructure and the need to establish a fence line surrounding solar project operations, the solar energy projects required conversion of most preexisting land uses within the fence line for development. While developers tout that the area under solar panels can be used for agriculture, residents often found this unrealistic due to the cramped space under raised panels.[42]

Solar projects are also occasionally accompanied by storage facilities. Although battery storage is typically located outside of the immediate project fence line, it is incompatible with other land uses and also requires converting to developed land. Across the case study projects, the consultant team found this to hold true. As shown in **Table 8**, 100% of the land within the footprint of solar energy case study projects (generally defined as the area within the fence line) was reclassified as "developed" after construction. Land use outside of the fence line but within the project lease area was unaffected.

In contrast with wind projects, most solar projects in the case studies were sited on land that was previously pastureland, barren, or already developed. As such, preclusion of use of these lands has not resulted in

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[39] Recent information shows that as of Spring 2024, Lund Hill Solar is hosting a pilot project to graze sheep at the solar farm. See: Kelly Pickerel, "Avangrid Hires 5,000 Sheep for Grazing on Two Solar Projects in the Pacific Northwest," Solar Power World, n.d.]
[40] Portland General Electric, "Register to Visit Tucannon," accessed April 24, 2024, https://portlandgeneral.com/hunting-at-tucannon/register-to-visit-tucannon.
[41] "Access rules: Tucannon River Wind Farm, Hopkins Ridge Wind Facility & Marengo Wind Facility," Portland General Electric. Accessed on April 24, 2024.
[42] Personal communication with Kittitas and Klickitat Counties.

substantial lost income to landowners for these projects. However, some planned developments are sited on currently active farmland, where lost farm profit for landowners could occur.

Table 8. Developed land acres within the project footprint[43] before and after project construction

Project	Project type	Pre-project (Acres, percent of total)	Post-project (Acres, percent of total)	Change (Acres, percent)
Columbia	Solar	0.5 (0.5%)	99.5 (100%)	+99 (+19,494%)
Horn Rapids	Solar	73 (100%)	73 (100%)	--
Lund Hill	Solar	3 (0.0%)	1,618 (100%)	+1,615 (+55,905%)
Tucannon River	Wind	226 (1.4%)	251 (1.6%)	+26 (+11%)
Skookumchuck	Wind	339 (4.5%)	341 (4.5%)	+2 (+0.7%)
Rattlesnake Flat	Wind	56 (0.6%)	135 (1.5%)	+80 (143%)
Total	--	696 (2.0%)	2,518 (7.3%)	+1,822 (262%)

Source: USDA NASS Cropland Data (2019, 2022, 2023) and National Land Cover Database (2011, 2016, 2021). Totals may not sum due to rounding.

Figure 8 highlights the difference between land use conversion in wind vs. solar projects. Wind projects in the case studies resulted in between two to 80 acres of leased land reclassified by USDA as "developed" after construction. Across all three wind projects, this means that developed land went from making up 1.7% of the project area to 2.2%, which is an average relative increase of 26%. Overall, the percentage of lands classified as developed in our wind projects remained low after construction, at 2.2%.

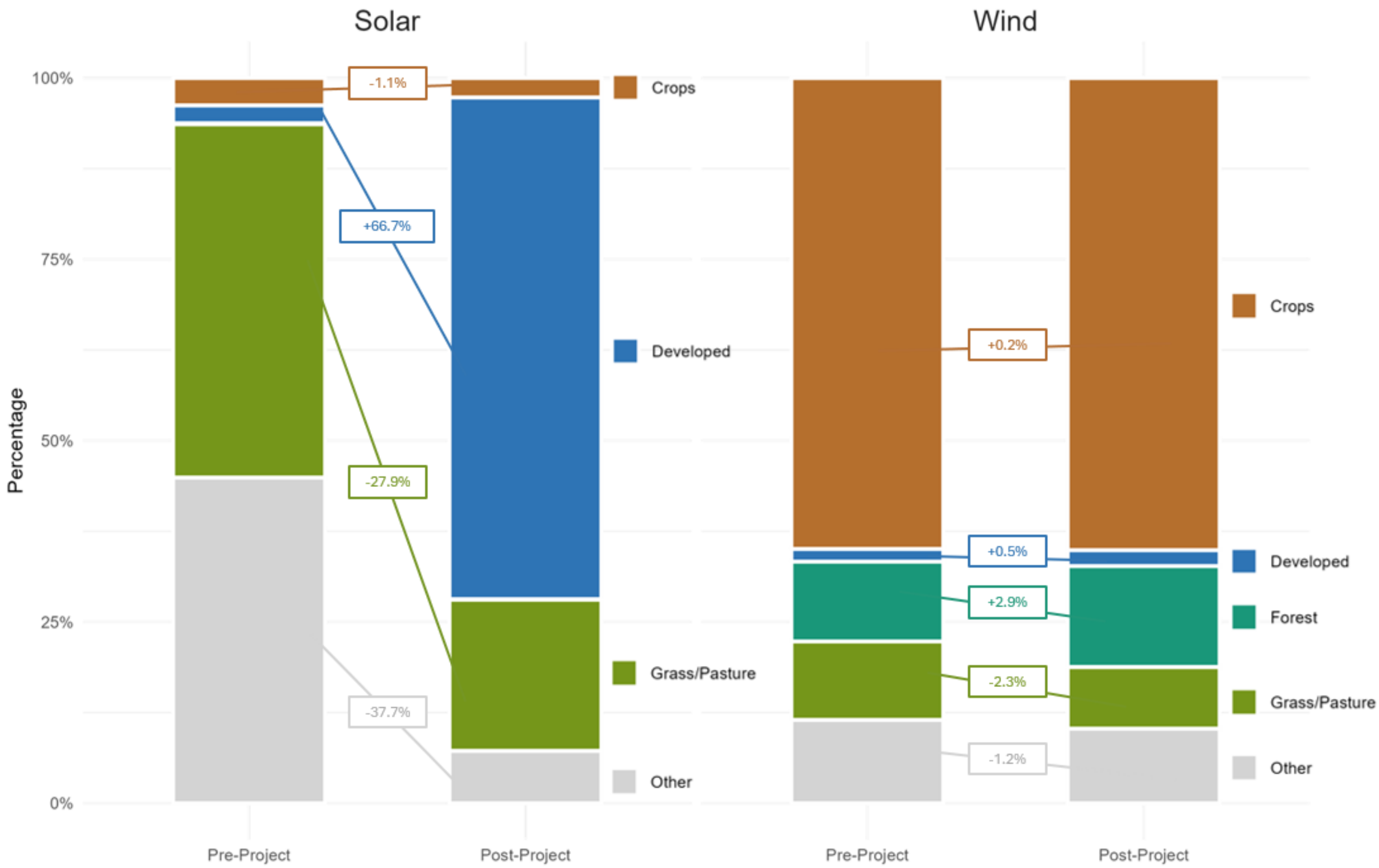
In contrast, solar projects resulted in between 0.5 to 73 acres being reclassified as developed after construction. While the acreage change is similar, these make up a much larger percentage of the total land area for each solar project: across all three solar projects, developed land went from occupying 2.5% of the project area to 69.2%, a relative increase of over 2,700%.

Most other land use classifications change minimally from pre- to post-construction, with forest, grass/pastureland, and cropland decreasing by 27%, 22%, and less than one percent, respectively. Changes in land use within solar project areas tell a different story. While the small amount of preexisting cropland within the case study solar project areas only decreased by 29%, grass/pastureland decreased by 57%, while "other" land (which includes scrubland, wetlands, and other natural land covers) decreased in coverage by 84%.

While these results are limited to the case study projects, discussions with county officials implied this trend is generally consistent across previously sited projects (i.e., agriculture continues around wind turbines, while fences and panels limit activities at solar projects).

[43] The consultant team choses to present the data focusing on changes within the project footprint because this area underwent more significant transformations due to the higher concentration of project infrastructure, unlike the greater project lease area where changes were less substantial and the infrastructure less dense.

Figure 8. Land use changes for solar (left) and wind (right) case study projects



Source: USDA NASS Cropland Data (2019, 2022, 2023) and National Land Cover Database (2011, 2016, 2021).

Land use values

As described above, agricultural land use experienced different degrees of change pre- and post-project, which varied between wind and solar case studies.

Estimated values and revenues also varied depending on the crops and land usage. At average 2023 crop values from the USDA, the value of the crops in the total project lease area for the three projects that had active agriculture prior to development (Rattlesnake Flat, Tucannon, and Columbia Solar) were approximately $10.3 million annually, or an average of $270 per acre in revenues.[44,45]

Net farm income would be a fraction of these total revenues. USDA data suggests that net income for Washington farms over the past five years was approximately 24% of gross receipts, which would equate to

[44] United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS), "2023 Washington State Agriculture Overview," 2023, https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=WASHINGTON.
[45] Other case study project that had pasture and rangeland (Lund Hill) as well as silviculture (Skookumchuck) are not included here. This analysis focuses on crop acreage and values.

net farm income of approximately $64 per acre at current crop prices for the three agricultural case studies.[46] For some of these project areas, there are idle or fallow areas of cropland. Excluding these idle or fallow acres, the revenues rise to approximately $430 per acre or net income of $100 per acre.

The combined area lost for these three projects was estimated at 146 acres. The loss of 146 crop acres equals approximately $39,000 to $62,000 lost in crop revenue, or approximately $9,000 to $15,000 in net income.[47,48] These estimated values for revenue per acre are relatively low compared to other agricultural production values observed in Washington, particularly fruit and other products where revenues can be over $10,000 per acre.

Planned projects are similar to existing projects in terms of their land use. For all three planned projects, most of the project lease area is currently used for agricultural purposes. About 1.8% to 3.4% of the land is currently developed, and the rest is occupied by grass or shrubland. Within the Carriger Solar and Horse Heaven project sites, about three-quarters of the project area is currently used for crop production, with winter wheat, spring wheat, alfalfa, and barley the most common crops grown in the area.

At average 2023 crop values, the Carriger and Horse Heaven project areas are predicted to produce $1.3 million and $10.1 million worth of crops per year, respectively. Although less than 1% of the Desert Claim acreage is used for crop production, a large part of the project area is likely pasture. Using information from the Final Environmental Impact Statement (EIS)[49] for the Desert Claim Wind Power Project and analysis of satellite imagery, the consultant team estimates this pasture area to be approximately 4,064 acres, which suggests an annual revenue to landowners of $36,579 in addition to the approximate $9,000 annual profit from crop revenues.

Although these projects are not yet constructed, the consultant team estimates the percentage loss of land for each project based on trends for similar projects as described above. For wind projects, approximately 2% of the total project area is converted to project operations, while the other 98% retains its original use. For solar projects, conventional solar photovoltaic projects typically preclude other uses, resulting in a 100% loss of land within the project footprint.

Based on these trends, the consultant team expects that the land within the footprint of the Carriger Solar and the solar portion of the Horse Heaven project will be converted to project-only use. As a wind farm, Desert Claim is only expected to lose about 2% of its land to project-only use. These estimates provide a sense of the general scale of changes in land use after these projects are installed, but projects may change significantly throughout the permitting, design, and approval process.

Summary of findings

Some community members provided input that clean energy projects may adversely affect local land use, including agriculture productivity losses and detrimental effects to tourism and recreation activity. After

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[46] USDA Economic Research Service (ERS), "Net Cash Income: 2015-2022, Washington State," February 7, 2024, https://data.ers.usda.gov/reports.aspx?ID=17831#Pa87321020af842b28220448e5be6d60f_2_105iT0R0x47.
[47] United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS), "2019 Cropland Data Layer," January 31, 2024, https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.
[48] Multi-Resolution Land Characteristics (MRLC) Consortium, "2011 Land Cover, National Land Cover Database (NLCD," accessed May 23, 2023, https://www.mrlc.gov/.
[49] Kittitas County, "Desert Claim Wind Power Project: Final Environmental Impact Statement," n.d., https://www.efsec.wa.gov/sites/default/files/180105/00133/20040816_FEIS.pdf.

reviewing six operating projects (three wind and three solar) as case studies, the consultant team found that while wind projects tend to have minimal impacts to the land within the project lease area, solar projects typically replace previous land use within the project footprint.

Based on satellite imagery and discussions with county officials, the consultant team determined that solar panels and associated facilities (e.g., battery storage) are typically inside fence lines such that preexisting land uses are no longer viable once the clean energy installation is in place. The case studies revealed that solar energy projects convert the majority (if not all) of preexisting land use to solar development with a lease area and the project fence line. These changes in land use are contained to the project footprint; outside of the footprint within the lease area, land use continues as it did before project construction. There may be potential for agricultural land use using agrivoltaics, but the consultant team did not find specific examples alongside current utility-scale projects.

Notably, wind projects were sited on agriculturally or commercially profitable land more often than solar projects, thus leading to reduced potential for adverse financial impacts to landowners. However, several planned solar projects are intended to occupy land currently used for agriculture, which will prevent crop harvest within the project footprint. Wind projects have a distinctly different impact on land use.

Projects with onshore wind convert approximately 2% of the total project area to project operations, with the remainder retaining its original land use. Onshore wind projects sited in primarily agricultural land experience negligible changes pre- and post- construction in harvested crop acreage within the project area given the relatively small footprint. One onshore wind project sited in forestland also allows for uninterrupted recreational use while experiencing negligible reductions in timber harvests.

Findings: Financial returns to property owners

Background

Community members and lawmakers inquired whether and to what extent leasing lands for renewable energy projects is beneficial or harmful to landowners. Primary concerns include both the short- and long-term community impacts, as well as whether adjacent landowners could be affected by these projects. Answering this question is challenging due to the confidential nature of the agreements made between landowners and project developers and further complicated by the variety of characteristics that affect neighboring property values. This section evaluates what the consultant team could determine about the effects of rural clean energy development on landowners within the project area.

Net financial impacts of leasing for energy projects

When a developer negotiates for land to develop a project, lease agreements with landowners can provide a variety of financial incentives:

- **Regular annual rent payments:** Often different amounts during pre-development, construction, and operation phases paid either on a per acre basis or per MW installed. Some wind projects set per turbine lease rates and some agreements are based on a percentage of revenue. The consultant team found some agreements that provided a combination of these payments (e.g., a small amount per acre plus a per MW fee).
- **Access payments:** For example, for an access road or transmission line. Typically paid based on distance (e.g., by foot).
- **Bonus payments:** For example, a one-time bonus when the lease is signed.

Per-acre leases are more typical for solar projects, while per MW is common for wind projects. Based on publicly available information, typical solar land lease rates range from a few hundred dollars per acre (e.g., $200 to $350 per acre) to as high as $1,000 per acre. These lease terms can vary significantly; on lower value federal lands, the Bureau of Land Management (BLM) has lease rates as low as $30 per acre while for higher values areas they can be as high as $3,000 per acre.

Wind lease agreements based on a per MW rate are typically thousands of dollars per MW. **Table 9** shows the range in leasing rates for wind and solar projects. These rates can vary dramatically by project but will generally result in positive financial impacts for most landowners compared to agriculture, which is the most common type of land used for clean energy development. For wind leases, where only 1%-3% of land is taken up by turbines and infrastructure, there would be even larger financial returns as existing land uses can often continue.

Across the nine case studies, agriculture was the most common pre-project land use, followed by timberland and pastureland. To illustrate the potential financial impacts to landowners, the consultant team gathered publicly available information on land values by type of economic activity, which the consultant team then compared against estimated clean energy lease payments. To quantify the potential financial impact to agricultural landowners, the consultant team relied on Geographic Information System (GIS) data to identify the crop type that existed within the project footprint prior to development combined with data from the USDA data to develop a per-acre estimate of pre-project agricultural revenues.[50]

For wheat (the most common crop grown in agricultural areas of project sites prior to development), the statewide average revenue per acre is at the low end of leasing rates. Per acre, in the past five years, wheat has averaged production revenues of $250 to $410 per acre ($61 to $100 in net income) while hay had average revenues of $200 to $330 per acre ($8 to $79 in net income).[51] This net income per acre is a relatively low value compared to available leasing data. These values are general averages and do not represent actual specific activities at a certain project site. The consultant team heard concern during interviews and outreach that the crop values may be low or not capture the year-to-year market variations landowners experience.

Most crops grown in the state are slightly higher than this value, but also close to low-end leasing rates when considering net income (i.e., after accounting for the costs of production). The exceptions are fruits such as apples, cherries, and pears, as well as potatoes, which are nearly or above to $1,000 per acre or higher in net income. These crop types appeared in limited quantities (i.e., less than 5%) in the case study analyses. This is the higher end of leasing rates and would require significant payments to be financially responsible for a property owner. In **Table 9** below, only a few of the publicly reported lease rates would equal or greater than these high value crops.

Overall, clean energy lease payments have the potential to generate a significant amount of revenue for landowners. For example, for Rattlesnake Flat, annual lease payments for the entire lease area are estimated at between $530,000 to $740,000 annually. After accounting for estimated lost crop income from primarily wheat of up to $44,000, landowners as a group would gain up to $690,000 annually.

Prior to development, the Lund Hill Solar project footprint was pastureland that had historically low land rents between $8 and $9 per acre over the past five years. As a result, the Lund Hill Solar Project likely resulted in a substantial revenue boost to landowners, potentially increasing landowner income by up to $470,000 annually in the first 10 years.

The total lease value of the Columbia Solar Project based on publicly available estimates would range from $20,000 to $100,000 for 100 acres, not including signing bonuses and pre-development payments. This project had slightly higher estimated crop values with most of the crop area being dry beans and alfalfa (slightly higher than hay and wheat at $100 and $320 in net income, respectively). At the low end of the leasing range, the project would barely break even (lease payments would be approximately $5,000 higher). Nevertheless, these projects have the potential to result in positive financial returns to local landowners, which can also contribute positively to local economies.

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[50] Specific crop values for case study projects are discussed in the Land Use section above. These projects might not be representative of all potential lease areas for planned future projects.
[51] United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS), “2023 Washington State Agriculture Overview.”

Table 9. Publicly available annual lease rate data sources and literature

Source	Year	Scope of Analysis	Pre-development	Construction	Operations
Wind					
Rattlesnake Flat WA DNR Lease	2019	Adams County, WA	$7,500 + $5,000	$4,000/installed MW capacity	5-7% of gross quarterly revenues
Industry	2016	N/A	--	--	$3,000 to $4,000/MW or 2-4% of revenues
American Wind Energy Association	2019	Western US	$7,841/MW	--	--
USDA Forum	2023	United States	$10,000/turbine	--	--
In-state Wind Developer	2024	Lincoln County, WA	$10/acre (+$1/year in year 4 of pre-development)	Assumed same as Operations	$45/acre rented for 30 years + $6,000/installed MW capacity $1/linear foot of access road + $2/linear foot of transmission line/year (increases by 2% after 2nd anniversary of construction start)
Solar					
Lund Hill WA DNR Lease	2019	Klickitat County, WA	$50,000 + $5,000	Increasing $1,000/year after 2nd year of pre-development + construction	Years 1-10: $300/acre Years 11-20: $350/acre Years 21-40: $400/acre
BLM Solar Lease Rates[52] (2017-2025)	2023	Higher land value counties (e.g. King, Snohomish)	--	--	$1,013 - $3,112/acre
BLM Solar Lease Rates (2017-2025)	2023	Moderate land value counties (e.g. Walla Walla, Lewis)	--	--	$146 – $410/acre
BLM Solar Lease Rates (2017-2025)	2023	Lower land value counties (e.g. Klickitat, Douglas, Ferry)	--	--	$36 – $106/acre
Moore et al.	2022	Michigan, Texas, Maine	--	--	$500 - $1,200/acre
Strategic Solar Group	2018	United States	--	--	$300 - $2,000/acre, depending on location and project size

Property values

During public meetings and interviews, members of the public expressed concerns about potential impacts of clean energy project development on neighboring property values. To determine whether any effects are observable from the case study projects, the consultant team reviewed the assessed values of nearby parcels

[52] https://www.blm.gov/sites/blm.gov/files/policies/IM2021-005_att5.pdf

in and outside of project footprints for three years prior and three years after project development, or until present day.

As shown in **Table 10**, average parcel values for most projects did not change more than 6% from pre- to post-project assessments, regardless of property location and project type. However, there were a few exceptions to this finding. Lund Hill property values increased after project construction by 64% within the project footprint and 30% in the project lease area outside footprint.

Skookumchuck property values within the footprint increased by 284% after project construction. The consultant team did not find decreases in assessed property value larger than 2.5%.[53] **Table 10** also shows how much the project parcels varied in value with standard deviations above $100,000 for many projects and the combined case study parcels overall.

Table 10. Changes in average assessed parcel property values, pre- and post-project

Project Name (# of Parcels)	Parcel Value: Footprint Pre-Project*	Parcel Value: Footprint Post-Project* (standard deviation)	Within Footprint Percent Change	Parcel Value: Project Lease Area Outside Footprint Pre-Project*	Parcel Value: Project Lease Area Outside Footprint Post-Project* (standard deviation)	Outside Footprint Percent Change
Columbia (14)	$130,441	$138,024 (± $109,250)	5.8%	$466,951	$461,702 (± $511,116)	-1.1%
Skookumchuck (27)	$83,255	$319,497 (± $223,624)	283.8%	$87,540	$86,258 (± $32,737)	-1.5%
Tucannon (111)	$126,643	$123,451 (± $109,632)	-2.5%	$47,308	$46,516 (± $67,898)	-1.7%
Lund Hill (12)	$50,289	$82,357 (± $55,466)	63.8%	$63,114	$82,002 (± $80,420)	29.9%
Rattlesnake Flat (99)	$142,245	$138,705 (± $97,855)	-2.5%	$165,052	$173,685 (± $142,903)	5.2%
Overall Case Study Average	$106,575	$160,407 (± $119,165)	50.5%	$165,993	$170,033 (± $167,015)	2.4%

*Pre- and post-project values represent 3 years before and after the project construction year, respectively.

Property value literature review summary

Table A13 in Appendix A summarizes literature the consultant team identified and reviewed on the impact of clean energy projects on property values. Studies in the western U.S. have identified public concerns that property values will be affected by the "loss of rural character" caused by the presence of large-scale clean

[53] Parcels within the Tucannon project footprint, see **Table 10**.

energy projects.[54,55] Regarding the observed impacts of clean energy projects on property values, several studies have found no significant impact on surrounding property values in rural or urban areas.[56,57,58,59]

Other studies suggest that properties with significant project-induced visual impairments could experience adverse impacts on property values of 0.8% to 3.6% associated with large solar energy project developments, or range from zero to 5.2% for wind developments.[60,61] Notably, most sources describing the impacts of clean energy development in rural areas are specific to New England, which may limit their applicability to rural Washington.

Some research also supports the existence of "anticipation stigma," where the uncertainty associated with installation can cause property values to decline in anticipation of a new wind farm in the area.[62] Regardless, the negative impacts of project installation are typically limited to an approximate one-mile radius surrounding the farm;[63] beyond this, both visual and property value effects are not significant.

Summary of findings

Landowners have several factors to consider when deciding whether to lease land for clean energy development. The key decision for property owners includes whether received lease payments outweigh the potential revenues from existing land uses.

Lease payments can take many forms and may vary in magnitude by project phase. However, once projects are in operation, lease payments are often distributed on a per-acre or per-MW basis (or both) and are typically in the thousands of dollars annually for a single landowner. The size of payments will vary for each landowner depending on the size of their lease or how many turbines (i.e., MW) they have on their land.

Based on the analysis, these lease payments are relatively lucrative for landowners. Lease payments typically exceed the revenue per acre values associated with common Washington crops after consideration of the associated costs of production. For wind energy leases, only 1%-3% of land is occupied by infrastructure, so there may be even larger financial returns if a significant amount of agricultural land remains productive.

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[54] Shawn K. Olson-Hazboun, Richard S. Krannich, and Peter G. Robertson, "Public Views on Renewable Energy in the Rocky Mountain Region of the United States: Distinct Attitudes, Exposure, and Other Key Predictors of Wind Energy," *Energy Research & Social Science* 21 (November 2016): 167–79, https://doi.org/10.1016/j.erss.2016.07.002.

[55] Brent S. Steel et al., "Environmental Value Considerations in Public Attitudes About Alternative Energy Development in Oregon and Washington," *Environmental Management* 55, no. 3 (March 2015): 634–45, https://doi.org/10.1007/s00267-014-0419-3.

[56] Steven Laposa and Andrew Mueller, "Wind Farm Announcements and Rural Home Prices: Maxwell Ranch and Rural Northern Colorado," *Journal of Sustainable Real Estate* 2, no. 1 (January 1, 2010): 383–402, https://doi.org/10.1080/10835547.2010.12091798.

[57] Ben Hoen et al., "Spatial Hedonic Analysis of the Effects of US Wind Energy Facilities on Surrounding Property Values," *The Journal of Real Estate Finance and Economics* 51, no. 1 (July 2014): 22–51, https://doi.org/10.1007/s11146-014-9477-9.

[58] Gabriel S. Sampson, Edward D. Perry, and Mykel R. Taylor, "The On-Farm and Near-Farm Effects of Wind Turbines on Agricultural Land Values," *Journal of Agriculture and Resource Economics* 45, no. 3 (2020): 410–27, https://doi.org/10.22004/AG.ECON.302463.

[59] Stephen Grover, "The Economic Impacts of a Proposed Wind Power Plant in Kittitas County, Washington State, USA," *Wind Engineering* 26, no. 5 (September 2002): 315–28, https://doi.org/10.1260/030952402321160615.

[60] Vasundhara Gaur and Corey Lang, "House of the Rising Sun: The Effect of Utility-Scale Solar Arrays on Housing Prices," *Energy Economics* 122 (June 2023): 106699, https://doi.org/10.1016/j.eneco.2023.106699.

[61] Salma Elmallah et al., "Shedding Light on Large-Scale Solar Impacts: An Analysis of Property Values and Proximity to Photovoltaics across Six U.S. States," *Energy Policy* 175 (April 2023): 113425, https://doi.org/10.1016/j.enpol.2023.113425.

[62] Jennifer Hilnman, "Wind Farm Proximity and Property Values: A Pooled Hedonic Regression Analysis of Property Values in Central Illinois," (Illinois State University, Department of Economics, May 2010), https://www.livingstoncounty-il.org/wordpress/wp-content/uploads/2014/11/PR-Ex.-32-2010-Wind-Farm-Proximity-and-Property-Values-Central-Illinois.pdf.

[63] Elmallah et al., "Shedding Light on Large-Scale Solar Impacts."

Many individuals expressed concerns about how the presence of clean energy development affects neighboring property values. The consultant team also found that with a few exceptions, assessed property values generally do not change more than 5% between pre- and post- construction averages, regardless of property location and project type.

Findings: Tax revenues and public services

Background

Projects bring tax revenues to counties. Increases to county taxes come from three sources: real property, personal property, and sales tax, with the majority coming from personal property and the one-time sales tax increase during construction operations. However, there have been questions raised about whether the impacts are sustained over time and how the changes to tax payments over time affect the counties in which they are located, particularly as projects depreciate. In this section, the consultant team evaluates the impact on tax collections from renewable energy project development, evaluates taxes from recent projects, and analyzes the impact on county finances over time. This section also summarizes discussions and interviews with several county officials.

Overview

Clean energy projects pay three forms of tax to state and local jurisdictions: real property tax, personal property tax, and sales tax. Real and personal property are annual payments made by landowners and the project owner, respectively. Sales taxes are paid on all purchases related to a project; these payments occur primarily during project construction, and then periodically thereafter whenever equipment is replaced. Of these three forms of taxes, personal property accounts for the largest portion of tax payments, followed by sales tax and then real property. The consultant team discusses each form of tax payment in more detail.

Property taxes

Real property

Real property tax is the payment of taxes on land, structures, and other improvements on a site. Counties and states tax these properties based on an assessment of fair market value. Importantly, solar panels and wind turbines are treated as personal property and therefore are excluded from real property valuation. For the case study projects, real property tax revenues are relatively small compared to the corresponding personal property tax revenues for each project, given the undeveloped or agricultural nature of the land where these projects are developed. Real property tax revenues in the first year of operation for the case study projects range from $5,600 up to $67,000; on average, the ratio of first year real to personal property tax revenues is 0.027. Parcels with buildings or other facilities would have higher real property taxes.

One aspect of real property taxes that affects certain projects is Current Use Status[64] for agricultural, open space, or timber land. Landowners apply for this status to the county authority where the land is located. Under Current Use, land is taxed more favorably for as long as it remains in this status. When projects are developed, depending on how much of the parcel is developed, the parcel might lose this status and require the landowner to pay seven years of back taxes based on the difference between the Current Use valuation and the valuation without that designation (fair market value).

This change results in a one-time bump in real property taxes when those back taxes are paid, as well as higher real property taxes moving forward. For the solar case studies, Lund Hill Solar and Columbia Solar, Current Use Status was removed from the associated parcels once the project was developed. Although the

[64] Department of Revenue Washington State, “Current Use: Open Space Taxation,” Property Tax Resource Center, n.d.

landowners were the listed taxpayers, the consultant team expects that the project developer would pay the taxes associated with the removal of Current Use Status and the tax benefits associated with it. In the cases where the consultant team identified a lease document, the project lease agreement required the developer to pay all taxes and fees associated with project development.

Property tax rates vary by jurisdiction and different methods to appraise property are available to county assessors to use to determine the value of both real and personal property. For 2023, the average property tax rate across all counties was $8.70 per $1,000 of assessed value, or approximately 0.87 percent including all state and county levies.[65] The state portion was approximately one third of property taxes at $2.33 in 2023.

Average local regular levies (e.g., county general funds) were $3.48 while local special levies (e.g., school enrichment levies) were $2.80 in 2023. Total rates ranged from a maximum rate of $14.18 in Whitman County to a minimum of $5.67 in San Juan County. The difference is largely driven by local levies with relatively consistent state levies across counties. For example, San Juan had the smallest local special levy at under $1, while Whitman's was the highest at over $5. It is worth noting that statewide between 2022 and 2023 the average county rate dropped by approximately $1.

Personal property

Personal property tax is levied on the items used by businesses; for example, machinery, equipment, supplies, and tools. In the context of energy development, personal property includes turbines and towers for wind projects and panels and panel mounts for solar projects. Personal property is taxed at the same rate as real property based on assessed value.

One important distinction between personal property and real property is that personal property is expected to depreciate over time as items age. As a result, the assessed value of personal property and therefore the taxes paid decreases over time. Washington DOR provides a set of schedules that project depreciation year-over-year as a percentage of the initial purchase value. As of 2023, there are two depreciation schedules, one schedule for clean energy generation projects and a second schedule applicable to battery storage systems. The DOR guidelines recommend a four-step process for county officials using their assessment guidelines and depreciation schedules:

1) Determining the appropriate class/type of property (e.g., Renewable Energy Generating facilities for solar panels)
2) Identifying the depreciation trend for that property type (e.g., the trend for clean energy generating facilities - "Trend RG")
3) Locating the applicable "percent good factor" based on the age of the property (e.g., 88.1% for a four-year-old solar facility)
4) Multiplying the percent good factor by the historical or original cost to determine the current value (e.g., 88.1% multiplied by the total cost, say $50 million, equaling a value of $44 million for a four-year-old facility)

[65] Department of Revenue Washington State, "Tax Statistic Report 2023," n.d., https://dor.wa.gov/about/statistics-reports/property-tax-statistics/property-tax-statistics-2023.

Chapter 82.96 RCW — tax on renewable energy generation or storage
The consultant team also considered the recently enacted changes to clean energy taxation under SHB 1756,[66] which defers the state portion of property taxes in favor of a production tax based on the installed MW capacity.

SHB 1756 passed in 2023 and applies to projects in production or construction as of June 2023. It is an optional exemption, so it is up to project owners to apply for the exemption with Washington DOR. If they apply and are approved, they will pay the production excise tax instead of state personal property taxes; county personal property taxes are unaffected by the legislation. The incentive for a developer would be a potentially lower personal property tax if the production excise tax is lower than their expected personal property tax.

The production excise tax rates established in SHB 1756 are:

- Either $75 per month per MW of nameplate capacity for 15 years or $80 per month per MW of nameplate capacity for 10 years for a system that uses solar energy to generate electricity and was granted a personal property tax exemption
- Either $130 per month per MW of nameplate capacity for 15 years or $150 per month per MW of nameplate capacity for 10 years for a system that uses wind energy to generate electricity and was granted a personal property tax exemption
- Either $14 per month per MWh of clean energy storage capacity for 15 years or $19 per month per MWh of clean energy storage capacity for 10 years for battery storage capacity granted a personal property tax exemption

All revenues collected from the production excise tax are deposited into a Renewable Energy Local Benefit Account. Under SHB 1756, funds under this account must be distributed as follows:

- 42.5% of excise tax paid by a clean energy system located in a county must go to that county
- 42.5% must go to qualified school districts in the county, in proportion to the number of students served by the school district
- 15% must go to qualified federally recognized Indian tribes with rights or protected lands potentially impacted by a clean energy system

The state fiscal note for the legislation estimates that it will cost the state $60,000 in fiscal year 2025 increasing to $280,000 by FY 2027. It estimates that the exemption will be a net benefit for counties, with counties and school districts each receiving an additional $25,500 in FY 2025, $89,250 in FY 2026 and $119,000 in FY 2027 with the remainder (approximately $4,900 to $42,000) going to federally recognized Tribes (FY 2025 through FY 2027).[67]

During discussions with county officials, the consultant team heard concerns and confusion from several officials about SHB 1756 adversely affecting their county taxes. Based on discussions with DOR and review of the bill language, it is intended to solely apply to the state portion of personal property taxes. It will not adversely affect county taxes and is expected to result in a loss of revenue for the state and a gain for the counties through the redistribution of the state production excise tax.

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[66] Supporting clean energy through tax changes that increase revenue to local governments, schools, and impacted communities.
[67] State of Washington, "Multiple Agency Fiscal Note Summary: HB 1756, Clean Energy/Tax Changes," n.d., https://fnspublic.ofm.wa.gov/FNSPublicSearch/GetPDF?packageID=66577.

Property tax across projects

The case study projects, as well as other projects in the state, generate significant amounts of property tax for their respective jurisdictions. Personal property tax is significantly larger than real property tax for all projects reviewed. **Table 11** summarizes the personal and real property taxes for the six operating case study projects. Large wind and solar projects (i.e., over 100 MW) generate over $1 million in personal property tax payments annually. Smaller projects generate less personal property revenue.

All personal property assessments will depreciate over time. **Table 12** summarizes an estimate of the tax collections in year 22 of the project, which is when the projects have fully depreciated according to the Washington DOR schedule. Real property would be expected to appreciate over time with taxes increasing. Farm property land value grew at approximately 4% over the past 20 years, so the consultant team assumes the same rate.[68] The impact on county taxes varies considerably and is evaluated further in the County Taxes: Short- and Long-term Effects section below.

Table 11. Historical property tax collections for operating case study projects

Project	County	Project type (MW capacity)	Initial Assessed Value	Year 1 Personal Property Tax	Year 1 Real Property Tax	Year 1 Total Project Tax	Year 1 Total County Tax	Average % of County Tax Roll
Rattlesnake Flat	Adams	Wind (144 MW)	$130 million	$1.3 million	$23,000	$1.4 million	$28 million	4.8%
Lund Hill	Klickitat	Solar (150 MW)	$160 million	$1.0 million	$5,600	$1.1 million	$100 million	1.0%
Tucannon	Columbia	Wind (267 MW)	$230 million	$1.8 million	$67,000	$2.4 million	$9.3 million	20.2%
Skookumchuck	Lewis	Wind (136 MW)	$280 million	$2.1 million	$19,500	$2.3 million	$110 million	2.0%
Columbia	Kittitas	Solar (15 MW)	$18 million	$140,000	$9,400	$150,000	$100 million	0.14%
Horn Rapids*	Benton	Solar + BESS (4 MW)	$0	$0	$0	$0	$0	N/A

*Horn Rapids site is tax exempt due to its status as an educational facility.
All values are for the first full year of operation, regardless of the year the project started. Since counties and tax districts have different tax rates, similar assessed values will not yield the same amount of tax in each jurisdiction.
All dollar values are in 2023 USD to allow for comparison.
Sources: Adams County TaxSifter, accessed on March 20, 2024 at https://adamswa-taxsifter.publicaccessnow.com/Search/Results.aspx,
Klickitat County Property Search, accessed on May 9, 2024 at http://www.klickitatcountytreasurer.org/propertysearch.aspx,
Columbia County Assessor & Treasurer, accessed on April 12, 2024 at http://64.184.153.98/PropertyAccess/PropertySearch.aspx?cid=0,
Lewis County Treasurer Parcel Database. https://parcels.lewiscountywa.gov/,
Kittitas County TaxSifter, accessed on April 30, 2024 at https://taxsifter.co.kittitas.wa.us/Search/Results.aspx

68 United States Department of Agriculture, “National Agricultural Statistics Service Quick Stats Database, Agricultural Land Value (Incl. Buildings) Asset Value: 2003-2023,” n.d., https://quickstats.nass.usda.gov/.

Table 12. Estimated future property tax collections for operating case study projects

Project	County	Estimated Year 22 Personal Property Tax Collections	Estimated Year 22 Real Property Tax Collections	Year 22 Total Project Tax Collections	Total Property Tax Percentage Change from Year 1
Rattlesnake Flat	Adams	$200,000 – $250,000	$59,000	$300,000	-78%
Lund Hill	Klickitat	$170,000	$14,000	$180,000	-83%
Tucannon	Columbia	$350,000 – $430,000	$166,000	$520,000 to $600,000	-75 to -78%
Skookumchuck	Lewis	$300,000 – $350,000	$54,000	$350,000 to $400,000	-83 to -85%
Columbia	Kittitas	$22,000	$24,000	$46,000	-70%
Horn Rapids*	Benton	--	--	--	N/A

*Horn Rapids site is tax exempt due to its status as an educational facility.
All dollar values are in 2023 USD to allow for comparison.
Year 22 values are illustrative examples and assume tax rates remain constant. Real property is assumed to appreciate at approximately four percent per year.

Source: IEc analysis based on Year 1 tax data (Table 11) WA DOR depreciation schedule for personal property (Personal Property Valuation Guidelines, Washington State department of Revenue. Accessible at: https://dor.wa.gov/taxes-rates/property-tax/personal-property-valuation-guidelines) and USDA land value trends for the past 20 years (USDA NASS. Agricultural Land Value (Incl. Buildings) Asset Value: 2003-2023).

These findings are generally consistent with public literature. A study examining the economic impacts of wind energy in rural Texas by De Silva, et al., (2016) found that the addition of clean energy projects to a county will decrease the overall county property tax rate while increasing the total value of the tax base.[69] As a result, counties tend to see an increase in property tax revenues that starts high and depreciates over time.

One study estimates the potential property tax revenue from $100 million invested in clean energy developments in Klickitat County to be approximately $140,000 in year one, declining to about $75,000 in year 10. Across comparable counties in the rural western U.S., tax impacts vary widely but tend to be more substantial for counties with small tax bases and high tax rates.[70]

Sales tax

Sales tax is collected at the state, county, and local level. Projects also pay sales tax on equipment, machinery, and labor purchased to construct a project. The state sales tax rate is 6.5% plus an additional county and local sales tax rate, which varies by jurisdiction. The highest combined county and local sales tax in 2023 was 4.1% (i.e., 10.5% total) in multiple areas of Spokane County, while the lowest is 1% percent (i.e., 7.5% total) in multiple counties.[71] The average local sales tax, without weighting for the amount of tax collected, was 8.7%.

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[69] Dakshina G. De Silva, Robert P. McComb, and Anita R. Schiller, "What Blows in with the Wind?," *Southern Economic Journal* 82, no. 3 (January 2016): 826–58, https://doi.org/10.1002/soej.12110.
[70] Julia H. Haggerty, Mark Haggerty, and Ray Rasker, "Uneven Local Benefits of Renewable Energy in the US West: Property Tax Policy Effects," *Western Economics Forum* 13, no. 1 (2014).
[71] Department of Revenue Washington State, "Tax Statistic Report 2023."

Importantly, local sales tax is collected by the county in which the equipment is installed, rather than the jurisdiction in which the purchase is made.

Senate Bill (SB) 5116

Under RCW Chapter 82.08, the state offers projects the opportunity to receive sales tax exemptions related to the sale of clean energy equipment and machinery. In 2013 the Legislature extended this incentive through January 2020. In 2019, as part of the bill enacting the Clean Energy Transformation Act, the Legislature extended the exemption through January 2030 and revised the criteria and refund options for developers.[72]

Historically, projects could only receive a 75% reduction, which multiple case study projects received. Following SB 5116, eligible applicants may receive varying reductions in qualified sales tax if they meet certain workforce objectives:

- **50% reduction** if the Department of Labor and Industries (L&I) certifies the project includes procurement and contracts with women, minority, or veteran owned businesses; entities that have a history of complying with federal and state wage and hour laws; apprenticeship utilization; and/or preferred entry workers living in the project construction area
- **75% reduction** if, in addition to meeting the 50% standard, the project compensates workers at prevailing wages determined by local collective bargaining
- **100% reduction** if L&I certifies the project is developed under a community workforce agreement or project labor agreement

Sales tax across projects

Table 13 presents estimated sales tax collected for each case study project. Sales tax rates differ across counties examined, ranging from 7.5% to 8.7%. The effect of sales tax returns to the county depends on which of the exemptions the projects received. For purpose of this analysis, the consultant team assumes that all projects received the 75% exemption.

Table 13. Estimated sales tax collection for case study projects during construction

Project	County	Overall Sales Tax Levy	Total Project Sales Taxes	Portion of Project Sales Taxes to County	County Sales Tax Exemption Back to State	County Sales Tax to County
Rattlesnake Flat	Adams	0.08	$14 million	$2.6 million	$1.9 million	$640,000
Lund Hill	Klickitat	0.075	$7.4 million	$990,000	$740,000	$250,000
Tucannon	Columbia	0.082	$26 million	$5.4 million	$4.1 million	$1.4 million
Skookumchuck	Lewis	0.078	$13 million	$2.1 million	$1.6 million	$530,000
Horn Rapids	Benton	0.087	$630,000	$160,000	$120,000	$40,000
Columbia	Kittitas	0.081	$800,000	$160,000	$120,000	$40,000
Planned Projects						
Carriger	Klickitat	0.075	$11 million	$1.5 million	$1.1 million	$370,000

[72] https://app.leg.wa.gov/BillSummary/?BillNumber=5116&Year=2019&Initiative=false

Project	County	Overall Sales Tax Levy	Total Project Sales Taxes	Portion of Project Sales Taxes to County	County Sales Tax Exemption Back to State	County Sales Tax to County
Horse Heaven	Benton	0.087	$99 million to $118 million	$25 million to $30 million	$19 million to $22 million	$6.3 million to $7.4 million
Desert Claim	Kittitas	0.081	$8.5 million	$1.7 million	$1.3 million	$420,000

The above data is based on JEDI-derived project costs per kW and assumes that 75 percent of the county sales tax portion goes to the state. All dollar values are in 2023 USD.

Overall, sales taxes increase during the construction phase of a project; however, they could be higher if a project does not have an exemption from the state that refunds both state and local sales taxes. County officials raised concerns regarding the timing and management of the sales tax exemption. Counties receive the full amount of sales tax, and then the developer requests and files for the refund with the state. Once this is processed, the county must return the sales tax to the state to refund the developer.

Multiple county officials said that this process was poorly communicated and that they were unaware of the refund before the state requested it, causing some confusion for their tax and financial planning. To achieve a refund under the sales and use tax provisions revised in 2019, developers must have a signed and approved Application for Clean Energy Labor Standards Certification from the state prior to the start of the project (i.e., the state should be aware of the refund ahead of construction and be able to alert counties). The previous law did not specify a timeline for developers to apply for the tax refund, but it did require records for validation and one county official stated that a business could request the refund within four years. Three case study counties mentioned having to refund taxes well after receiving the funds.

County taxes: Short- and long-term effects

Overall, clean energy projects can contribute to notable increases in local property tax payments. While all case study projects experienced an increase in property taxes relative to the previous land use, primarily through sales tax and personal property taxes, the relative impact varied dramatically based on the baseline size of a county's tax base. **Table 11**, in the Property tax across projects section, summarizes some examples of this using tax data from the case studies with a percentage for the total county collections. These increases in taxes are both short- and long-term; however, depreciation affects the amount of personal property taxes collected over time.

Examples of these patterns can be seen in Lewis and Garfield counties (**Figure 9**), which have seen the installation of a large wind energy project within the past two decades. However, the size of the tax base before the projects were installed makes a big difference in how much the addition of a wind farm impacts the county's tax collections.[73] In Lewis County, which has a relatively large tax base, the addition of the 136 MW Skookumchuck Wind Project brought in extra tax revenue to the county; however, the impact to the total tax collections is relatively small, with the project only making up a maximum of 2% of the county's total tax collections. Lewis County includes the population centers of Centralia and Chehalis, both of which have approximately as many residents as Garfield County.

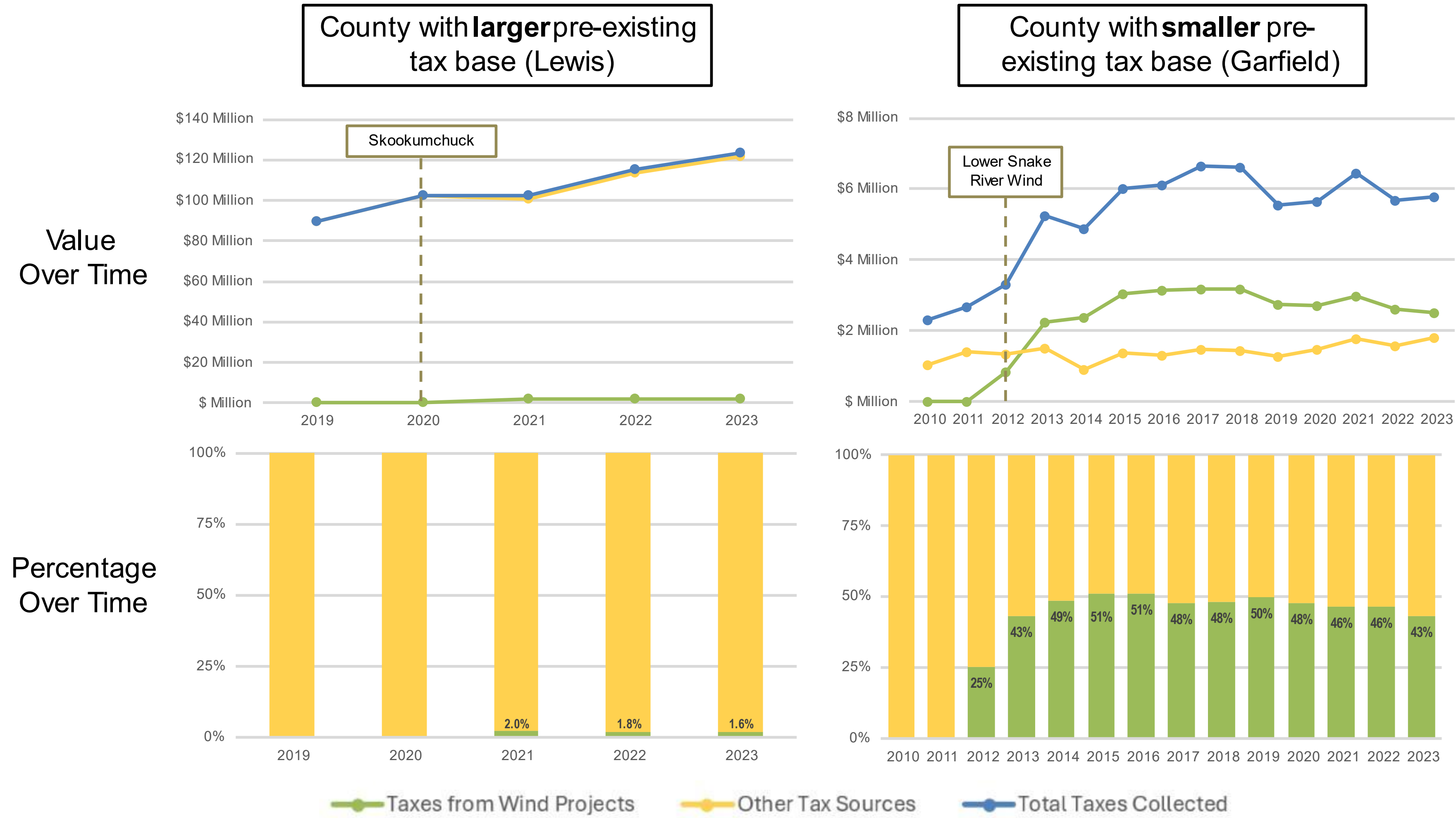
[73] Note: The Lower Snake River Wind Farm project was not included in the list of case study projects. However, the countywide tax data for Garfield County and associated wind projects was provided at a public meeting and is thus included here as part of the analysis.

In Garfield County, the addition of the larger 343 MW Lower Snake River Wind Farm in 2012 caused tax collections to increase significantly at first. From 2014 to 2019, the project brought in an average of 49% of the tax collections. In 2020, however, tax collections from the project began to decline, thus decreasing the total property tax collection over time. By 2023, tax collections from the project reached 43% of the tax base, and as previously discussed, contributions will continue to decline over time due to asset depreciation.

While the Lower Snake River Wind Farm project is larger than Skookumchuck, the payments to Garfield County would not represent more than five percent of Lewis County's tax collections, even at their peak. For nearly half of counties in Washington, the payments from the Lower Snake Wind project would be less than 2.5% of the total tax base as of 2022.

For the counties with a smaller tax base like Garfield, Columbia, Ferry, and Wahkiakum, such an injection of $2 million to $3 million dollars from a project's taxes can be a major contribution (i.e., more than a fifth of their tax collections). Of the nine case studies reviewed, six are in counties with tax collections below the median county collections of approximately $105 million as of 2022. Four projects are in counties with collections below $50 million.

Figure 9. Comparison of county tax collections over time



Local effort assistance (LEA) and school funding

A potential increase in tax revenue also results in benefits to other community services, such as local and state schools, county roads, and county government. Some studies show that an increase in tax revenue from clean energy development brings about concrete benefits in local schools, while other studies find no significant changes in the quality of local educational institutions.[74] Regardless of the degree of increase in tax revenue, the addition of another source of tax revenue helps make schools and other community services within the resident county less susceptible to changes in federal or state funding.[75]

In addition to boosts from new taxable assets, some school districts receive local effort assistance payments (LEA). LEA, also known as levy equalization, is a state education funding program to ensure that school districts with smaller tax bases receive a set amount of funding per student. LEA payments ensure a school district raises at least $1,550 per student when levying a rate of $1.50 per $1,000 of assessed value (i.e., it ensures that districts with lower property values do not have above average tax rates to maintain education activities).

While local clean energy projects do not determine local levy rates and LEA payments, they do affect taxes, and some participants at public meetings voiced concern about school districts losing LEA funding due to wind turbines increasing the baseline property taxes for the county and district.

An evaluation of clean energy project impacts on LEA is complicated by changes in the funding mechanisms and levies from legislation enacted in 2017 (Chapter 13, Laws of 2017 (EHB 2242)).[76] This has led to a significant drop off in LEA payments since 2018, with some districts losing all LEA funds.

At the Dayton public meeting, a district with one existing wind project in the vicinity of the specific school district was highlighted. The nearby project was built before 2019 and therefore was not included in the study scope or as a case study. Based on tax data, the project close to the district of concern is depreciating in assessed value, with decreases from 2019 to present. However, these changes in assessed value do not align with changes in LEA funding in the district. Review of state education funding data does show that the district's LEA funding ($12,000 in 2016 and $50,000 in 2018) was zero in 2017 and from 2019 to present, but this is consistent with LEA decreases across the state from the revised taxation law. Overall, the impacts of clean energy projects on LEA do not seem significant relative to the recent changes to the law surrounding these funds.

In addition, since LEA is based on a set levy rate and a funding level per student, changes in taxes collected from wind turbines should not result in a net loss in school funding but instead should be a redistribution of where that funding is coming from. Should a project depreciate over time and reduce the amount of tax that a school district is receiving below the LEA threshold, the district would begin to receive LEA again.

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[74] De Silva, Dakshina G., Robert P. McComb, and Anita R. Schiller. "What Blows in with the Wind?" Southern Economic Journal 82, no. 3 (2016): 826–58. http://www.jstor.org/stable/44283478.;
Castleberry, Becca, J. Scott Greene. "Impacts of wind power development on Oklahoma's public schools." Energ Sustain Soc 7, 34 (2017). https://doi.org/10.1186/s13705-017-0138-8

[75] Ibid., Castleberry

[76] "Funding Fully the State's Program of Basic Education by Providing Equitable Education Opportunities through Reform of State and Local Education Contributions," Pub. L. No. House Bill 2242 (2017), https://app.leg.wa.gov/billsummary?Year=2017&BillNumber=2242.

Summary of findings

Projects bring tax revenues to counties. Questions include whether the impacts are sustained over time and how the changes to tax payments over the years affect the counties in which they are located, particularly as projects depreciate over time.

State and local taxes are collected from clean energy projects in three primary methods: real property tax (land and buildings), personal property tax (equipment and machinery), and sales tax. Property tax, whether real or personal, is taxed at the same rate within each county. Property tax rates vary county by county from $5.87 per $1,000 of assessed value up to $14.18 per $1,000 of assessed value (or 0.0587% to 0.14% of assessed value). Sales tax is levied separately from property tax, with a statewide sales tax rate of 6.5%, plus an additional county and local sales tax, which is typically 2%.

Turbines and solar panels are taxed as personal property. Across case study projects, clean energy projects contributed far more to total county personal property taxes than real property taxes due to the high values of equipment assessed at these sites. While assessed values for equipment are high following project construction, personal property is depreciated over time, which would reduce local taxes collected over time, all else equal. This study showed that projects often reinvest in projects, resulting in a slower depreciation in taxes over them that would otherwise be expected from the depreciation schedule.

Sales tax is collected on all labor and materials purchased for a project, which primarily occurs during the construction phase. Sales tax collections also provide additional economic stimulus to project counties, despite the presence of a sales tax exemption that can be 50%, 75%, or 100% of state and county sales taxes on clean energy project purchases.

All case study projects experience an increase in local taxes relative to previous land uses, primarily driven by sales and personal property taxes. For counties with a smaller tax base, clean energy projects comprise a larger share of total property taxes (inclusive of both real and personal property). Potential increases in tax revenues can also benefit school funding and local services; however, there were some concerns that these increases may affect state school funding through local effort assistance payments that ensure school districts receive a set level of funding. Between 2016 and 2024, the consultant team did not find any specific examples of this benefit stream reduced in a county where a case study project was developed.

County officials provided additional input on how the current landscape of clean energy development taxation affects local economies. Clean energy projects can be centrally assessed by DOR or locally assessed by a county's Office of the Assessor. Central assessment determined by DOR occurs for statewide utilities or projects that cross county boundaries. Of the case study projects reviewed, two wind projects were centrally assessed: Skookumchuck (in both Lewis and Thurston Counties) and Tucannon (owned and operated by Portland General Electric). All other case study projects were locally assessed.

While counties have the authority to locally assess parcels that contain clean energy development, some county officials noted that they lack the expertise for conducting these assessments as well as for advocating for themselves upon appeal by developers. However, a drawback of central assessment is that county officials may not be able to understand or anticipate changes in assessed values from year to year, noting that they often receive updated assessments from the state close to the end of the budget development period, offering little room for budget adjustments in response to changes.

County officials also expressed concern about the optional wind and solar excise tax alternative to property taxes enacted in 2023 (Chapter 82.96 RCW), which allows projects to be exempt from state personal property tax in favor of a new clean energy production excise tax.[77] Assessors noted that the law dictates which taxing districts may receive funds distributed to counties from the excise taxes, which may adversely affect some districts. County officials also fear that the law may be updated to include both state and county tax collections, which could substantially alter how funds are distributed within the county taxing districts. Due to these concerns and others, such as the depreciation of projects over time, some county officials suggested taxing clean energy projects as a standalone tax category instead of as personal property.

[77] Supporting clean energy through tax changes that increase revenue to local governments, schools, and impacted communities.

Findings: Evaluation of direct, indirect, and induced jobs in construction and operations

Background

Community members and representative interests inquired about the effect of renewable energy projects on local employment. They expressed concerns that projects sited in rural areas do not adequately leverage and benefit local economies. This section describes the extent of jobs impacts that project construction and operations have had or may have in Washington.

Direct investments

To model the impacts of clean energy on local economies, the consultant team first estimated the total costs of installing and operating each project to understand the level of investment in the local economies that these projects may have. Ideally, these estimates would include details about specific expenditures with the names of contractors who received funds for the work.

Unfortunately, developers are not required to make these costs publicly available, although the costs of infrastructure elements are provided to the state or counties for tax assessment purposes. Some developers provide estimates of total investments in press releases, but these estimates often combine direct investments with internal estimates of project effects on regional activity, and therefore are not useful as inputs for modeling job effects. Similarly, specific job demands are not required to be reported.

Because the project investments were not available, the consultant team used average construction and operation costs by project phase for each sector on a per MW capacity basis based on assumptions. While imperfect, this method provided a working estimate from which the consultant team could assess the likely level of local investment by projects even without developer input.

For solar photovoltaic system components, the consultant team used the model assumption of $1,030 per kW for project installation and capital expenditure costs (2023 USD). Similarly, the consultant team assumes that project operation and maintenance (O&M) costs are $20 per kW (2023 USD).[78] These costs were then distributed across a suite of cost categories, including (but not limited to) materials, equipment, labor, and permitting for both construction and operation phases.

For onshore wind system components, the consultant team used the model assumption of $1,531 per kW for project installation and capital expenditure costs (2023 USD). Similarly, the consultant team assumed that project O&M costs are $38 per kW (2023 USD).[79] These costs were then apportioned to a similar set of cost categories as the solar PV JEDI model.

JEDI does not currently include cost data on battery storage systems. As shown in **Table 14**, the consultant team relied on literature to arrive at a dollar figure for the cost of construction and operation. The consultant team then used GDP deflators from the Office of Management and Budget (OMB) (2023) to adjust cost

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[78] National Renewable Energy Laboratory (NREL), "Jobs & Economic Development Impact (JEDI) Wind Models Rel. W6.28.19.," n.d., https://www.nrel.gov/analysis/jedi/wind.html.
[79] Ibid.

estimates to 2023 dollars and use the Impact Analysis for Planning (IMPLAN) input-output model to evaluate the impacts of this component of Washington's economy.[80]

Table 14. Battery energy storage system cost references.[81]

Project	Source
Horn Rapids Solar, Storage and Training	Pacific Northwest National Laboratory (2022)
Carriger Solar	Magnum Economics (2022)
Horse Heaven Clean Energy Center	U.S. EIA (2023), Northwest (NWPP) region

Modeling jobs impacts

The consultant team developed an estimate of job effects using the JEDI model for solar PV and onshore wind. For battery storage facilities, the consulting team supplemented this modeling with IMPLAN model. Both JEDI and IMPLAN are input-output models that estimate the direct, indirect (supplier), and induced (consumer spending) effects associated with project expenditures.

The U.S. DOE developed JEDI to improve the specificity of input-output models to assess the economic effects of operating and planned clean energy development.[82] JEDI has multiple models available for assessing the regional economic impacts of solar photovoltaics and onshore wind, among other technologies. Both models evaluate the spending effects on jobs, earnings (employee wages, salaries, and benefits), value added (market value of a region's goods and services), and economic output (value added plus the value of intermediate goods and services used to produce products for final consumption).

As of July 2024, there is no dedicated JEDI model for battery storage, so the consultant team relied on IMPLAN for this technology. When modeling battery storage component-related impacts in IMPLAN, the consultant team assigned input expenditures to the "Storage Batteries" category (IMPLAN Industry 3333) and applied an IMPLAN assumption that approximately 48% of expenditures in this industry are spent in Washington.[83]

Available employment pool

Table 15 presents occupations of residents within the project census tracts, project counties, and Washington, as broadly grouped by the ACS. Employment is higher within natural resources and construction in the relevant census tracts (14%) and project counties (14%) than average in Washington (9%).

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[80] White House Office of Management and Budget (OMB), "Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2029," n.d., https://www.whitehouse.gov/omb/budget/historical-tables/.
[81] Xu Ma, Di Wu, and Aladsair Crawford, "Energy Northwest – Horn Rapids Solar and Storage: A Techno-Economic Assessment," August 1, 2022, https://doi.org/10.2172/1894860; Mangum Economics, "Carriger Solar Economic & Fiscal Contribution to Klickitat County and the State of Washington" (Cypress Creek Renewables, 2022), https://www.efsec.wa.gov/sites/default/files/230001/001/Attachment_J_Carriger_Socioeconomic_Report.pdf.; U.S. Energy Information Administration, "Cost of Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2023," 2023, https://www.eia.gov/outlooks/aeo/assumptions/pdf/elec_cost_perf.pdf.
[82] National Renewable Energy Laboratory (NREL), "Jobs and Economic Development Impact (JEDI) Models," NREL/FS-5000-64129 (Golden, CO (US), 2015).
[83] IMPLAN Support, "Input-Output & Social Accounting Matrix Structure," 2023, https://support.implan.com/hc/en-us/articles/18943702175003-Input-Output-Social-Accounting-Matrix-Structure..

This suggests clean energy projects sited within these areas could potentially leverage local construction and maintenance workforces. Production, transportation, and material moving industries are either similar or slightly more common in relevant census tracts (12%) and project counties (13%) compared to the state average (12%).

Table 15. Occupation of residents near study projects, 2018-2022

Occupation	Total employment in Census tracts intersected by case study projects* (% of total)	Total employment in case study project counties (% of total)	Employment in Washington (% of total)
Management/Business/Science/Arts	6,359 (41%)	65,406 (38%)	1,664,322 (44%)
Sales/Office	2,819 (18%)	30,945 (18%)	697,384 (19%)
Service	2,266 (15%)	29,047 (17%)	595,994 (16%)
Production/Transportation/Material Moving	1,829 (12%)	22,314 (13%)	443,300 (12%)
Natural Resources/ Construction/Maintenance	2,136 (14%)	22,975 (14%)	351,076 (9%)
Total	**15,409 (100%)**	**170,687 (100%)**	**3,752,076 (100%)**

* These estimates include all census tracts that intersect with any of the case study project boundaries.
Source: 2022 ACS 5-Year Survey.

Review of studies of job effects of solar and wind developments

As shown in **Table 16**, analyses of project impacts in rural U.S. counties support evidence for increased employment demand ranging from 0.5 to six jobs per MW of wind or solar power capacity for the construction phase and 0.1 to 2.5 jobs per MW during the operations phase. Existing studies suggest that developers often rely on non-local or international manufacturers and labor brought in from outside local communities to assemble the turbines and panels, limiting the number of local job opportunities provided by these projects.[84] Examples of reviewed studies include:

- Kotarbinski et al. (2020) estimates the total number of O&M full-time equivalent (FTE) jobs per MW of installed capacity of land-based wind energy development. NREL calculated this estimate from the entire fleet of land-based wind energy plants in the United States as of November 2019.[85]
- BW Research Partnership (2024) modeled technology-specific job impacts associated increased clean energy development if the Northwest were on the path to net-zero emissions and found that Washington could gain over 1,000 jobs in wind energy and nearly 600 jobs in solar by 2030. They then estimated the average total jobs per million U.S. dollar invested and total jobs per MW capacity. BW Research Partnership also uses JEDI and IMPLAN to estimate investments and associated job impacts but includes both distributed and utility-scale projects.[86]

[84] Max Wei, Shana Patadia, and Daniel M. Kammen, "Putting Renewables and Energy Efficiency to Work: How Many Jobs Can the Clean Energy Industry Generate in the US?," *Energy Policy* 38, no. 2 (February 2010): 919–31, https://doi.org/10.1016/j.enpol.2009.10.044.
[85] Matthew Kotarbinski, David Keyser, and Jeremy Stefek, "Workforce and Economic Development Considerations from the Operations and Maintenance of Wind Power Plants," (Golden, CO (US): National Renewable Energy Laboratory (NREL), December 2020), https://www.nrel.gov/docs/fy21osti/76957.pdf.
[86] BW Research Partnership, "CETI: Net-Zero Northwest Workforce Analysis Technical Report," November 2023, https://www.nznw.org/files/workforce-analysis-technical-report-regional.

The consultant team also received local wind industry employment information from an economic development agency that serves a county with wind energy development.[87] The consultant team used company-specific estimates of annual employment and total capacity data to calculate an average total jobs per MW capacity from 2017 to 2022 of 0.084. The specific companies and county that the employment data is associated with are kept anonymous for confidentiality.

Table 16. Job impacts literature review summary

Author(s)	Year	Journal	Scope of Analysis	Job Effects: Construction and Installation Phase	Job Effects: O&M Phase	Income Effects: Construction and Installation Phase	Income Effects: O&M Phase
Wind Projects							
Brown et al.	2012	Energy Economics	United States	0.5 jobs/MW*	*included in construction phase estimate	$11,000/MW*	*included in construction phase estimate
BW Research Partnership	2024	N/A	Northwest United States (Idaho, Montana, Oregon, Washington)	1.1 jobs/MW*	*included in construction phase estimate	--	--
de Silva et al.	2016	Southern Economic Journal	Rural Texas	No significant effect	No significant effect	Per capita county income = + $2,657/MW*	*included in construction phase estimate
Kotarbinski et al.	2020	N/A	United States	--	0.086 jobs/MW	--	--
NREL	2009	N/A	United States	4-6 jobs/MW	0.3-0.6 jobs/ MW	--	--
Wei et al.	2010	Energy Policy	United States	0.79 jobs/MW	0.69 jobs/MW	--	--
Solar Projects							
BW Research Partnership	2024	N/A	Northwest United States (Idaho, Montana, Oregon, Washington,)	1.9 jobs/MW*	*included in construction phase estimate	--	--
Wei et al.	2010	Energy Policy	United States	5.1 jobs/MW	2.5 jobs/MW	--	--

Regional economic impacts of case study projects

Tables 17 and **18** present modeled estimates for each case study for the construction phase and O&M phase, respectively.[88] For each project, the consultant team evaluated the effects of the estimated direct investments on FTE employment and economic output and calculated a multiplier that reflects the economic stimulus to Washington per dollar of clean energy investment, which ranged from $0.32 to $0.62 of output per dollar invested for the construction phase (one time effects), and $0.65 to $1.37 per dollar invested in operations and

[87] Personal communication with County economic development agency, May 2024.
[88] As of June 2024, the total capacity of the proposed Horse Heaven Clean Energy Center project is unclear. To reflect this uncertainty, the consultant team performs their jobs analysis for a range of proposed project sizes that have been discussed between EFSEC and Washington State governmental officials.

maintenance (ongoing costs). This output reflects the assumption that investments in turbines and other components are not spent in the state, while operations phase expenditures would be made within the state.

The analyses were run at the state level. While local workforces are involved in some capacity during both construction and operations phases, data do not exist to quantify the portion of jobs that are local to the counties in which projects operate. Some portion of jobs require a level of technical expertise that cannot be filled locally, especially during the construction phase; although the consultant team was unable to find public data to further clarify a more granular breakdown of job creation.[89,90]

Table 17. Regional economic impacts of the case study projects, construction phase

Project	Status	Capacity (MW)	Estimated project costs (2023 USD)	Jobs (FTEs)	Output (2023 USD)	Output per $ invested
Columbia Solar	Operating	15	$15 million	68	$10 million	$0.62
Horn Rapids Solar, Storage and Training	Operating	4	$11 million	40	$7 million	$0.65
Lund Hill Solar	Operating	150	$155 million	681	$95 million	$0.62
Tucannon River Wind Farm	Operating	267	$409 million	744	$133 million	$0.32
Skookumchuck Wind Facility	Operating	137	$209 million	381	$69 million	$0.33
Rattlesnake Flat Wind Project	Operating	144	$220 million	399	$73 million	$0.33
Carriger Solar	Planned	160	$205 million	890	$140 million	$0.66
Horse Heaven Clean Energy Center	Planned	975 to 1,150	$1.5 billion to $1.8 billion	5,600 to 6,000	$0.94 to $1.0 billion	$0.58 to $0.63
Desert Claim Wind	Planned	100	$153 million	360	$62 million	$0.40

Source: IEc analysis. Project costs for solar photovoltaic components are estimated by taking the product of the project's rated capacity and the solar photovoltaic JEDI model's default average cost value of $1,030 per kW (including sales tax) for the state of Washington. Job impacts associated with the battery energy storage component are estimated by inputting costs from Magnum Economics (2022) into the input-output model IMPLAN, assuming 48.34 percent of expenditures are spent per IMPLAN's Social Accounting Matrix (SAM). Project costs for onshore wind components are estimated by taking the product of the project's rated capacity and the onshore wind JEDI model's default average cost value of $1,531 per kW (including sales tax) for the State of Washington.

Note – Impacts include direct, indirect, and induced effects of construction spending, which are assumed to include spending on labor, materials, equipment, permitting, and taxes. Some materials and equipment costs are assumed not to be spent locally. Estimated project costs include both in-state and out-of-state expenditures. Both JEDI and IMPLAN are run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

[89] Personal communication with Washington County assessors, treasurers, planers, and economic development directors.
[90] Through personal communication with USDA Rural Development, since 2018, there are several renewable energy projects funded by USDA's Rural Energy for America Program (REAP) program sized between 500 kW and 1 MW that employ contractors based in Washington State. USDA Rural Development posts rural investments by state and county at: https://www.rd.usda.gov/rural-data-gateway/rural-investments/by-county.

Table 18. Regional economic impacts of the case study projects, O&M phase

Project	Status	Capacity (MW)	Annual operation and maintenance costs (2023 USD)	Annual jobs (FTE)	Annual output (2023 USD)	Annual output per $ invested
Columbia Solar	Operating	15	$300,000	4	$410,000	$1.37
Horn Rapids Solar, Storage and Training	Operating	4	$80,000	1	$110,000	$1.37
Lund Hill Solar	Operating	150	$3 million	37	$4 million	$1.37
Tucannon River Wind Farm	Operating	267	$11 million	38	$7 million	$0.65
Skookumchuck Wind Facility	Operating	137	$5 million	21	$4 million	$0.69
Rattlesnake Flat Wind Project	Operating	144	$6 million	22	$4 million	$0.69
Carriger Solar	Planned	160	$3 million	39	$4 million	$1.37
Horse Heaven Clean Energy Center	Planned	975 to 1,150	$23 million to $30 million	230 to 260	$28 million to $33 million	$1.12 to $1.21
Desert Claim Wind	Planned	100	$4 million	15	$3 million	$0.71

Source: IEc analysis. O&M costs for solar photovoltaic components are estimated by taking the product of the project's rated capacity and the solar photovoltaic JEDI model's default average cost value of $20 per kW for the State of Washington. O&M costs for onshore wind components are estimated by taking the product of the project's rated capacity and the onshore wind JEDI model's default average cost value of $38 per kW for the state of Washington. Due to data limitations, estimates reflect annual job impacts associated with operation and maintenance of only the solar and/or wind component of the system, but do not include impacts associated with the O&M of the battery storage facility. FTEs have a duration of one year.

Note – Impacts include direct, indirect, and induced effects of O&M spending, which are assumed to include spending on labor, materials, equipment, and other services. O&M expenditures are assumed to be spent in the State of Washington. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality).

Table 19 presents estimated job effects per million USD invested and per MW capacity during construction and operations. As shown, estimated job effects during the construction phase are estimated to range from 2 to 10 jobs per million MW invested, or 3 to 10 per MW capacity. Job effects during the operations phase are estimated to range from 4 to 13 jobs per million invested, or 0.1 to 0.2 jobs per MW capacity. **Table 20** presents a summary of job impacts for all case study projects stratified by technology.

Table 19. Job impacts of the case study projects, per million dollars invested and MW

Project	Status	Construction Phase: Total jobs per $M invested	Construction Phase: Total jobs per MW capacity	O&M Phase: Annual jobs per $M invested	O&M Phase: Annual jobs per MW capacity
Columbia Solar	Operating	5	5	13	0.27
Horn Rapids Solar, Storage and Training	Operating	4	10	13	0.25
Lund Hill Solar	Operating	4	5	12	0.25
Tucannon River Wind Farm	Operating	2	3	3	0.14
Skookumchuck Wind Facility	Operating	2	3	4	0.15
Rattlesnake Flat Wind Project	Operating	2	3	4	0.15
Carriger Solar	Planned	4	6	13	0.24
Horse Heaven Clean Energy Center*	Planned	3 – 4	5 – 6	9 – 10	0.23 – 0.24
Desert Claim Wind	Planned	2	2	4	0.10

Source: IEc analysis. See notes to Tables 17 and 18 for additional analytical details.
*For this project, the consultant team took the central estimate of the calculated range of potential investments to include in their calculations for both wind and solar PV.

Table 20. Summary of job impacts for case study projects by technology

Technology	Number of case study projects	Average total jobs per MW capacity, construction	Average annual jobs per MW capacity, O&M
Onshore Wind	5	3.2	0.16
Solar PV	5	6.0	0.25

Source: IEc analysis. See notes to Tables 17 and 18 for additional analytical details.

School funding

The benefits of local jobs extend beyond the direct benefits of those employed. Clean energy jobs can also bring employees with families to an area. If young children of employees are enrolled in local public schools, the amount of school funding from the state increases, as such funding is disbursed on a per-pupil basis.

Most school funding comes from the state (about 76%-80% from 2018 to 2022). While many factors go into the funding formula — including income levels, local cost of living, and special education needs — the state distributed approximately $14,556 per student in the 2019-20 school year.[91] Assuming that most maintenance sites employ five to 15 people and that some of these employees have school-age children, additional income to local schools could be in the hundreds of thousands of dollars per year.

[91] Venice Buhain, "Breaking down WA's School Funding Formula," *Crosscut*, n.d., https://crosscut.com/news/2022/11/breaking-down-was-school-funding-formula.

Summary of findings

Clean energy projects generate jobs during construction, and a smaller number of jobs during annual operations.

Using regional economic models, the consultant team estimated the economic impact of projects. Note that these are not actual confirmed job numbers from projects. Across all operating case study projects, during project construction:

- Investments ranging from $11 million to $409 million are associated with 40 to 744 FTE jobs and $7 million to $133 million in one-time economic contributions to Washington.
- For every dollar of investment (including both in-state and out-of-state expenditures), Washington receives $0.32 to $0.65 in economic stimulus. Job impacts during the construction phase range from two and five FTE jobs per million dollars of investment, and between three and 10 jobs per MW of capacity.

During project operations:

- Annual investments between $80,000 and $11 million are associated with one to 38 FTE jobs and $110,000 to $7 million of annual in-state economic contributions.
- For every dollar of investment during annual operations, Washington receives between $0.65 and $1.37 in economic output. Job impacts during the operation and maintenance phase range from four and 13 FTE jobs per million dollars of investment, and between 142 and 267 jobs per kW of capacity.

Projects that contain solar have a higher economic output per dollar of investment during both construction and operation than onshore wind projects. Solar projects are also associated with a higher number of jobs per MW during both construction and operations compared to onshore wind projects. Compared to the jobs per MW estimates identified from the literature review, on average there are 0.5 to six jobs per MW estimates during construction fall within the 0.5 to 6 range of MW capacity installed. The average jobs per MW estimates during operation are also within the 0.1 to 2.5 range of MW capacity installed identified from the literature review.

As shown in **Table 20**, for both technologies, the jobs per MW estimates are on the low end of the identified jobs per MW ranges from the reference studies. However, there are several dissimilarities in geographic and/or temporal scope between the analysis and each reference study. Furthermore, the results include both indirect and induced job impacts, while many reference studies that evaluate wind energy O&M job impacts only consider direct job effects.

There are also opportunities to encourage developers to hire local workforces. For example, under RCW Chapter 82.08[92] there is a tax exemption for certain clean energy investment projects, in which approved applicants may receive a reduction of state sales and use taxes owed on machinery and equipment if they involve local workers living within the project construction area. However, this exemption comes at a cost, as previously discussed, in the form of reduced sales tax receipts to local jurisdictions.

[92]Washington State Legislature, "Exemptions—Sales of Machinery and Equipment Used in Generating Electricity," n.d., https://app.leg.wa.gov/RCW/default.aspx?cite=82.08.962.≈

Findings: Evaluation of potential economic development assistance and impact mitigation payments

Background

Communities and representative interests inquired whether and to what extent renewable energy projects provide investments to communities in which they are located. Projects typically provide payments to landowners in lease areas. In addition, the projects pay personal property taxes, which are collected by the counties where they are located. This section discusses additional payments or benefits these projects have provided to communities.

Benefits in the form of economic development assistance and impact mitigation payments can take many different forms. There is no standardized definition on what constitutes a "community benefit," and they can range from formal agreements or jobs for local community members to funding for local priorities, organizations, or programs.[93]

According to an NREL presentation exploring the role of benefits in wind energy development,[94] less than half (205 out of 546) of the examined wind projects included some form of benefit. This aligns with the community engagement findings in this study; interviewees and public meeting participants anecdotally mentioned various benefits that project developers offered, although dollar amounts were rarely public knowledge, and several counties did not know of any substantial assistance. The most common benefit seen was contributions to local organizations and causes (e.g., volunteer fire departments, food banks, school programs). There were also funds established, such as grants and scholarships. Several of the most common types of benefits are discussed in this section.

Lastly, many funds or mitigation payments do not address other concerns about impacts to local culture, ways of life, or the environment. A Berkeley Law report about community benefit agreements (CBAs) recommends that they should help create "community-responsive organizations with local governance that lead to long-term community improvements and a community voice" in project monitoring and management.[95]

Community benefits agreements/Host community agreements

CBAs are tools that can help local communities have a voice in the development of new projects. CBAs are legally binding, enforceable contracts signed by project developers and community groups. CBAs can provide funds for development, support affordable housing, environmental mitigation, infrastructure, priority projects identified by the community.[96] Host community agreements (HCAs) are similar tools with a different name, by

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[93] WINDExchange. Wind Energy Technologies Office, "Wind Energy Community Benefits Guide" (U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, 2023), https://windexchange.energy.gov/community-benefits-guide.
[94] Matilda Kreider et al., "Benefits and Burdens: Exploring the Role of Community Benefits in Wind Energy Development" (National Renewable Energy Laboratory,
[95] Louise Bedsworth and Katherine Hoff, "Offshore Wind & Community Benefits Agreements in California" (Berkeley Law, Center for Law, Energy, & the Environment, April 2024).
[96] U.S. Department of Energy, Office of Economic Impact and Diversity, "Community Benefits Agreements: Frequently Asked Questions," accessed June 12, 2024, https://www.energy.gov/justice/articles/community-benefit-agreement-cba-resource-guide-faqs.

which clean energy project developers negotiate directly with the host community to provide customized benefits.

While benefits are not currently required by the federal government (or most U.S. states, with New York as a notable exception — see examples explained later in this section), the U.S. DOE does require Community Benefits Plans (another similar tool by a different name) for all Bipartisan Infrastructure Law and Inflation Reduction Act funding opportunity announcements and loan applications.[97] Some federal organizations, like the Bureau of Ocean Energy Management (BOEM), incentivize the use of community benefits by providing a bidding credit, which was used in the 2023 California offshore wind energy sale, to encourage developers to form CBAs.[98]

Payment in lieu of taxes

In general, a payment in lieu of taxes (PILT, also referred to as PILOT or PLOT), is paid to compensate a government for property tax revenue lost due to tax exempt ownership or use of real property. In the context of clean energy projects, the developer of clean energy project would financially compensate the hosting municipality annually as a replacement for a portion of the taxes it would have otherwise paid. These payments can "replace an irregular set of payments based on depreciating assessed property values with a more regular set of payments."[99]

As previously discussed, Washington recently passed a new exemption on the state portion of personal property tax for qualifying clean energy facilities, which will come into effect on January 1, 2025.[100] The clean energy facilities granted this exemption would pay a new "production excise tax" based on the generation/storage capacity of the facility, the proceeds of which would be distributed to local municipalities, school districts, and federally recognized tribes in which projects are sited.[101] Similar to a PILT, this exemption and production tax would fund local activities at a stable level year over year, avoiding some of the concerns around the depreciation of personal property for the period of the exemption.

The federal government will also make PILT payments for counties that host a large portion of tax-exempt federal land.[102] These payments should not be confused with voluntary or required agreements that project developers make with local jurisdictions. This study does not include an analysis of whether a PILT program is permissible under Washington law.

Other community benefits

Additional support for communities may include direct investments in infrastructure improvements, recreational and/or scenic enhancements, and job opportunities. Examples of such benefits identified as part

[97] U.S. Department of Energy, "About Community Benefits Plans," n.d., https://www.energy.gov/infrastructure/about-community-benefits-plans.
[98] Schatz Energy Research Center, "Competitive Offshore Wind Leases on the U.S. Outer Continental Shelf: A Review of the Use of Multiple-Factor Auctions and Nonmonetary Credits," n.d., https://schatzcenter.org/pubs/2023-OSW-R1.pdf.
[99] Eli Gold, "Solar Energy Property Taxation" (Gerald R. Ford School of Public Policy, University of Michigan, June 2021).
[100] Marty Tschida and Shane Griffiths, "New Renewable Energy Property Tax Exemption in Washington State," Moss Adams, March 11, 2024, https://www.mossadams.com/articles/2024/03/energy-storing-generating-facility-exemption.
[101] Stoel Rives LLP, "New Washington State Personal Property Tax Exemption for Certain Renewable Energy Generation and Storage Facilities," February 8, 2024, https://www.stoel.com/insights/publications/new-state-personal-property-tax-exemption-for-rene.
[102] U.S. Department of the Interior, "Payments in Lieu of Taxes," n.d., https://www.doi.gov/pilt#:~:text=Welcome%20to%20the%20PILT%20Website,Federal%20lands%20within%20their%20boundaries.

of this analysis via research and public engagement include installing solar panels on the roof of a community pool, funding to the local school district, and supporting medical facilities and hospitals.

Examples of economic development assistance

Although community benefits are not always public, these examples from the case study analysis provide insights on how clean energy project developers may choose to invest in the communities where they operate.

Case study projects

The six operating clean energy projects demonstrate a variety of mitigation and assistance measures that contribute to the local communities. The following list summarizes the initiatives associated with five of these operating projects:

- **Horn Rapids Solar, Storage, and Training (4 MW, Constructed 2020)**
  This project directly benefits the City of Richland by supplying all generated energy to the local community to supplement energy needs and help reduce peak energy demand. The project also provides the City of Richland with a variety of demand response and grid services, which are particularly useful during peak usage times. According to an analysis from the Pacific Northwest National Lab (PNNL), this arrangement has a 25-year present value of $7,386,098 in benefits for residents.[103] Additionally, the City received a $3 million Clean Energy Fund grant from the Washington State Department of Commerce to offset costs of developing the project and test the facility's functions.[104] Depending on the modeling assumptions and the inclusion of the grant, PNNL estimates a net benefit cost ratio of the Horn Rapids project as negative to slightly positive.
- **Rattlesnake Flat Wind (144 MW, Constructed 2020)**
  Managed by Clearway Energy in partnership with Avista, this project supports local services and infrastructure through donations to the Washtucna Heritage Museum and Community Center, the Adams County Fire Protection District, and the Lind Senior Center. During the COVID-19 pandemic, it also contributed to local food banks. Revenues from land leases on public land fund local government services and school construction.[105]
- **Skookumchuck Wind (136 MW, Constructed 2020)**
  Southern Power Company collaborated with Lewis County's Community Development Office to develop the Environmental Impact Statement and development agreement. This development agreement ensures that revenue from building permits covers the office's operational costs. Additionally, Southern Power contributed to mitigation costs for local fire services.[106]

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[103] Kelly Rae and Carla Martinez, "New Energy Project Powers Up in Richland," Energy Northwest, November 9, 2020, https://www.energy-northwest.com/whoweare/news-and-info/Pages/New-energy-project-powers-up-in-Richland.aspx.
[104] Ma, Wu, and Crawford, "Energy Northwest – Horn Rapids Solar and Storage."
[105] Zadie Oleksiw, "Clearway Energy Group, Avista Host Ribbon-Cutting to Mark Commencement of Commercial Operations for Rattlesnake Flat Wind Farm," Clearway Energy Group, December 15, 2020, https://www.clearwayenergygroup.com/press-releases/clearway-energy-group-avista-host-ribbon-cutting-to-mark-commencement-of-commercial-operations-for-rattlesnake-flat-wind-farm.
[106] Personal communication with Lewis County Community Development Office on March 8, 2024.

- **Columbia Solar (15 MW, Constructed 2022)**
  While not directly tied to project operations, Puget Sound Energy (PSE) and the PSE Foundation have invested over $105,000 in community-based organizations within Kittitas County, including Habitat for Humanity and the Kittitas County Historical Museum.[107,108]
- **Tucannon Wind (267 MW, Constructed 2014)**
  In 2015, Portland General Electric established the Tucannon River Wind Farm Habitat Project Fund, which annually allocates up to $20,000 for local conservation projects.[109]

Additional examples

In addition to mitigation measures described above, which are associated with the case study projects, there are measures implemented elsewhere that provide examples of what could be applicable to future clean energy projects in the state. **Table 21** at the end of this section summarizes projects that have used these programs, including the financial details of the support where available.

NYSERDA Build-Ready Program

Build-Ready is a New York State Energy Research and Development Authority (NYSERDA) program that works with communities to design and develop clean energy projects on under-utilized land (e.g., brownfields, landfills, former commercial or industrial sites, parking lots) and that are customized to meet local needs.[110] After a municipality identifies and nominates a site, NYSERDA works with the host municipalities on permitting, design, interconnection, and developing a customized benefits package. NYSERDA then auctions the site to clean energy developers, who are required to comply with the previously agreed upon benefits package.

Since the program's creation in 2020 and as of December 2023, Build-Ready has resulted in the ongoing development of 21 projects.[111]

NYSPSC Host Community Benefit Program

In 2021, the New York State Public Service Commission (NYSPSC) established a host community benefit program in accordance with the state's Accelerate Renewable Energy Growth and Community Benefit Act. Owners of large-scale (over 25 MW) clean energy facilities pay $500/MW for solar or $1,000/MW for wind each year for the first 10 years of the project's operation, to be distributed equally among all residential utility customers residing in the municipality where the facility would be located through electricity bill credits.[112] These funds are meant to complement, not replace, other agreed-upon benefits (such as PILOT agreements).

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107 "2022 Puget Sound Community Profile: Kittitas County," n.d., https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.pse.com/-/media/PDFs/Community-profiles/Kittitas.pdf%3Fsc_lang%3Dhi%26modified%3D20230329205914%26hash%3D23D7856FB7B9997F98FEBF1CC1DBF3AF&ved=2ahUKEwj-u_m15e-FAxVCHjQIHX8kDQAQFnoECBQQAQ&usg=AOvVaw2RzWFVtLdkmOZXVkP02OA-.
108 "2022 Puget Sound Community Profile: Kittitas County."
109 Blue Mountain Community Foundation, "PGE Tucannon River Wind Farm Habitat Project Fund: Request for Proposal," accessed April 24, 2024, https://www.bluemountainfoundation.org/grants/grantinfo/.
110 New York State Energy Research & Development Authority, "Build-Ready Program," NYSERDA, accessed June 12, 2024, https://www.nyserda.ny.gov/All-Programs/Build-Ready-Program.
111 NYSERDA, "NYSERDA's Build-Ready Community Benefits Package," https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Clean-Energy-Standard/Build-Ready-Community-Benefits-Package---Dec2020.pdf.
112 Thomas F. Puchner, "New York State Public Service Commission Establishes Host Community Benefit Program," *Renewable Energy Post* (blog), February 15, 2021, https://www.renewableenergypost.com/public-service-commission/new-york-state-public-service-commission-establishes-host-community-benefit-program/.

According to a status report submitted in June 2023, there were eight applicable projects on the list in New York, with developer fees estimated to total $7.8 million over 10 years (this total to be distributed among all host community residents).[113] The same report notes that applicable facilities are not expected to commence operations until at least 2025, so the estimated economic benefits are prospective in nature.

Oregon's Strategic Investment Program

Oregon's Strategic Investment Program (SIP) is a program that offers a 15-year property tax exemption on a portion of large capital investments by "traded sector" businesses (including clean energy developers).[114] If approved, the SIP project is initially taxed according to project size, with a 3% increase with each year of the SIP period. Approval for SIP tax treatment starts with negotiation an agreement between the project developer, the county government, and any other local parties that may be affected (e.g. city, port district), with a public hearing held by the county's governing body before executing an agreement. Once all parties agree, the developer may apply to Business Oregon for the official determination.

The SIP agreements are public, and the Business Oregon website[115] provides financial summary tables for over 20 different projects that have used SIP from 2018 to 2024, though the tables do not include information about how the counties are using the SIP payments.

Solar Energy Zones Regional Mitigation Strategy

In 2017, the U.S. Department of Interior Bureau of Land Management released solar regional mitigation strategies to ensure equitable development of "Solar Energy Zones" in Colorado, Arizona, and Nevada.[116] The strategy applies a landscape-level approach to managing solar development and mitigation on public lands, including identification of natural, cultural, and human resources that could be impacted by potential development, measures to compensate for any unavoidable impacts, and identification of priority of sites for mitigation. The strategy also recommends a per-acre regional compensatory mitigation fee for solar development to fund off-site compensatory mitigation measures.

Potential mitigation actions mentioned include:

- Perform high density shrubland treatments
- Research, identify and protect national historic trail routes
- Develop educational and interpretative services
- Develop and maintain partnership with local community colleges to encourage solar energy technical courses in environmental justice communities

Locally owned, community-scale wind farm in Grayland, Washington

Coastal Energy Project is a locally owned community-scale commercial wind farm (6 MW) built in 2010 in Grayland, Washington. It is sponsored by the Coastal Community Action Program (CCAP).[117] The project's

[113] New York State Department of Public Service, "In the Matter of a Renewable Energy Facility Host Community Benefit Program," n.d., https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=62773.
[114] Business Oregon, "Business Oregon : Strategic Investment Program (SIP) : Strategic Investment Program (SIP) : State of Oregon," accessed June 12, 2024, https://www.oregon.gov/biz/programs/sip/pages/default.aspx.
[115] Business Oregon.
[116] U.S. Department of the Interior Bureau of Land Management and Environmental Science Division Argonne National Laboratory, "Regional Mitigation Strategy for the Colorado Solar Energy Zones," January 2017, https://blmsolar.anl.gov/documents/docs/FINAL_CO_SRMS_Jan_2017.pdf.
[117] Craft3, "Coastal Energy, Grayland, Washington," February 21, 2023, https://www.cdfifund.gov/sites/cdfi/files/documents/coastal-energy_02212013.pdf.

financing came from three sources: a state grant, a commercial loan provided by Craft3 (a Community Development Financial Institution and Community Development Entity), and government tax incentives.

The project created approximately 50 construction jobs, six new and permanent jobs, and indirectly supported another 23 full-time equivalent positions. CCAP can sell energy from the six MW project to its local electric utility and use the earnings (estimated to be around $450,000 annually in 2011) “as an unrestricted source of funds for its housing, energy assistance, health, and other programs that serve the local community.”[118]

[118] Katie Kienbaum and John Farrell, “Advantage Local: Why Local Energy Ownership Matters, 2023,” (Institute for Local Self-Reliance, June 2023).

Table 21. Clean energy projects supported by economic development programs

Program	Project	Location	Capacity	Direct Economic Benefits	Indirect Economic Benefits
NYSERDA Build-Ready Program	Mount Morris Solar Farm	Mount Morris, NY	177 MW	PILOT and HCA agreements ($500k/yr)	Developer will pay for water study, which will help town apply for grants & reduce municipal water project cost by up to 80%
NYSERDA Build-Ready Program	Homeridae Solar Farm	Olean, NY	4 MW	PILOT agreement ($5,000/MW/yr to host town to reinvest in community)	Energy from solar farm (equates to $125,000/yr in reduced electricity costs for city)
NYSPSC Host Community Benefit Program[119]	Mill Point Solar	Glen, NY	250 MW	$125,000/yr distributed among residents of town	--
Lewis County Industrial Development Agency HCA[120]	Number Three Wind Energy Center	Lewis County, NY	103.9 MW	$150,000/yr distributed via grants for projects that benefit the greater community and/or local businesses	--
Oregon Strategic Investment Program[121], [122]	Hay Canyon & Star Point Wind Farms	Sherman County, OR	200 MW (combined)	$1.1 million in SIP fees paid in 2023 ($330 million invested by end of 2021)	11 newly created direct jobs with average $91,971 salary (compared to median Sherman County household income of $57,171 in 2022)
Oregon Strategic Investment Program[123,124]	Montague Wind Power Facility	Gilliam County, OR	200.9 MW	$1.3 million in SIP fees paid in 2023 ($265 million invested by end of 2021)	4 newly created direct jobs with $111,043 average salary (compared to median household income in Gilliam County of $58,409 in 2022)
Solar Regional Mitigation Strategy (U.S. BLM)[125]	Solar Energy Zones (3) in Colorado	San Luis Valley, CO and Taos Plateau, NM	N/A	--	Identified natural, cultural, and human resources that could be impacted by development, selected priority sites for mitigation, and set per-acre fee recommendation for solar development to fund off-site compensatory mitigation measures.
Coastal Community Action Program[126]	Coastal Energy Project Community-Scale Wind Farm	Grayland, WA	6 MW	$450,000/yr from selling energy to local utility; used for funding "housing, energy assistance, health, and other programs that serve the local community"	Created 50 direct construction jobs (6 permanent) and 23 indirect full-time jobs

[119] New York State Energy Research and Development Authority, NYSERDA Annual Filing Host Community Benefits 2023 (November 1, 2023).
[120] WINDExchange. Wind Energy Technologies Office, "Wind Energy Community Benefits Guide."
[121] Business Oregon, "Business Oregon : Strategic Investment Program (SIP) : Strategic Investment Program (SIP): State of Oregon."
[122] U.S. Census Bureau, "Sherman County, OR Census Profile," n.d., https://data.census.gov/profile/Sherman_County,_Oregon?g=050XX00US41055.
[123] Business Oregon, "Business Oregon : Strategic Investment Program (SIP) : Strategic Investment Program (SIP): State of Oregon."
[124] U.S. Census Bureau, "Gilliam County, OR Census Profile," n.d., https://data.census.gov/profile/Gilliam_County...?g=050XX00US41021.
[125] Bureau of Land Management, "BLM Releases Strategy for Solar Energy Development on Colorado Public Lands," January 12, 2017.
[126] Kienbaum and Farrell, "Advantage Local: Why Local Energy Ownership Matters, 2023."

Recommendations

These recommendations emerged from community engagement and the economic and financial analysis documented in this study.

Recommendation 1: Strengthen local involvement in clean energy siting/project development processes to ensure that rural communities are informed and have a meaningful role in the decision-making process.

Rural communities often feel disconnected from decision-making processes that directly affect their environment and livelihoods. The state should take proactive steps to enhance outreach and engagement, ensuring that rural communities are informed and given the opportunity to actively participate in decision-making processes. This includes integrating county-level input into state-level decisions and ensuring that overburdened communities have equitable opportunities to influence project outcomes.

The state should:

- Enhance outreach and engagement for proposed clean energy projects.
  - Increase the frequency and accessibility of public meetings in rural communities where clean energy projects are proposed. This includes holding meetings at convenient times and locations for local residents and providing translation services where needed.
  - Establish feedback mechanisms, such as public meetings or online surveys, to gather community input throughout the siting/project development process, and ensure that feedback is considered in decision-making processes.
  - Develop and distribute clear, accessible information on opportunities for local input throughout the project development process, using traditional media, social media, and local community organizations to reach a broader audience.
  - Require developers to demonstrate and communicate how they consider and address community input during the process.
- Develop and improve community engagement and target outreach in overburdened communities to ensure equitable engagement.
  - Give voice to overburdened communities to ensure they are not disproportionately impacted by utility-scale clean energy projects.
  - Tailor community outreach to the needs of overburdened communities, consistent with guidelines described in Community Engagement Values and Guidance Adopted by the Environmental Justice Council.[127]
- Strengthen county-level engagement in the EFSEC decision-making process.

[127] Environmental Justice Council, “Community Engagement Values and Guidance,” August 25, 2023.

    - Support Interagency Clean Energy Siting Council efforts to examine local government's role in EFSEC project siting and development decisions and identify opportunities to strengthen rural communities' voice in these decisions.

- Provide no-cost technical assistance for community clean energy permitting.

    - Offer dedicated technical support to counties for navigating the permitting process for community-scale clean energy projects. This support should include resources for understanding state regulations (including the EFSEC siting process), completing permit applications, and addressing community concerns.
    - Create a centralized resource hub where counties can access best practices, case studies, and technical guidelines for clean energy permitting and development.

Recommendation 2: Make efforts to increase rural community benefits and mitigate potential harms from clean energy projects.

The state and developers should work collaboratively to maximize the benefits of clean energy projects to rural communities, such as job creation, economic growth, and community development, while mitigating potential harms, including environmental risks and safety concerns.

The state should:

- Strengthen the ability of rural communities to engage in informed discussions about clean energy projects, ensuring they can fully understand and participate in decisions that affect their local environment and economy.

    - Collaborate with local organizations to host community conversations that increase fact-based understanding of clean energy projects, their potential impacts, and the benefits they can bring.
    - Provide resources and support to local leaders to help them effectively communicate fact-based information about the potential benefits and impacts of clean energy projects.

- Support local non-government organizations, nonprofit organizations, and community-based organizations with training and education grants and other financial assistance.

    - Provide grants or other forms of financial assistance to nonprofits and other community-based organizations in rural communities to build their capacity for training and education around clean energy projects.
    - Encourage partnerships between local organizations, state agencies, and educational institutions to develop and deliver training programs that meet the specific needs of rural communities.

- Address fire and emergency response concerns about clean energy projects.

    - Develop a standardized protocol for assessing and mitigating fire and emergency response risks associated with clean energy projects in rural areas, including the supply of necessary equipment and resources.
    - Develop standardized curriculum and offer funding and training for local fire districts on the unique risks associated with each wind, solar, battery storage, and small modular nuclear development project.

- Promote community benefit agreements (CBAs).

    - Encourage the use of CBAs in negotiations between clean energy developers and rural communities to ensure that project benefits are shared with local residents. These agreements would include provisions for community-specific needs, such as local hiring and infrastructure improvements. Agreements between communities and developers should include long-term commitments rather than vague promises to local communities.
    - Facilitate the development of CBAs by providing templates and best practices both developers and communities, ensuring that these agreements are fair, transparent, and beneficial to all parties.

- Encourage direct investments in job creation in local communities to provide long-term benefits to those communities.

    - Encourage investments (beyond project costs) be direct, evident, and tangible to local communities so that residents understand and appreciate the engagement, commitment, and contributions of project developers locally.
    - Ensure that the jobs created through these investments are quality, family-sustaining jobs that offer competitive wages, benefits (including health care), and opportunities for advancement.
    - Address the challenges associated with workforce transitions, particularly for workers displaced from fossil fuel industries. Promote strategies that help these workers upskill, such as offering retraining programs and supporting the establishment of registered apprenticeships.

- Require developers to track and publicly report on the outcomes of their investments in local job creation, including the number of jobs created, the duration of employment, and the long-term benefits to the community.

Recommendation 3: Safeguard and enhance the quality of life in rural communities as clean energy projects are developed.

The introduction of large-scale clean energy infrastructure can disrupt local ecosystems, alter landscapes, and create challenges for nearby residents. The state should seek additional approaches that minimize environmental and aesthetic impacts and prioritize local residents' well-being, working with relevant jurisdictions and building on existing practices.

The state should:

- Avoid, minimize, or mitigate environmental and aesthetic impacts.

    - Use best practices to avoid, minimize, or mitigate disruptions to local ecosystems, water resources, and wildlife.
    - Design projects with community aesthetics in mind, such as maintaining visual buffers or using low-impact technologies that preserve the landscape in rural areas.
    - Demonstrate to rural communities that cleanup and restoration activities at the time of facility decommissioning will be fully financed and completed, such as with reclamation bonds.

- Support setbacks that buffer and protect adjacent landowners and neighbors.

    - Establish community-informed setbacks for clean energy projects to ensure adequate distance between lands where the development will occur and adjacent properties. These setbacks would be designed to minimize visual impact, noise, and other potential disturbances to neighbors.
    - Develop setback guidelines that consider the specific characteristics of the local landscape, land use, and community concerns.

- Preserve and enhance community well-being.
  - Develop programs that ensure clean energy projects contribute to local well-being, such as providing funding for community amenities, recreational spaces, or infrastructure improvements.
  - Address concerns related to noise, light pollution, and other potential disturbances from clean energy projects by setting clear guidelines and requiring developers to implement mitigation measures.
- Support local community and economic resilience.
  - Encourage development of community-scale clean energy projects that provide direct benefits to local residents through energy sovereignty, reduced energy costs, enhanced energy reliability, and increased resilience to natural disasters.
  - Support initiatives that encourage clean energy projects to be compatible with traditional rural industries, such as tourism or agriculture.

Recommendation 4: Improve transparency in the planning, development, and operation of clean energy projects.

Rural communities often feel left out of the loop regarding decisions that affect them. The state should require developers to maintain clear, accessible, and consistent communication throughout the project lifecycle.

The state should:

- Build trust by seeking input during the siting and permitting decision process from local communities, representative interests, and tribes. Base decisions on factual records, and carefully document the rationale for siting decisions when they override input or recommendations from those entities.

- Provide accessible information on project impacts and benefits.

- Create and maintain a centralized data site/dashboard where detailed information about clean energy projects can be accessed, including updates on construction, job creation, environmental impacts, permitting process, economic impacts (e.g., tax revenues), and community benefits.

- Ensure that regular project progress reports are communicated to local communities through a variety of channels to complement the information available on the centralized data site/dashboard. Recognizing that not all residents may have reliable internet access, provide printed copies, use local media channels, and distribute progress reports to community leaders, government officials, and tribal representatives to share at community meetings.

- Offer project-related documents in Spanish and other languages pertinent to affected communities.

Recommendation 5: Explore an alternative taxation approach for large clean energy projects.

The long-term depreciation of clean energy projects (consistent with their categorization as personal property) and the associated reduction in property taxes collected over time is a concern for county officials. Some county officials articulated that mixing clean energy taxation with other personal property taxation is confusing. Further, some projects are assessed by counties while others are assessed by the state. County officials also expressed that not having the expertise at the local level hinders their ability to conduct the assessment effectively and to address appeals.

The state should:

- Consider creating a separate approach for clean energy projects, or a separate category of personal property tax specifically designated for energy and/or clean energy projects.
- Consider whether personal property tax, which is tied to the assessed value and associated depreciation schedule, could be replaced with a more consistent taxation method that would provide more certainty over time about revenues.
    - Any approach would also need to continue to provide latitude to the recipient counties for distributing funds to their various taxing districts. A major concern about HB 1756 appears to be that the counties would lose control over distribution of affected tax revenues.
- Consider central assessment of all utility-scale clean energy projects should they remain taxed as personal property under the current approach.

Recommendation 6: Improve communication about sales taxes and clarify expectations about payback timelines for developer rebates.

County officials expressed concerns that sales tax exemptions provide incentives to bring projects to the state but then penalize local jurisdictions, which do not control or have input into the state's rules on exemptions. These tax exemptions have also brought confusion to local jurisdictions, which lack clarity about the amount or timing of sales taxes that will need to be returned to the state due to these exemptions.

The state should:

- Clearly communicate any agreements about tax exemptions for the projects to counties that will be required to return funds.
- Clearly communicate to counties the timeline of the sales tax exemption process, including how long companies can request a sales tax exemption on qualified purchases, when counties are notified of refund requests, and when counties must confirm and send payments.
- Consider reducing the length of the statutory period to claim a refund so that counties can have greater certainty in future budget planning efforts.

Recommendation 7: Increase transparency of economic and financial data reporting.

Developers should clearly communicate the intended and actual expenditures, as well as economic and financial impacts, of their projects on the affected communities using verifiable data. Economic and financial data for clean energy projects have not been made available for projects constructed to date, which makes outside assessment difficult. Collecting and making such data available would provide real information for both skeptics and proponents of projects to describe effects.

Specifically, the state or local permitting authority should:

- Expand pre-permitting reporting requirements for economic and financial data.
  - Developers should report the total estimated project investments in the design, permitting, and construction phases of projects (project costs) and what portion of those costs will be spent in the state and locally.
  - Developers should be asked to estimate the number of jobs they will provide and over what duration during the construction period and the operations period. They should be required to evaluate the portion of this labor that will be provided with labor supply within the state or counties affected.

Recommendation 8: Improve documentation of federal and state incentives.

The state does not appear to require a complete accounting of all forms of financial support that projects receive. This has led to some skepticism from community members about whether projects are providing incremental financial benefits to the state.

The state should:

- Collect data on financial incentives received by developers for each project, including comprehensive public reporting of sales tax exemptions approved by the state each year. For example, such reporting should include the project name, applicant, date of application and date of approval, the form of the exemption (e.g., through a project labor agreement or community workforce agreement), and exemption approval date.
- Communicate the availability of production excise tax from HB 1756 and report the recipients and duration of personal property tax exemptions.
- Expand post-construction reporting requirements. After some period following construction, operators should be asked to provide updated data on actual expenditures in the state and locally, including labor provided.

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Appendix A: Methodology Details

Project Timeline Overview

Table A1. Timeline for the Rural Clean Energy Study and Report

Task	Time Frame (2024)
Phase 1 Representative Interest Interviews	January - February
Economic and Financial Impacts Assessment	January - June
Online Comment	February-July
Phase 2 Representative Interest Interviews	March-June
Community Meetings	May-June
Drafting, Reviewing, and Finalizing Report	July - September
Representative Interests and Commerce Review Draft Report	August-September
Final Report Submitted to Commerce	October 1

Outreach and Engagement: Interviews, Focus Groups, and Public Meetings

During the project, the consultant team used a baseline set of questions as a starting point for discussion. The questions functioned as a general framing tool and are listed below.

General Questions

1. Please briefly describe your connection to rural communities and energy development in Washington State.
2. From your perspective, what are the greatest benefits and greatest challenges from clean energy projects in the communities you serve?
3. How can the State of Washington increase the benefits and reduce the negative impacts of clean energy projects?
4. What actions can energy developers take to increase the benefits and reduce the negative impacts of clean energy projects?
5. What examples come to mind – both positive and negative – of clean energy project development and implementation in rural areas, that can inform future work?

Economic Questions

1. When you think about the potential economic benefits of clean energy in the communities you serve, what would you like to see? (e.g., increased local tax revenue, reducing household energy cost, job opportunities, etc.)
2. What are some of the barriers to achieving these benefits?

Future Engagement Questions

1. How do you suggest we engage organizations and people in rural communities to get their ideas about the benefits and challenges about clean energy development?
2. What challenges might we run into and how do you suggest we approach them?
3. As we conduct this study of rural clean energy in Washington, how would you like to be engaged?

4. How would you like to give and receive information about this study?
5. Are there other methods of communication that would be more helpful?

Table A2. Affiliations for all Individual and Focus Group Interviews

Category	Organization/Individual
Agriculture/Ranching/Business	EDF Renewables Mynocarbon Vaagen Timbers Washington Cattlemen's Association Washington Wheat Growers Association Zero Emissions Northwest
County Assessors	Asotin County Benton County Columbia County Grant County Kittitas County Klickitat County Skagit County Spokane County
City/County Government	City of Richland Douglas County Garfield County Klickitat County Lincoln County Port of Columbia County Skamania County Yakima County
County Organizations	Adams County Development Council Economic Development Alliance of Skagit County Grant County Economic Development Okanogan Economic Council Tri-County Economic Development District Washington Association of County Officials Washington State Association of Counties Yakima Valley Council of Governments
Labor	Building and Construction Trades Council Washington State Labor Council
Local Non-profits	Firelands Washington Klickitat Valley Health North Olympic Development Council Okanogan County Community Action Agency Prosser Economic Development Association Self-Help Credit Union Yakima Chapter of the Asian Pacific Islander Coalition
NGOs	American Farmland Trust Blue Mountain Action Council Chelan-Douglas Land Trust Clean Technology Alliance Friends of the San Juans Renewable Northwest Rural Resources The Lands Council The Nature Conservancy Washington State Audubon

Category	Organization/Individual
Other	United States Department of Agriculture
State Government	Washington Energy Facility Site Evaluation Council (EFSEC) Washington State Interagency Siting Council
State Legislature	Senator Liz Lovelett Senator Matt Boehnke Representative Alex Ybarra Representative Mary Dye Representative Mark Klicker Representative Alex Ramel
Tribal Nations/Organizations	Confederated Tribes of the Colville Reservation Confederated Tribes of the Umatilla Indian Reservation Sovereign Power Yakama Nation
Utilities	Avista Chelan PUD Cowlitz PUD Jefferson County PUD Puget Sound Energy Washington State Public Utility Districts Association Washington Rural Electric Cooperatives

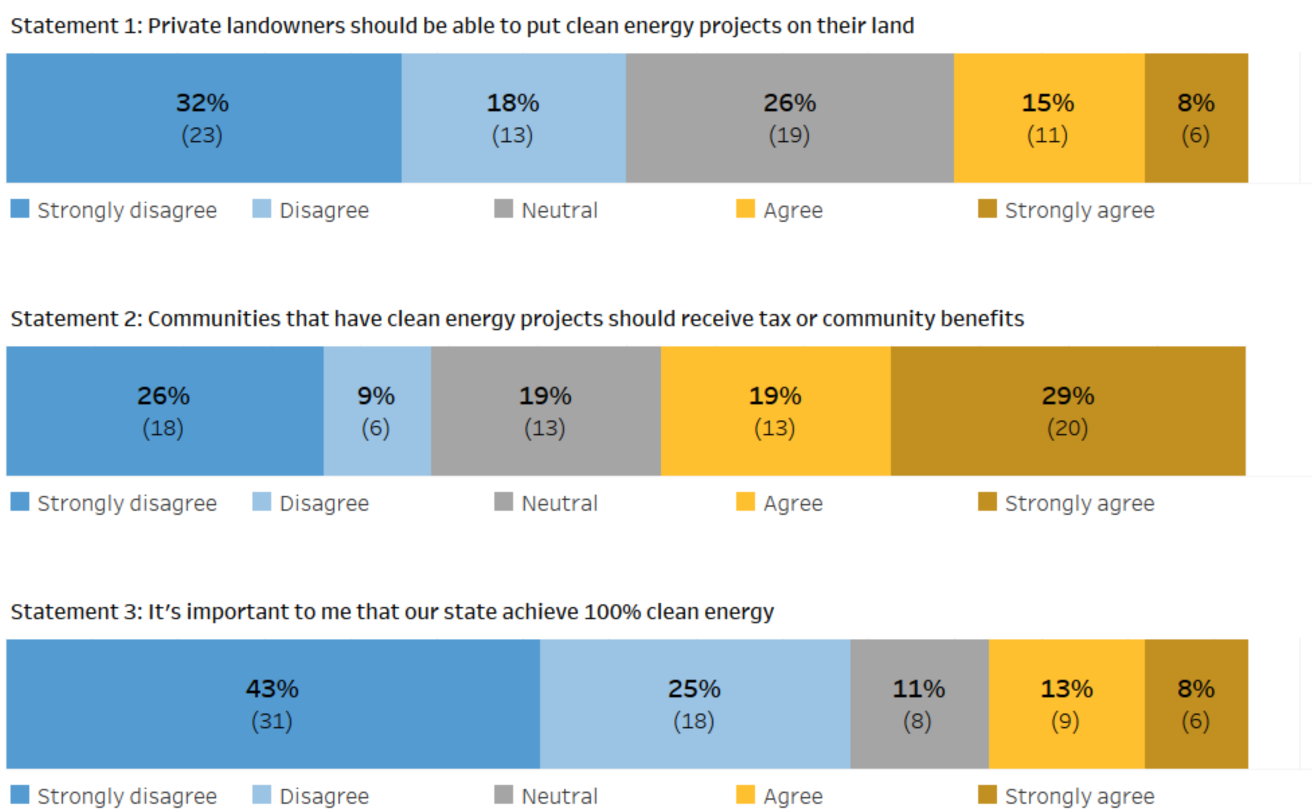
Table A3. Number of Online Comments Received by County of Origin

County	Number of Comments
Klickitat	38
Benton	27
Whitman	16
Grant	9
Douglas	8
Yakima	8
Kittitas	6
Franklin	5
King	3
Chelan	2
Lincoln	2
Skagit	2
Snohomish	2
Asotin	1
Clallam	1

County	Number of Comments
Clark	1
Columbia	1
Garfield	1
San Juan	1
Spokane	1
Total	**135**

The online comment process included a set of three statements that respondents were asked to react to, on a scale from “strongly disagree” to “strongly agree”. Responses are summarized below. Not all respondents answered all statements.

Figure A1. Responses to Statements from Online Comment Process



Economic and Financial Methodology

Figure A2. Overview of the Economic and Analysis Process

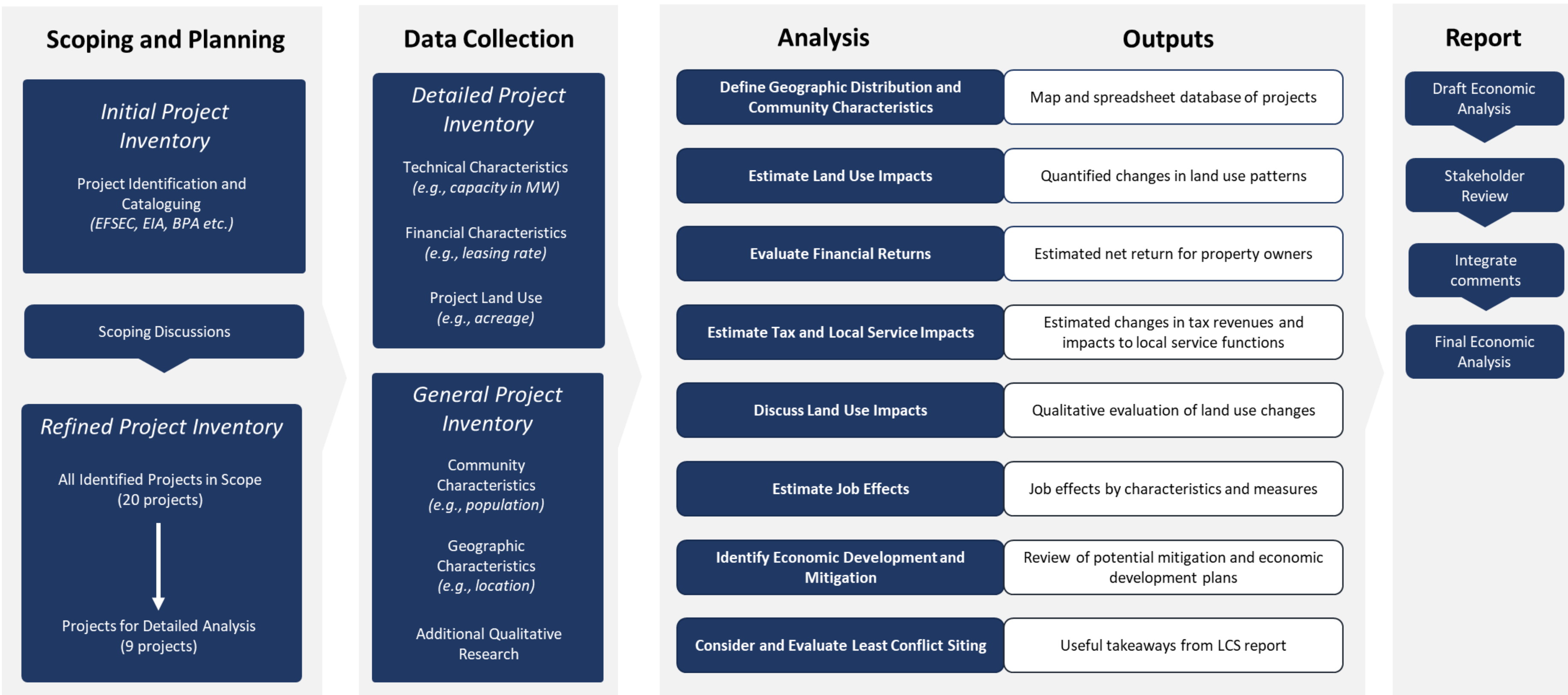


Table A4. Outline of Methods and Data Sources for Detailed Economic Analyses

Name	Analytical Steps (quantitative analysis)	Additional Qualitative Analytical Steps	Data Sources
Land Use	• Determined changes to project land use using satellite data and estimated acreage by type • Analyzed the percent change in land use type due to renewable energy development and estimated the value of this land based on agricultural revenues from production and sales data • Where land use changed, analyzed changes in value based on changes in acreage and average values • For non-agricultural projects, identified state specific rental or revenue data per acre (e.g., cash rent from pasture) • Where applicable, assessed recreational permit data to determine whether access changed following project development. Estimated financial impact using estimates of number of permits issued and the cost of permits	• Gathered information from county planning departments during interviews and focus groups • Discussed land use concerns during public meetings regarding local experiences with farmland development	• EFSEC land use reports as well as project-specific land use consistency reviews • Input from members of affected communities • USDA agricultural land use data • USDA NASS values data • Recreation usage and values • Satellite imagery from the National Land Cover Database's Multi-Resolution Land Characteristics Consortium and USDA NASS Cropland Data Layers • Parcels from Washington State Geospatial Portal
Financial Returns to Property Owners	• Evaluated the financial implications of projects on landowners by comparing an estimate of the annual income associated with pre-project land uses (e.g., agriculture) with estimates of the annual income generated from renewable energy lease agreements • Where lease documents were unavailable, gathered publicly available leasing rates and estimated an applicable range for projects	• Discussed property value concerns and leasing opportunities during public meetings • Literature review on property values	• Publicly available literature and reports on typical leasing rates • Financial arrangements between property owners and project developers, for example, land sales, and lease agreements. The two formal lease documents identified were both from the Washington Department of Natural Resources (DNR) • Pre-project land use; affected acreage from EFSEC documents as well as project-specific EFSEC land use consistency reports • USDA NASS agricultural value data
Effects on Local Tax Revenues and Public Services	• Gathered pre-and post-project tax collections for all case study projects and evaluated the increase in tax collections to their counties from project development. Specifically evaluated real and personal property tax data • Modeled and estimated sales tax data using the JEDI model assumptions on construction costs and sales tax rates. Multiplied these costs by tax rates to estimate state and county sales tax collections from case study projects. Reviewed and evaluated the impact of	• Conducted multiple interviews with county and state officials • Participated in focus groups and public meetings	• Property tax data and parcels from counties, local authorities and Washington State Dept. of Revenue. Parcel data was sourced directly from county websites or assessors. • Property tax rates for the state and counties and Washington DOR depreciation guidelines and schedules • Prior land use based on EFSEC documents as well as project-specific land use consistency reviews • Washington DOR data and reports • Sales tax data and rates

Name	Analytical Steps (quantitative analysis)	Additional Qualitative Analytical Steps	Data Sources
	Washington state sales tax exemptions • Gathered school funding data to assess local effort assistance and the impact of projects on school districts • Calculated the percentage of total county taxes coming from project real, personal and sales tax collections • For personal property taxes, projected project tax payments for 22 years using the State tax depreciation schedule		• Interviews and focus groups with county assessors and treasurers
Job Impacts	• Calculated project costs using either JEDI model defaults (wind and solar) or cost references (battery storage) • Used JEDI (wind and solar) or IMPLAN (battery storage) to model job impacts associated with project construction and operation in the state of Washington	• Reviewed existing literature and gathered information from interviews and public meetings • Identified challenges and opportunities associated with improving the extent of local employment in renewable energy projects • Compared model estimates against information gathered from existing literature and public outreach	• Project characteristics from EFSEC/EIA (e.g., type, size) • Data from developers/local permitting agencies, when possible • Jobs and Economic Development Impact Model (JEDI); input-output model (IMPLAN)

Economic and Financial Interviews

In addition to broader focus groups, group interviews, and public meetings, which are described in the Methodology: Community Engagement section of the report, the consultant team also conducted targeted interviews and focus groups with county officials, including assessors, treasurers, building and planning departments, and economic development specialists. These additional interviews focused on issues related to county finances and economics associated with renewable energy developments. The questions that structure the economic and financial interviews included the following topics:

- Do you have information about project costs, broken out by phase (e.g., engineering and design, construction, operations)?
    - What type of financial arrangement did the builder have with property owners?
    - To what extent has actual financial returns differed from expectations?
- What type of tax arrangement does the county have with [relevant] project?
    - Can you share data with us on the local taxes collected to date and the schedule for future tax payments expected for this project?
- What types of land uses has the project area been used for?

- Has the developer agreed to provide community services for this project? If so, do you have information about the costs of these services?

Each interviewee was asked these general questions, tailored to their expertise and knowledge. While many interviewees did not have responses about specific data sources, they often directed interviewers towards additional resources or contacts. **Table A5** provides a list of counties that participated in at least one session (interview or topic-based focus group). In addition to these county officials, IEc reached out to State officials, including:

- Department of Revenue regarding taxation of clean energy projects
- Department of Natural Resources regarding clean energy leases on state land
- Employment Security Department regarding employment in the clean energy sector

Table A5. Participants by County

County	Officials
Adams	Building and Planning Department, Economic Development Director
Asotin	Assessor
Benton	Assessor, Treasurer, Planning Manager
Columbia	Assessor, Treasurer, Economic Development Council
Grant	Assessor
Kittitas	Assessor
Klickitat	Assessor, Planning Official, Economic Development Director
Lewis	Assessor, Treasurer, Community Development Director
Lincoln	Planning Department
Skagit	Assessor
Spokane	Assessor
Thurston	Assessor
Yakima	Planning Official
Whitman	Assessor

Geographic and Demographic Information

Table A6. USDA Rural Commuting Area Code Definitions

Code	Code name	Definition	Designation in this analysis
1	Metropolitan	Metropolitan area core: primary flow within an urbanized area (UA)	Urban
2	Metropolitan	Metropolitan area high commuting: primary flow 30% or more to a UA	Urban
3	Metropolitan	Metropolitan area low commuting: primary flow 10% to 30% to a UA	Urban
4	Micropolitan	Micropolitan area core: primary flow within an urban cluster of 10,000 to 49,999 (large UC)	Rural
5	Micropolitan	Micropolitan high commuting: primary flow 30% or more to a large UC	Rural

Code	Code name	Definition	Designation in this analysis
6	Micropolitan	Micropolitan low commuting: primary flow 10% to 30% to a large UC	Rural
7	Small Town	Small town core: primary flow within an urban cluster of 2,500 to 9,999 (small UC)	Rural
8	Small Town	Small town high commuting: primary flow 30% or more to a small UC	Rural
9	Small Town	Small town low commuting: primary flow 10% to 30% to a small UC	Rural
10	Small Town	Rural areas: primary flow to a tract outside a UA or UC	Rural
99	Rural	Not coded: Census tract has zero population and no rural-urban identifier information	Rural

Table A7. Counties by USDA RUCA Code

County	Predominant RUCA Code	Designation in this analysis
Adams	4	Rural
Asotin	1	Urban
Benton	1	Urban
Chelan	1	Urban
Clallam	4	Rural
Clark	1	Urban
Columbia	7	Rural
Cowlitz	1	Urban
Douglas	1	Urban
Ferry	10	Rural
Franklin	1	Urban
Garfield	10	Rural
Grant	4	Rural
Grays Harbor	4	Rural
Island	4	Rural
Jefferson	10	Rural
King	1	Urban
Kitsap	1	Urban
Kittitas	4	Rural
Klickitat	7	Rural
Lewis	4	Rural
Lincoln	10	Rural
Mason	2	Urban
Okanogan	10	Rural

County	Predominant RUCA Code	Designation in this analysis
Pacific	7	Rural
Pend Oreille	2	Urban
Pierce	1	Urban
San Juan	10	Rural
Skagit	1	Urban
Skamania	2	Urban
Snohomish	1	Urban
Spokane	1	Urban
Stevens	2	Urban
Thurston	1	Urban
Wahkiakum	10	Rural
Walla Walla	1	Urban
Whatcom	1	Urban
Whitman	4	Rural
Yakima	1	Urban

Table A8. Number of BPA Interconnection Requests by County and Technology

County	Battery	Battery/ Solar	Battery/ Wind	Hydro	Solar	Wind[a]	Battery/ Solar/Wind	Total
Adams	1	1	0	0	4	0	0	6
Benton	4	18	0	0	6	1	0	29
Clark	1	0	0	0	2	0	0	3
Columbia	0	1	0	0	1	0	0	2
Cowlitz	1	0	0	0	0	2	0	3
Douglas	5	3	0	1	3	1	1	14
Franklin	0	0	0	0	2	0	0	2
Garfield	0	0	0	0	0	1	2	3
Grant	2	6	0	0	3	1	0	12
Grays Harbor	0	0	0	0	0	2	0	2
King	1	0	0	0	0	0	0	1
Kittitas	0	0	0	0	0	1	0	1
Klickitat	1	6	0	0	1	3	1	12
Lewis	0	0	1	0	0	0	0	1
Lincoln	0	1	0	0	0	4	0	5
Mason	0	1	0	0	0	1	0	2

County	Battery	Battery/ Solar	Battery/ Wind	Hydro	Solar	Wind[a]	Battery/ Solar/Wind	Total
Skagit	0	0	1	0	0	1	0	2
Snohomish	1	0	0	0	1	0	0	2
Spokane	0	1	0	0	0	2	0	3
Thurston	2	0	1	0	0	0	0	3
Walla Walla	0	0	0	0	1	2	3	6
Yakima	0	1	0	1	1	0	0	3
Grand Total	**19**	**39**	**3**	**2**	**25**	**22**	**7**	**117**

[a] The BPA Interconnection Queue does not differentiate between on-shore and off-shore wind technologies.
Source: Bonneville Power Administration interconnection queue, accessed Sept. 11, 2024.

Table A9. Total Requested Capacity (MW) from BPA Interconnection Queue by County and Technology

County	Battery	Battery/ Solar	Battery/ Wind	Hydro	Solar	Wind[a]	Battery/ Solar/Wind	Total
Adams	300	200	0	0	400	0	0	900
Benton	700	15,900	0	0	1,100	200	0	17,900
Clark	0	0	0	0	0	0	0	0
Columbia	0	200	0	0	200	0	0	400
Cowlitz	100	0	0	0	0	1,100	0	1,200
Douglas	2,200	1,700	0	500	800	200	1,600	7,000
Franklin	0	0	0	0	0	0	0	0
Garfield	0	0	0	0	0	300	2,300	2,600
Grant	600	2,100	0	0	900	300	0	3,900
Grays Harbor	0	0	0	0	0	2,000	0	2,000
King	300	0	0	0	0	0	0	300
Kittitas	0	0	0	0	0	400	0	400
Klickitat	1,200	1,900	0	0	500	1,100	400	5,100
Lewis	0	0	600	0	0	0	0	600
Lincoln	0	300	0	0	0	1,600	0	1,900
Mason	0	300	0	0	0	300	0	600
Skagit	0	0	300	0	0	200	0	500
Snohomish	0	0	0	0	0	0	0	0
Spokane	0	300	0	0	0	400	0	700
Thurston	0	0	600	0	0	0	0	600
Walla Walla	0	0	0	0	200	500	900	1,600

County	Battery	Battery/ Solar	Battery/ Wind	Hydro	Solar	Wind[a]	Battery/ Solar/Wind	Total
Yakima	0	300	0	600	200	0	0	1,100
Grand Total	**5,400**	**23,200**	**1,500**	**1,100**	**4,300**	**8,600**	**5,200**	**49,300**

[a] The BPA Interconnection Queue does not differentiate between on-shore and off-shore wind technologies.
Source: Bonneville Power Administration interconnection queue, accessed Sept. 11, 2024.

Table A10. Project Community Population Statistics

Metric	Census tracts intersected by case study projects [a]	Census tracts intersected by all in-scope projects	State of Washington
Population (2022)	61,671	100,496	7,688,549
10-year population change (2012 – 2022)	+47.8% [c]	+58.0%	+14.1%
Average median household income	$91,806	$81,968	$90,325
Average population identifying as other than white and non-Hispanic	21.1%	26.5%	34.5%
Average population with income below federal poverty level	7.2%	9.6%	9.9%
Average population with less than high school diploma or equivalent	9.9%	11.7%	7.9%
Average population that is unemployed	2.8%	3.7%	3.2%
Average population without health insurance	12.0%	14.3%	9.2%
Average Population over 65 years old	17.7%	17.3%	16.0%
Average Population with low English proficiency	5.3%	6.7%	7.7%
Population-weighted average energy burden [b]	2.2%	1.7%	1.5%

[a] The above demographic information pertains to the 22 census tracts represented by the 20 study projects. Statistics were calculated by dividing the total number of residents meeting the demographic condition by the total number of residents in all census tracts. Average energy burden was calculated as a population-weighted average of each individual tract's energy burden.
[b] Energy burden is defined as the percentage of gross household income spent on energy cost.
[c] Certain census tract boundaries changed between 2012 and 2022, changing which tracts overlapped projects. Case study projects where this occurred (2 of 9) were excluded from the calculation of percentage change.
Sources: U.S. Census Bureau. 2022 American Community Survey (ACS). 5-Year Data. https://www.census.gov/data/developers/data-sets/acs-5year.html. U.S. Census Bureau.; 2012 ACS 5-Year Data. https://www.census.gov/data/developers/data-sets/acs-5year.html; U.S Department of Energy. Low-Income Affordability Data (LEAD) Tool. Data updated in 2021. https://www.energy.gov/scep/slsc/lead-tool.

Northwest Solar and Wind Capacity

Table A11. Solar electricity generation capacity (GW) in the Northwest on the path to net-zero emissions

State	2021	2050	Change 2021-2050
Idaho	0.4	9.5	9.1
Montana	0.0	4.6	4.6
Oregon	1.1	16.4	15.2
Washington	0.5	15.3	14.9

Source: Net-Zero Northwest Energy Pathways, June 2023. https://www.nznw.org/energy

Table A12. Wind electricity generation capacity (GW) in the Northwest on the path to net-zero emissions

State	2021	2050	Change 2021-2050
Idaho	1.0	12.3	11.3
Montana	0.9	56.1	55.3
Oregon	3.8	14.0	10.3
Washington	3.4	10.4	7.1

Source: Net-Zero Northwest Energy Pathways, June 2023. https://www.nznw.org/energy

Property Value Impacts

Table A13. Property Values Impacts Literature Review Summary

Wind

Author(s)	Year	Title	Journal	Scope of Analysis	Property Value Effects
ECONorthwest	2002	The Economic Impacts of a Proposed Wind Power Plant in Kittitas County, Washington State, USA	Wind Engineering	Kittitas County, Washington	No significant impact
Laposa	2010	Wind farm announcements and rural home prices: Maxwell ranch and rural Northern Colorado	Journal of Sustainable Real Estate	Rural Northern Colorado	No significant impact
Hoen	2013	Spatial Hedonic Analysis of the Effects of US Wind Energy Facilities on Surrounding Property Values	Journal of Real Estate Finance and Economics	United States	No significant impact
Sampson	2020	The On-Farm and Near-Farm Effects of Wind Turbines on Agricultural Land Values	Journal of Agricultural and Resource Economics	Kansas	No significant impact on nearby agricultural lands

Author(s)	Year	Title	Journal	Scope of Analysis	Property Value Effects
Heintzelman	2012	Values in the Wind: A Hedonic Analysis of Wind Power Facilities	Land Economics	New York	6.2% - 15.8% for 0.5-1.0 mi; 8.8-21.6% for 0.1-0.5 mi
Hinman	2010	Wind Farm Proximity and Property Values: A Pooled Hedonic Regression Analysis of Property Values in Central Illinois	Illinois State University Department of Economics	Central Illinois	Prices drop 21.63% post-announcement, but return to pre-announcement levels after operation begins
Lang and Opaluch	2013	Effects of Wind Turbines on Property Values in Rhode Island	University of Rhode Island Environmental and Natural Resource Economics Department	Rhode Island	No significant impact, maximum 5.6% decrease (90% confidence)

Solar

Author(s)	Year	Title	Journal	Scope of Analysis	Property Value Effects
Gaur	2023	House of the rising sun: The effect of utility-scale solar arrays on housing prices	Energy Economics	Urban and rural New England	1.5% - 3.6% within 0.6 mi
Elmallah	2023	Shedding light on large-scale solar impacts: An analysis of property values and proximity to photovoltaics across six U.S. states	Energy Policy	United States	1.5% decrease for 0-0.5 mi; 0.8% for 0.5-1.0 mi
Al-Hamoodah	2018	An Exploration of Property-Value Impacts Near Utility-Scale Solar Installations	University of Texas at Austin LBJ School of Public Affairs		5.4% decrease within 1 mile; no significant impact beyond 1 mile

Data Limitations and Uncertainties

Many of these analyses rely on publicly available best estimates. **Table A14** provides a summary of potential data limitations and uncertainty.

Table A14. Data Limitations and Uncertainties

Topic	Assumption/Source of Uncertainty	Direction and Significance of Potential Uncertainty
Geographic Distribution	**Uncertain project details for forecasted projects.** Projects that have not yet been constructed may not have some information identified or finalized, such as project location, capacity, or area. In these cases, we utilized the most detailed information available or described the potential range of locations under consideration (based on publicly available sources and/or representative interest interviews).	**Uncertain.** As these projects develop, these details may change; this may change project data and cause overestimates/underestimates of impacts to relevant communities.
Financial Returns	**Uncertain or unconfirmed leasing rates for multiple projects** reviewed. The analysis relies on a set of information provided from public sources or shared	**Uncertain.** May overestimate or underestimate financial returns to property owners. There will be moderate variation from stated lease rates for specific projects and regions given

Topic	Assumption/Source of Uncertainty	Direction and Significance of Potential Uncertainty
	during outreach in combination with leases for case study projects when available. Many projects had confidential leasing terms. Developers and landowners in many cases are not inclined or allowed to provide specific information about leasing rates.	the unique nature project lease agreements. One county assessor stated that lease rates appeared low. This analysis provides ranges to capture this uncertainty.
Financial Returns	**Property values are represented by assessed parcel value, not market value**. Though assessed parcel value is supposed to reflect changes in the market value of a parcel, this is not always a perfect reflection.	**Likely understates impact.** Market value is typically higher than assessed value. Market value is more likely to be influenced by other factors such as recent sales, nearby construction, and market conditions.
Land Use	**Analysis relies on satellite imagery**. This imagery is not a precise reflection of what is occurring at ground level and may not perfectly estimate acreage.	**Uncertain.** Satellite estimates of land use represent areas in binary pixels; thus, even if a crop takes up a portion of a pixel, it might not be considered in analysis. The opposite is also true; if a crop takes up the majority but not all of a pixel, the area is assumed to be 100% that crop.
Land Use	**Crops that accounted for negligible crop acreage were excluded from the values analysis**. This is due to the uncertainty of the satellite and USDA Cropscape analysis and the possibility that these very minor acreage totals are inaccurate or incorrect.	**Underestimates impact.** The total crop revenues for each project are lower than they would be if the revenue from these crops were included, however given the low acreage the impact be minor.
Tax Impacts	**Analysis does not include a comprehensive database of tax assessments for all renewable energy projects.** This analysis relies on a case study approach to evaluate a subset of projects, and thus counties, in the state. There are additional projects that have not been	**Likely underestimates impact** for some counties. This analysis does not include each and every project
Job Impacts	**Project costs are uncertain.** We were unable to acquire reliable and confirmed project cost information from publicly available sources and outreach with both county officials and project developers. There is additional cost uncertainty for planned projects given potential variability in system size and geographic scope. This analysis relies on a set of assumptions to model direct investments for each case study project. This also affects local employment impacts, which are modelled based on project costs.	**Uncertain.** May overestimate or underestimate job impacts and regional economic impacts on rural communities, depending on the magnitude and distribution of actual investments.
Job Impacts	**Analysis is performed at the state level.** The JEDI models for solar PV and onshore wind do not contain default demand multipliers and industry margins for sub-state geographic scales (e.g., county, census tract).	**Uncertain.** Modelled results reflect job impacts and economic contributions throughout Washington State. The nature of how the impacts are distributed across project counties is uncertain.
Job Impacts	**Analysis does not consider O&M impacts for battery energy storage system (BESS) components.** While the solar PV and onshore wind JEDI models have the capability to model O&M impacts, IMPLAN does not have the same functionality. There is currently no available BESS JEDI model.	**Likely underestimates impact.** This analysis does not capture O&M impacts associated with BESS components. However, from our outreach with county officials, we expect there to be a small number of jobs associated with BESS O&M.

Appendix B: Economic and Financial Case Studies

The following sections provide the full case studies for nine projects that were developed as part of the economic and financial analyses. The projects are listed below and are also bolded in **Table 3** in the body of the main report. Criteria for including a project in the case study approach are detailed in **Table 2** in the body of the main report.

- Columbia Solar
- Rattlesnake Flat Wind
- Skookumchuck Wind
- Lund Hill Solar
- Horn Rapids Solar, Storage & Training Facility
- Tucannon River Wind
- Three planned projects:
    - Carriger Solar
    - Horse Heaven Clean Energy Center
    - Desert Claim Wind

Case Study: Columbia Solar Project

Photo: Courtesy of Greenbacker

Type of Project	Location	Current Owner	Nameplate Capacity	Years of Operation	Size	Facilities
Solar energy and storage facility	Kittitas County, Washington	Greenbacker	15 MW	2022–present	100 fenced acres on 14 land parcels	Three solar arrays of approximately 20,000 panels each, two generation tie lines

Project Summary

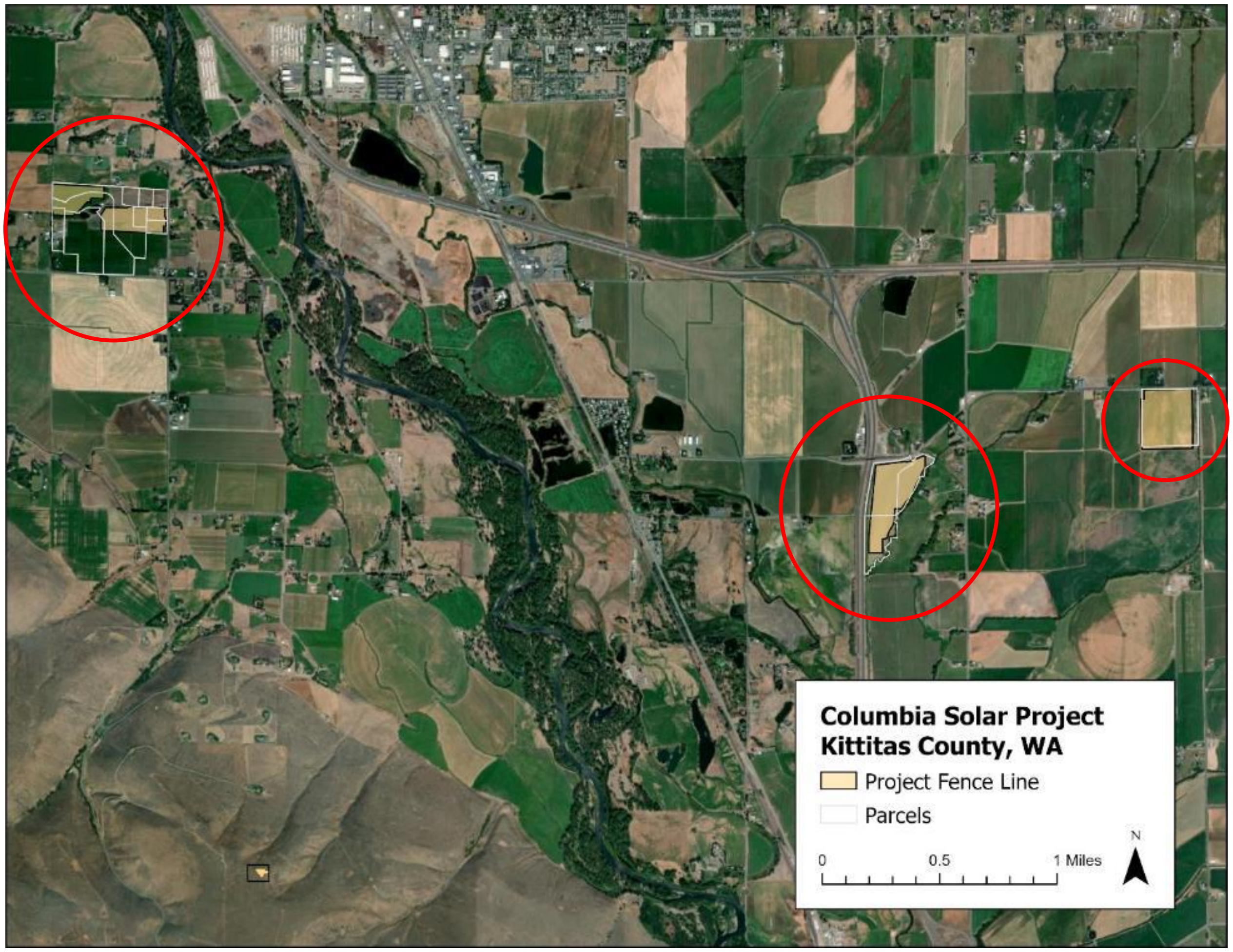
Columbia Solar Project is a 15-megawatt (MW) capacity solar energy facility in Kittitas County, Washington. The project was originally developed as five separate sites, of which three sites were constructed. Urtica, Camas, and Penstemon began operation in 2022 and are the subject of this case study.[128] TUUSSO Energy, LLC, the original project owner, transferred its related project companies (Penstemon, LLC; Camas, LLC; Urtica, LLC) to Citrine Solar LLC, a subsidiary of Greenbacker Renewable Energy Corporation in February 2022.129 The power generated by the solar panels is delivered by Puget Sound Energy Inc. (PSE), operating under a 15-

[128] Typha and Fumaria were terminated in July of 2021. "Columbia Solar." Washington Energy Facility Site Evaluation Council. https://www.efsec.wa.gov/energy-facilities/columbia-solar
[129] Columbia Solar SCA Amendment Presentation on August 17, 2021.

year power purchase agreement with Greenbacker.[130] PSE distributes energy to several counties in Western Washington, including Kittitas County.[131]

The project lease area contains approximately 100 acres. As **Figure B1** shows, the project lease area intersects 14 land parcels.

Figure B1. Columbia Solar Project in Kittitas County, WA (Washington State Geospatial Portal,[132] Columbia Solar Application for Site Certification[133])



[130] "Wash. Governor to decide on 25-MW solar project", S&P Global. August 27, 2018. Accessed on April 25, 2024 at https://www.spglobal.com/marketintelligence/en/news-insights/trending/6wy9gwbityim4pxxghbhew2.
[131] "PSE Locations", Puget Sound Energy. Accessed on April 25, 2024 at https://www.pse.com/en/Customer-Service/pse-locations-2.
[132] Washington State Geospatial Portal, Property Parcel data, Updated February 7, 2024. Accessed at https://geo.wa.gov/datasets/wa-geoservices::current-parcels/about on February 12, 2024.
[133] "Columbia Solar Projects: Washington Energy Facility Site Evaluation Council Application For Site Certification", TUSSO Energy, LLC. January 26, 2018.

Geographic Location/Community Context

Kittitas County has a population of 45,189 as of 2022. [134] The Urtica site is located about one mile south of Ellensburg; the Camas and Penstemon sites are located about two and three miles southeast of Ellensburg, respectively.

Ellensburg is the county seat and has a population of 18,703 as of 2022.[135] The county's largest city, Yakima, is about 25 miles south of the three projects. The County government employs 331 full time and 27 part-time individuals and has an annual budget of $141.3 million as of 2022.[136],[137]

Table B1 summarizes community population statistics for the project area. As shown in **Table B1**, while the population in Kittitas County is like the State for a number of characteristics, Kittitas County has a higher population living below poverty and a higher energy burden than the state population overall. Columbia Solar is one of two operating utility-scale clean energy projects in Kittitas County. Wild Horse is a wind farm constructed in 2006 with a total capacity of 274 MW.[138] There are also multiple planned projects and a second project known as the Desert Claim Wind Project, a 100-MW farm that has been permitted but has not yet begun construction.[139]

Table B1. Community population statistics for Columbia Solar Project Area (2018 - 2022).

Metric	Census tracts intersected by project [a]	Kittitas County	State of Washington
Population (2022)	4,889	44,424	7,688,549
10-Year Population Change (2012 – 2022)	+6.1%	+8.5%	+14.1%
Median Household Income	$85,625	$66,800	$90,325
Population identifying as other than white and non-Hispanic	15.3%	19.4%	34.5%
Population with income below federal poverty level	6.9%	14.5%	9.9%
Population with less than high school diploma or equivalent	9.8%	6.9%	7.9%
Population that is unemployed	1.8%	3.7%	3.2%
Population without health insurance	6.0%	7.5%	9.2%
Population over 65 years old	20.6%	16.8%	16.0%

[134] 2022 ACS 5-Year Survey, U.S. Census Bureau.
[135] 2022 ACS 5-Year Survey, U.S. Census Bureau.
[136] 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
[137] 2022 Annual Budget, Kittitas County.
[138] "Wild Horse Wind Power Project", Energy Facility Site Evaluation Council. Accessed on April 25, 2024 at https://www.efsec.wa.gov/energy-facilities/wild-horse-wind-power-project.
[139] "Desert Claim", Energy Facility Site Evaluation Council. Accessed on April 25, 2024 at https://www.efsec.wa.gov/energy-facilities/desert-claim.

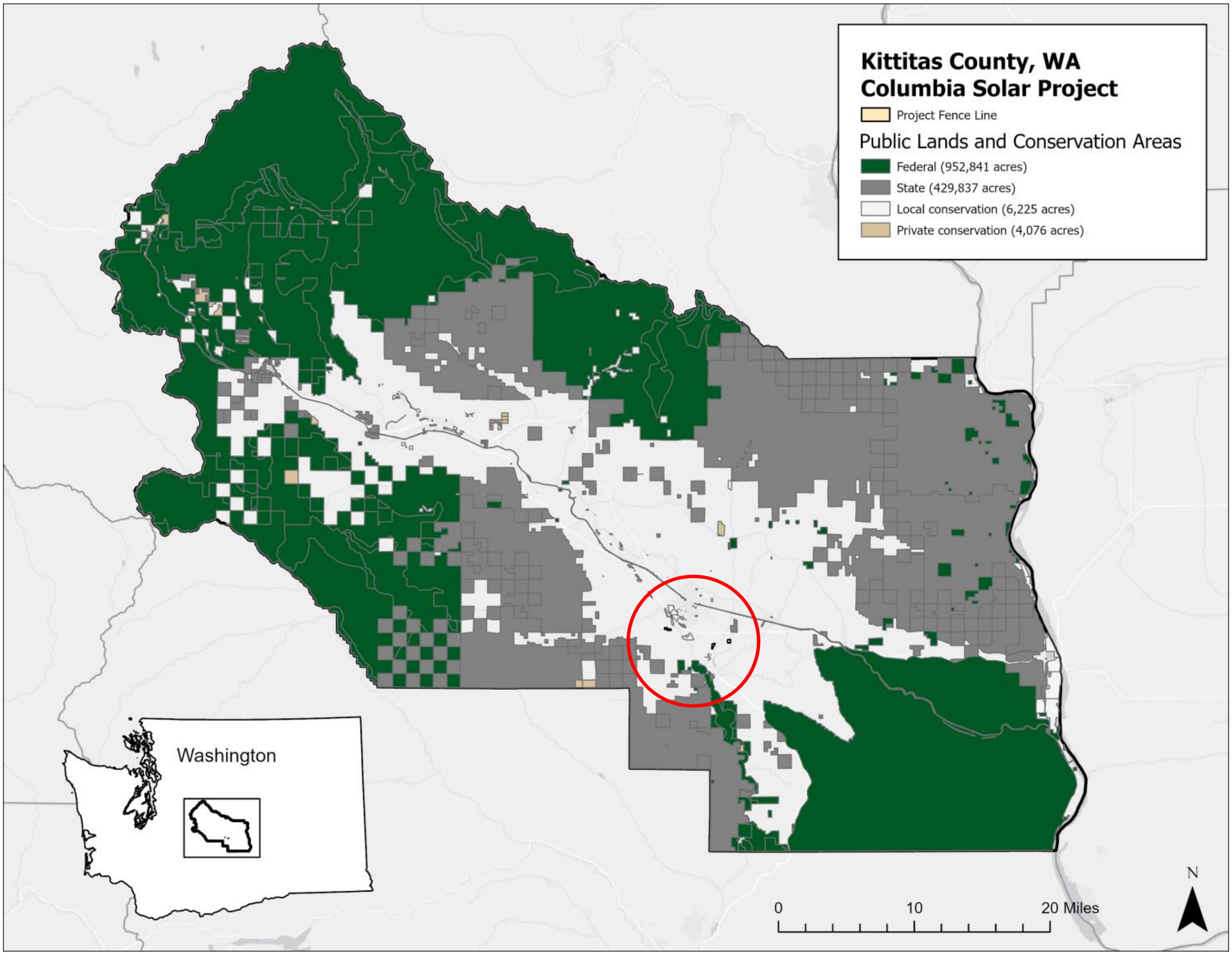
Metric	Census tracts intersected by project [a]	Kittitas County	State of Washington
Population with low English proficiency	2.5%	1.2%	7.7%
Energy burden [b]	2.4%	2.4%	1.5%

[za] The project intersects Census Tract 9757.
[b] Energy burden is defined as the percentage of gross household income spent on energy cost.
Sources: 2022 ACS 5-Year Survey, 2012 ACS 5-Year Survey; U.S Department of Energy LEAD Tool.[140]

As shown in **Figure B2**, approximately 93.0 percent of Kittitas County is publicly owned, including approximately 63.8 percent federal, 28.8 percent state, and less than one percent county or locally owned lands.[141] Agriculture is one of the primary economic activities in this county; in particular, timothy hay is a major cash crop and is grown primarily for export to Japan and other Pacific Rim countries. Central Washington University, located in Ellensburg, is the county's largest employer.[142]

[140] Low-income Energy Affordability Data Tool, Office of State and Community Energy Programs, 2022. Accessed on March 27, 2024 at https://www.energy.gov/scep/slsc/lead-tool.
[141] U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
[142] "Kittitas County Profile", Washington State Employment Security Department. July 2022. Accessed on April 25, 2024 at https://esd.wa.gov/labormarketinfo/county-profiles/kittitas.

Figure B2. Land ownership in Kittitas County, Washington.[143]



[143] U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B .

Land Use

Figure B3. Land use surrounding panels in Columbia Solar Project area (Google Earth, 2023).

THE ISSUES // Some community members and other representative interests have expressed concerns that renewable energy projects may adversely affect local communities, both in terms of losses to productive lands for agriculture, as well as potentially resulting in reductions in the attractiveness of the area to tourism, recreation, or other development activities. In this section, we evaluate the impacts of the Columbia Solar Project on land uses within the project lease area and discuss the likelihood of other potential effects on nearby land uses.

In 2016, land in the project footprint was used primarily for crop agriculture, with 96.8 percent of the area farmed.[144] As shown in **Table B2**, following project implementation, data indicates that all crop acres have been converted to solar development.[145] **Figure B3** shows the absence of agricultural land use within the project footprint[146] in one portion of the Columbia Solar Project area in 2023. NASS data from 2016 suggests that most of the crops grown in the footprint pre-project were dry beans, alfalfa, and other non-alfalfa hay.[147] At average 2023 crop values, the value of the crops in the project area pre-installation (97 crop acres) were

144 2016 Cropland Data Layer, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on May 5, 2024 at https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.
145 2023 Cropland Data Layer, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on May 5, 2024 at https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.
146 The project footprint is defined as including parcels on which panels are located.
147 Our analysis of crop value does not include revenue generated from apples, which are grown in 0.18 acres of the project footprint and account for less than one percent of the total crop acreage, due to the lack of relevant data in the 2023 Washington State-level USDA and NASS data set we rely on.

approximately $81,766 annually,[148] or an average of $844 per acre in farm revenues.149 Net farm income would be a fraction of these total revenues. USDA 2022 data suggests that net revenues for Washington farms were approximately 18 percent of gross receipts, which would equate to net farm income of approximately $152 per acre at current crop prices.[150]

Table B2. Cropland acres within project footprint before (2019) and after project (2022) construction.

Project Footprint (Area within fenceline)	Pre-project, 2019 (Acres, percent of total)	Post-Project, 2023 (Acres, percent of total)
Crops	96.8 (97.4%)	0.0 (0%)
Developed	0.5 (0.5%)	99.5 (100%)
Other	2.1 (2.1%)	0.0 (0%)
Total	99.5 (100%)	99.5 (100%)

Source: 2019, 2023 Cropland Data[151]

Financial Returns to Property Owners

THE ISSUES // Community members and lawmakers have inquired as to whether and to what extent the leasing of lands for renewable energy projects is beneficial or harmful to landowners. Primary concerns include both the short- and long-term community impacts, as well as whether adjacent landowners could be affected by these projects. Answering this question is made somewhat challenging due to the confidential nature of the agreements made between landowners and project developers and is further complicated by the variety of characteristics that affect neighboring property values. This section evaluates what we can determine about the effects of Columbia Solar Project on landowners in Kittitas County.

As is common practice with solar energy project development in rural areas, land parcels in the Columbia Solar Project area are owned by a separate entity and leased to the developer. All parcels within the footprint are owned by either Valley Land Company, LLC or the Snowden family. The Valley Land Company was established in 2009 and bought most of the parcels in the project area in 2010, with some parcels purchased as late as 2018. The remaining parcels have been owned by the Snowden family since at least 2017.[152]

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148 The total value of this cropland was determined by using satellite imagery to approximate the acreage of each crop in the area; then, each crop was multiplied by its reported value. These values were summed to find the total approximate value of this cropland. For dry beans, the value per harvested acre was estimated by taking the average of chickpeas, dry peas, and lentils, which are the categories of dry beans present in the data set.

149 United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). 2023 Washington State Agriculture Overview. Accessed on March 6, 2024 at https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=WASHINGTON.

150 United States Department of Agriculture (USDA) Farm sector financial indicators, Gross farm receipts and net farm income for the State of Washington, 2022. Accessed at https://data.ers.usda.gov/reports.aspx?ID=17839#P497d065d34af4dde8a5dd22d58d70ae9_3_185iT0R0x0 May 31, 2024.

151 2019, 2023 Cropland Data Layer. United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). Accessed June 22, 2023 at https://datagateway.nrcs.usda.gov/.

152 Kittitas County TaxSifter. Accessed on April 30, 2024 at https://taxsifter.co.kittitas.wa.us/Search/Results.aspx.

Property owners within leased areas typically enter into lease agreements with the project owners for a pre-development period (typically ranging from two to five years in duration). After the design of the project is established, landowners of parcels on which physical infrastructure is developed are further compensated on a per acre basis at an established fee. While these agreements are generally confidential to the parties engaged, and while agreements made with some public entities are sometimes public, all of the leased areas for this project are owned by private parties and as a result, no such agreements are publicly available.

Average lease rates provided through public sources range from approximately $200 to $1,000 per acre for leases in this area.[153] At these leasing rates, annual lease payments to landowners would range from approximately $20,000 to $100,000 for the 100 acres once the project is fully operational. This is likely to be in addition to one-time payments to landowners (i.e., signing bonuses) as well as smaller pre-development payments (e.g., 10 percent of the operational rent).

The project areas are marked by fences which enclose all panels and other project-related structures. Because of this physical barrier, parcels in these areas can no longer be used for activities such as farming or rangeland as they were prior to project implementation.

Given estimated net crop farm income of approximately $152 per acre, lease payments of $200 to $1000 per acre would exceed typical crop income, with a net increase of approximately $58 to $858 per acre. Across the 100-acre project, net payments to landowners could range from $5,000 to $85,000 annually, depending on lease terms and site-specifics.

The change in land use for areas within the fence line would also require changes to the zoning and taxation designation for the parcels since they are no longer active for agriculture. Under Washington's Current Use taxation laws, landowners receive a tax break for using land for agricultural purposes as long as compatible incidental uses (including solar panels) do not exceed 20 percent of the classified land.[154] As a result of the development of the project, parcels in the project footprint with panels have not been able to maintain this designation and are thus would be charged a penalty fee including 20 percent of the property value plus seven years of back taxes.[155] These one-time payments were made in 2021 and ranged from $87 to $21,000 per parcel based on value and tax history. The developer is likely to pay for this current use designation tax as well as other property taxes to avoid additional costs for the landowners.

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[153] While it is difficult to directly compare leases given the variety of factors likely considered in individual agreements, publicly available estimates provide similar annual values. BLM rents range from $18.61 per acre up to $62,000 per acre depending on the zone with a median of $400 per acre in zone 8. Kittitas is zone 6 where the rent is $211 per acre in 2023 from BLM (https://www.blm.gov/sites/default/files/policies/IM2021-005_att5.pdf, https://www.blm.gov/sites/default/files/policies/IM2021-005_att1_0.pdf). The Strategic Solar Group lists a broad range of $300 to $2,000 per acre as a standard range, noting that a variety of factors, including proximity to a substation influence the leasing rate (https://strategicsolargroup.com/what-is-the-average-solar-farm-lease-rate/). They note that in California's Central Valley leases are typically around $1,000 per acre. Based on these rates, we use a range of $200 to $1,000 for the estimate of returns for landowners.

[154] "Do You Qualify For Reduced Property Taxes? Current Use Taxation", WSU Extension Clark County, 2014. Accessed on May 30, 2024 at https://s3.wp.wsu.edu/uploads/sites/2079/2014/04/current-use-15.pdf.

[155] "Do You Qualify For Reduced Property Taxes? Current Use Taxation", WSU Extension Clark County, 2014. Accessed on May 30, 2024 at https://s3.wp.wsu.edu/uploads/sites/2079/2014/04/current-use-15.pdf

Taxes

THE ISSUES // Projects bring tax revenues to counties. However, there have been questions raised about whether the impacts are sustained over time and how the changes to tax payments over time affect the counties in which they are located, particularly as projects depreciate over time.

Since construction, Columbia Solar taxes have been assessed by Kittitas County, as the project footprint is entirely within Kittitas County.[156] The three distinct sites are all assessed individually. The assessed value of the project-associated personal property was $18.2 million in 2023.

Taxes are paid by the project owner, Greenbacker. Personal property tax payments initiated post-construction at $134,326 in 2022 and $145,622 in 2023. Because the infrastructure is anticipated to depreciate over time, the personal property tax payments made to the county will decline over time. Although improvements to the project may alter the schedule, the depreciation is anticipated to decline at a rate that is approximately consistent with the published state schedule of four percent for utility-scale renewable energy development.[157] Based on this schedule, the project would depreciate to 50 percent ($9.1 million) of its original value by Year 12 and to 15 percent ($2.7 million) by Year 22, where it would be constant for the remaining life of the project. This reduction in assessed value would result in proportional reductions of personal property tax payments (e.g., to approximately $22,000 in Year 22) using the current tax levies and valuation guidelines.

The annual real property taxes on the leased parcels are likely to paid by the developer as a part of the contract between the developer and the landowners of leased parcels. As shown in **Table B3**, real property tax payments from the project parcels increased from 2019 through the present with a notable jump in payments in 2021. This increase in 2021 was associated with "compensation" payments made for each parcel due to the change in land use designation described above. The 2021 compensation payments comprised the majority ($82,500 of the $89,818) paid in real property taxes to the county in 2021. This change in classification is also likely the cause of the observed increase in real property value and associated taxes in most recent years.

The sale of machinery and equipment for the Columbia Solar also generated sales tax revenue for both the state and county. Kittitas County had a 1.6 percent sales tax rate in 2022. Combined with the state's 6.5 percent tax rate, the overall sales tax levy was 8.1 percent in 2022. As such, the sales tax on materials and equipment for the project are estimated to have generated approximately $800,000 (2023 USD) in total state and county sales tax (based on a total sales figure of approximately $10 million).158 However, because there is a 75 percent state exemption for sales tax for renewable energy projects, projects may submit receipts to the state for reimbursement.[159] This means that after initially paying the sales taxes, the state and county will

[156] Personal communication with Washington State Department of Revenue on March 25, 2024.
[157] Personal Property Valuation Guidelines, Washington State department of Revenue. Accessible at: https://dor.wa.gov/taxes-rates/property-tax/personal-property-valuation-guidelines
[158] IEc analysis. We assume qualified expenditures that would generate sales taxes include material and equipment cost categories specified in the solar photovoltaic JEDI model. Costs for each category are estimated by first taking the product of the project's rated capacity (15 MW) and the solar photovoltaic JEDI model's default average cost value of $1,030 per kW (including sales tax) in the State of Washington, then by distributing the estimate by the default proportions of total costs for each cost category.
[159] The sales tax exemption was modified in 2019 to allow for a refund of 50%, 75%, or 100% of the state and local sales tax paid on machinery, equipment, and labor and services related to the installation of certain renewable energy systems purchased or installed after January 1, 2020. Depending on the source of their involved workforce, project owners may qualify for one of the three available tiers of this exemption. Due to data limitations, we are unable to allocate total sales tax collections to individual refund tiers and assume 75% of local sales tax paid on qualified expenditures are refunded to project owners.

return revenues to the projects. In this case, final sales tax payments are likely to have been closer to $160,000, of which approximately $40,000 were retained by the County.[160] The project will continue to generate sales tax revenue on a periodic basis, whenever project machinery or equipment is replaced or refurbished.

Table B3. Columbia Solar project tax payments to Kittitas County, 2019 – 2023.

Year	Real Property Tax	Estimated Personal Property Tax*	Total Project Collections	Total County Tax Collected	Total Project Collections (2023 dollars)	Total County Taxes Collected (2023 dollars)	% of County Tax Roll
2019	$2,330	$0	$2,330	$76,852,547	$2,777	$91,595,868	<0.01%
2020	$2,269	$0	$2,269	$85,629,443	$2,672	$100,812,803	<0.01%
2021	$89,818	$0	$89,818	$90,204,092	$100,999	$101,433,248	0.09%
2022	$9,365	$139,855	$149,220	$101,189,440	$155,363	$105,354,854	0.14%
2023	$9,799	$145,672	$155,471	$106,188,898	$155,471	$106,188,898	0.15%
Total	**$113,581**	**$285,528**	**$399,109**	**$460,064,420**	**$417,282**	**$505,385,671**	**0.08%**

*14 parcels are assigned to Columbia Solar.
Sources: Kittitas County Assessor's Report,[161] Washington DOR Property Tax Statistics (2019-2023).[162]

Jobs

THE ISSUES // Community members and representative interests have inquired about how much effect renewable energy projects have on local employment. This section describes information that we have gathered about the extent of impacts that project construction and operations have had on employment in Kittitas County.

Direct Investments

We estimate total Columbia Solar Project costs using the Jobs and Economic Development Impact (JEDI) input-output model built by NREL for solar photovoltaic energy development. For this estimate, we use the model assumption that solar photovoltaic energy project installation and capital expenditure costs are $1,030 per kW in the State of Washington. Similarly, we assume that project operation and maintenance (O&M) costs are $20 per kW of installed capacity. Using these assumptions, we estimate total Columbia Solar Project construction and installation costs to be approximately $15.5 million (2023 USD) across all three individual sites. Annual O&M costs are estimated to be approximately $300,000 (2023 USD).[163]

[160] The timing of the repayment of the county taxes has been highlighted as difficult for County Assessors to anticipate, particularly as the value of project sales are not specifically reported to the counties.
[161] "Kittitas County Assessor's Report", Kittitas County Assessor Mike Hougardy, 2023. Accessed on May 30, 2024 at https://www.co.kittitas.wa.us/uploads/assessor/reports/2023%20Assessed%20Valuations%20Levies%20and%20Taxes%20to%20be%20Collected%202024.pdf.
[162] Washington State Department of Revenue Property Tax Statistics, 2019-2023. Accessed March 2024.
[163] SWCA Environmental Consultants (2018) estimated the cost of each proposed Columbia Solar project to cost between $8 and $10 million. The greatest share of this cost estimate in project construction costs would be from the purchase of the solar panels, steel piles, tracker crossbeams/rails, inverters, transformers, switchgear, and above- and below-ground conductors. However, these estimates were drawn during a time during the project design phase when there were still five total proposed projects, which were eventually reduced to three projects. SWCA Environmental Consultants. 2018. Columbia Solar Projects Washington EFSEC Revised Application for Site Certification. EFSEC Docket Number EF-170823. Prepared for Tusso Energy, LLC.

Employment

Table B4 presents occupations of residents within the project lease area census tract, Kittitas County, and the State of Washington, as broadly grouped by the American Community Survey. As shown, occupations that include natural resources and construction are somewhat higher in the relevant census tract (12 percent) when compared to Kittitas County (9.7 percent) or the Washington State average (9.4 percent).

Table B4. Occupation of residents on and near the Columbia Solar Project, 2018 - 2022.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Kittitas County (% of total)	Employment in State of Washington (% of total)
Management/Business/Science/Arts	1,080 (44.4%)	8,300 (37.6%)	1,664,322 (44.4%)
Sales/Office	435 (17.9%)	4,416 (20.0%)	697,384 (18.6%)
Service	447 (18.4%)	5,013 (22.7%)	595,994 (15.9%)
Production/Transportation/Material Moving	187 (7.7%)	2,214 (10.0%)	443,300 (11.8%)
Natural Resources/ Construction/Maintenance	286 (11.7%)	2,146 (9.7%)	351,076 (9.4%)
Total	**2,435 (100%)**	**22,089 (100%)**	**3,752,076 (100%)**

*The project intersects Census Tract 9502.
Source: 2022 ACS 5-Year Survey.

We developed a modeled estimate of job effects of the project using JEDI to evaluate the impacts of the project on the Washington State economy (**Tables B5** and **B6**). The JEDI model estimates the direct, as well as the indirect (supplier) and induced (consumer spending) effects associated with project expenditures. **Table B5** presents the estimate for the Columbia Solar project for the construction phase. As shown, we estimate that project construction may have resulted in 68 full-time equivalent (FTE) jobs and contributed $4.6 million (2023 USD) to the State of Washington. As shown in **Table B6**, we also estimate annual O&M spending to be associated with four jobs (FTE) and $410,000 (2023 USD) in sales contributions to the State of Washington.

Table B5. Regional economic impacts of the Columbia Solar Project in Washington, Construction Phase

Economic Impact	Estimated Project Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$15,450,000**	**68**	**$4,600,000**	**$9,500,000**

Source: IEC analysis. Project costs are estimated by taking the product of the project's rated capacity (15 MW) and the solar photovoltaic JEDI model's default average cost value of $1,030 per kW (including sales tax) for the State of Washington. Impacts include direct, indirect, and induced effects of construction spending, which are assumed to include spending on labor, materials, equipment, permitting, and taxes. Materials and equipment costs are assumed not to be spent locally. Estimated project costs include both in-state and out-of-state expenditures. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Table B6. Regional economic impacts of the Columbia Solar Project in Washington, O&M phase, Annual

Economic Impact	Operation and Maintenance Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$300,000**	**4**	**$230,000**	**$410,000**

Source: IEC analysis. O&M costs are estimated by taking the product of the project's rated capacity (15 MW) and the solar photovoltaic JEDI model's default average cost value of $20 per kW for the State of Washington. Impacts include direct, indirect, and induced effects of O&M spending, which are assumed to include spending on labor, materials, equipment, and other services. O&M expenditures are assumed to be spent in the State of Washington. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Mitigation Impact Payments/Economic Development Assistance

THE ISSUES // Communities and representative interests have inquired whether and to what extent renewable energy projects provide investments to communities in which they are located. As discussed above, the projects typically provide payments to landowners in lease areas. In addition, the projects pay personal property taxes that are collected by the counties in which they are located. This section discusses some additional payments that the Columbia Solar Project has provided to communities.

Though not directly related to the project, Puget Sound Energy and PSE Foundation invested over $105,000 in Kittitas County in 2022 and continued to invest in the community in 2023, partnering with community-based organizations such as Habitat for Humanity and the Kittitas County Historical Museum to support charitable programs catering to the needs of PSE's customers and communities at large.[164],[165]

[164] 2022 Puget Sound Energy Community Profile: Kittitas County. Accessed at https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.pse.com/-/media/PDFs/Community-profiles/Kittitas.pdf%3Fsc_lang%3Dhi%26modified%3D20230329205914%26hash%3D23D7856FB7B9997F98FEBF1CC1DBF3AF&ved=2ahUKEwj-u_m15e-FAxVCHjQIHX8kDQAQFnoECBQQAQ&usg=AOvVaw2RzWFVtLdkmOZXVkP02OA-.

[165] 2023 Puget Soundy Energy Community Profile: Kittitas County. Accessed at https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.pse.com/-/media/PDFs/Community-profiles/Kittitas.pdf%3Frev%3Deea2d556d1ad499bbac5d8209f5c7e03%26sc_lang%3Den%26modified%3D20240416200950%26hash%3DF78FF5CBD130A13756E9EE2B74EDC180&ved=2ahUKEwj-u_m15e-FAxVCHjQIHX8kDQAQFnoECDoQAQ&usg=AOvVaw3kA5z_MqZ7rLZiSB9H7ZLK.

Case Study: Rattlesnake Flat Wind Project

Photo: Courtesy of Grow Adams County

Type of Project	Location	Current Owner	Nameplate Capacity	Years of Operation	Size	Impervious Surface	Facilities
Wind energy facility	Adams County, Washington	Clearway Energy Group	144 MW	2020–present	23,673 leased acres on 99 land parcels	80 acres	57 turbines, substation, O&M facility, and 5 permanent meteorological stations

Project Summary

Rattlesnake Flat Wind Project is a 144-megawatt (MW) capacity wind energy facility in Adams County, Washington. The project came online in December 2020 after receiving 64 building permits from the County, which included the installation of 57 turbines, five permanent meteorological stations, a project substation, and an O&M facility.[166] Construction was led by Blattner Energy, Inc., with turbines provided by Siemens Gamesa Renewable Energy. Clearway Energy Group partnered with Avista Utilities to deliver the energy generated by the turbines.[167] Avista is headquartered in Spokane and provides service to eastern Washington,

[166] Personal communication with Adams County Building Department on March 7, 2024.

[167] "Clearway Energy Group, Avista Host Ribbon-Cutting to Mark Commencement of Commercial Operations for Rattlesnake Flat Wind Farm", Clearway Energy Group, December 15, 2020. Accessed on April 1, 2024 at https://www.clearwayenergygroup.com/press-releases/clearway-energy-group-avista-host-ribbon-cutting-to-mark-commencement-of-commercial-operations-for-rattlesnake-flat-wind-farm/.

north Idaho, and southern and eastern Oregon.[168] Rattlesnake Flat LLC, a subsidiary of NRG Renew LLC, was the project applicant and taxpayer. Clearway Energy Group acquired 100 percent of Rattlesnake Flat LLC's equity interests in April 2020 and is the current owner of the project.[169]

The project lease area is approximately 23,000 acres. The project lease area intersects 99 land parcels, nearly all of which are farmed (see below evaluation of impacts to impacts to agricultural crop areas). Most of the project area continues to be zoned as prime farmland.[170] One parcel within the project boundary is owned by the Washington Department of Natural Resources.

The turbines occupy portions of 30 land parcels that encompass 8,973 acres, or 37.9 percent of the total project area. The impervious surface of the turbines, access roads, and other facilities, is much smaller, at approximately 80 acres.[171]

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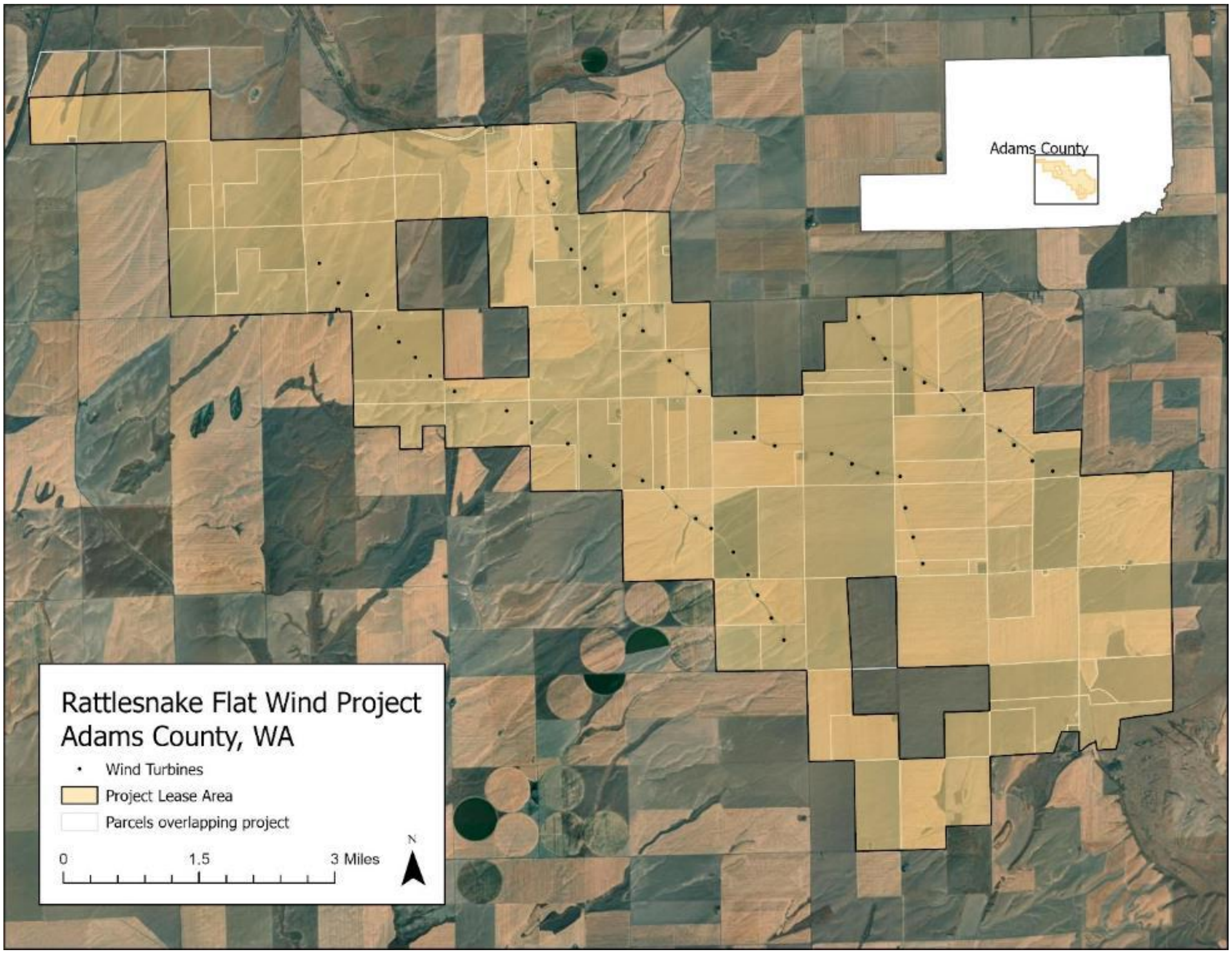
[168] "Company Information", Avista Corporation. Accessed on March 27, 2024 at https://investor.avistacorp.com/about-avista/company-information.
[169] "Clearway Energy, Inc. Announces Binding Agreements to Acquire and Invest in a Portfolio of Renewable Energy Projects", Globe Newswire, April 20, 2020. Accessed at https://www.globenewswire.com/news-release/2020/04/20/2018891/0/en/Clearway-Energy-Inc-Announces-Binding-Agreements-to-Acquire-and-Invest-in-a-Portfolio-of-Renewable-Energy-Projects.html.
[170] "SEPA Environmental Checklist", July 2016.
[171] "SEPA Environmental Checklist", July 2016.

Figure B4. Rattlesnake Flat Wind Project in Adams County, WA (Washington State Geospatial Portal,[172] U.S. Wind Turbine Database,[173] NRG Rattlesnake Flat Wind Program Application[174])



Geographic Location/Community Context

Rattlesnake Flat Wind Project occupies land in an unincorporated rural area of Adams County in the Columbia River Basin/Plateau. Adams County is a rural county, with a population of 20,557 as of 2022.[175] The project is located about 10 miles southeast of the 569-person town of Lind, Washington and 15 miles south of Ritzville, Washington, a town with a population of 1,733.[176]

[172] Washington State Geospatial Portal, Property Parcel data, Updated February 7, 2024. Accessed at https://geo.wa.gov/datasets/wa-geoservices::current-parcels/about on February 12, 2024.
[173] Hoen, B.D., Diffendorfer, J.E., Rand, J.T., Kramer, L.A., Garrity, C.P., and Hunt, H.E., 2018, United States Wind Turbine Database (ver. 6.1, November 2023): U.S. Geological Survey, American Clean Power Association, and Lawrence Berkeley National Laboratory data release, https://doi.org/10.5066/F7TX3DN0. Accessed on February 12, 2024.
[174] NRG Renew LLC. "Rattlesnake Flat Wind Project, Rattlesnake Flat Wind Project LLC, Adams County Washington." Wind Permit Application. June 14, 2018.
[175] 2022 ACS 5-Year Survey, U.S. Census Bureau.
[176] 2022 ACS 5-Year Survey, U.S. Census Bureau.

Adams County's two most populous cities are Ritzville and Othello.[177] The County government employs 168 full time and 10 part-time individuals and has an annual budget of $59.6 million as of 2024.[178],[179]

Table B7 summarizes community population statistics for the project area. As shown, the population in Adams County has a lower median income, higher population without a high school diploma, and higher population living below the poverty level than the state population overall.

Rattlesnake Flat is one of two operating utility-scale clean energy projects in Adams County. The second project, the Adams-Neilson Solar Plant, is a smaller, 28 MW solar plant constructed in 2018.[180]

Table B7. Community population statistics for Rattlesnake Flat Project Area (2018 - 2022).

Metric	Census tracts intersected by project	Adams County	State of Washington
Population (2022)	1,935	20,557	7,688,549
10-Year Population Change (2012 – 2022)	+20.3%	+10.7%	+14.1%
Median Household Income	$68,083	$63,105	$90,325
Population identifying as other than white and non-Hispanic	37.9%	68.1%	34.5%
Population with income below federal poverty level	15.1%	20.9%	9.9%
Population with less than high school diploma or equivalent	20.6%	29.0%	7.9%
Population that is unemployed	2.4%	3.9%	3.2%
Population without health insurance	25.7%	28.1%	9.2%
Population over 65 years old	16.0%	11.3%	16.0%
Population with low English proficiency	20.3%	24.7%	7.7%
Energy burden[b]	3.0%	2.5%	1.5%

[a] The project intersects Census Tract 9502.
[b] Energy burden is defined as the percentage of gross household income spent on energy cost.
Sources: 2022 ACS 5-Year Survey, 2012 ACS 5-Year Survey; U.S Department of Energy LEAD Tool.[181]

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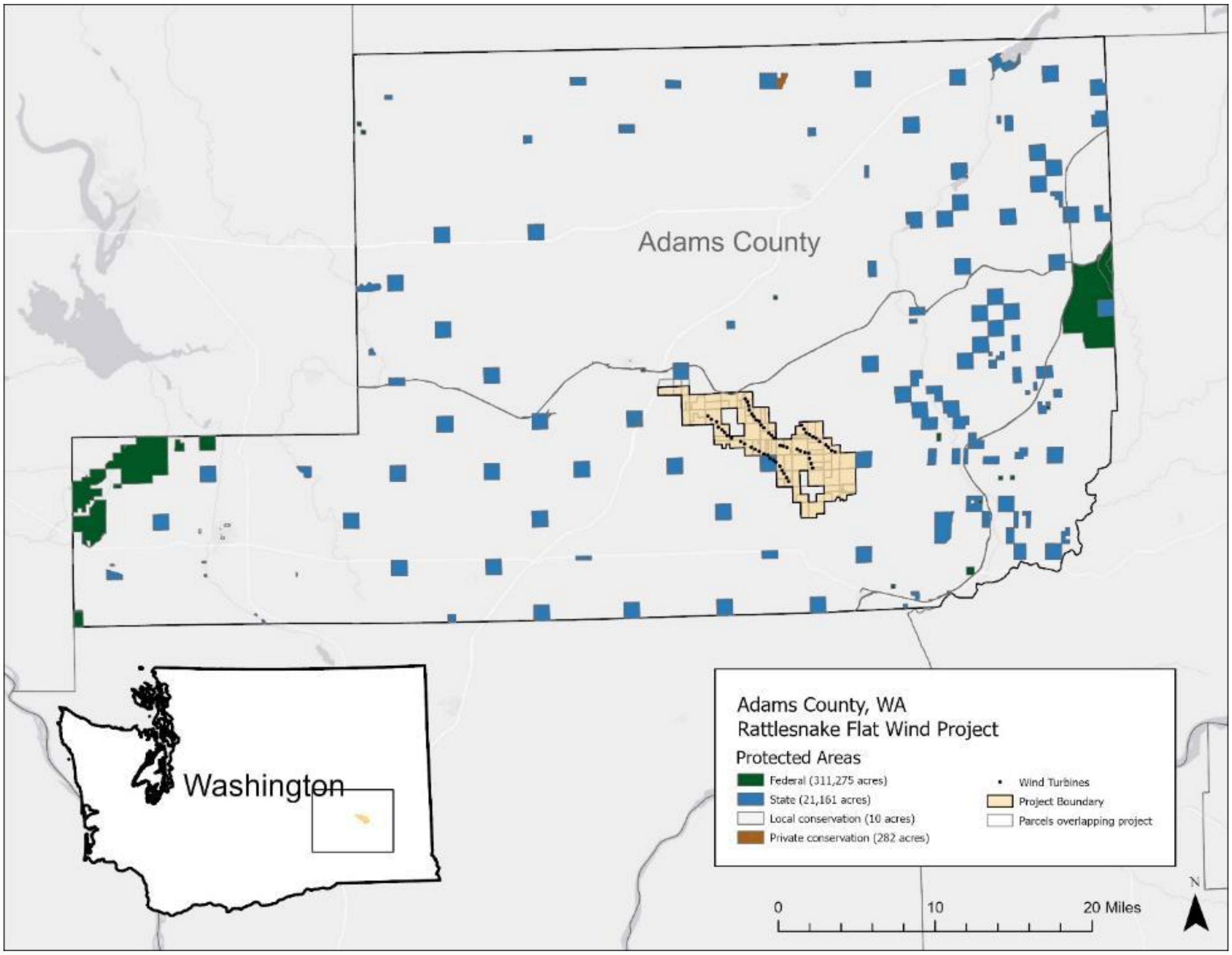
[177] "About Adams County", Adams County Washington. Accessed at https://www.co.adams.wa.us/residents/about_adams_county/index.php.
[178] 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
[179] "Commissioner's Proceedings", Adams County Washington, December 20, 2023. Accessed at https://cms5.revize.com/revize/adamscounty/DeptPages/Commisioners/Minutes/CP20231220.pdf on March 11, 2024.
[180] "Power plant profile: Adams-Neilson Solar PV Park, US", Power Technology, January 31, 2024. Accessed at https://www.power-technology.com/marketdata/power-plant-profile-adams-neilson-solar-pv-park-us/?cf-view.
[181] Low-income Energy Affordability Data Tool, Office of State and Community Energy Programs, 2022. Accessed on March 27, 2024 at https://www.energy.gov/scep/slsc/lead-tool.

As shown in **Figure B5**, approximately 6.5 percent of Adams County is publicly owned, including approximately 1.9 percent federal, 4.6 state, and less than one percent county or locally owned lands.[182] Agriculture and livestock ranching are the primary economic activities in this county, with wheat, corn, and apples among the most common crops.[183] Adams County is one of the largest wheat producers in the state of Washington. Eastern Adams County is farmed primarily with dryland crops – wheat, canola, camelina, sunflowers, etc. The western portion of the county, known as the 'panhandle," is more diverse agriculturally due to the presence of canal irrigation. Around Othello, a diverse selection of fruit and vegetable crops are raised.

Figure B5. Land ownership in Adams County, Washington.



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[182] U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
[183] "About Adams County", Adams County Washington. Accessed at https://www.co.adams.wa.us/residents/about_adams_county/index.php.

Land Use

Figure B6. Agricultural land use surrounding turbine in Rattlesnake Flat Wind Project area (Google Earth, 2023).

THE ISSUES // Some community members and other representative interests have expressed concerns that renewable energy projects may adversely affect local communities, both in terms of losses to productive lands for agriculture, as well as potentially resulting in reductions in the attractiveness of the area to tourism, recreation, or other development activities. In this section, we evaluate the impacts of the Rattlesnake Flat Wind Project on land uses within the project lease area and discuss the likelihood of other potential effects on nearby land uses.

Like other areas in this part of the county, NASS data from 2022 suggests that most of the crops grown in the lease area are winter wheat, but also include spring wheat, alfalfa hay, and small areas of other crops. At average 2023 crop values, the value of the crops in the lease area (21,177 crop acres) were approximately $3.8 million annually, or an average of $339 per acre in revenues.[184]

[184] 2023 Washington State Agriculture Overview, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on March 6, 2024 at https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=WASHINGTON.

In 2019, land use in both the lease area and the project footprint area[185] were used primarily for crop agriculture, with 91.4 percent and 96.7 percent of these areas farmed, respectively.[186],[187] As shown in **Table B8** and highlighted in **Figure B7**, following project implementation, data indicates that crop acres have decreased slightly from before the project was constructed, with 21,177 acres of cropland harvested in the project lease area following construction, and 8,529 acres in the project footprint area, a decrease of 2.2 and 1.7 percent in cropland, respectively. **Figure B6** (above) shows agricultural land use surrounding a turbine in the Rattlesnake Flat Wind Project area in 2023.

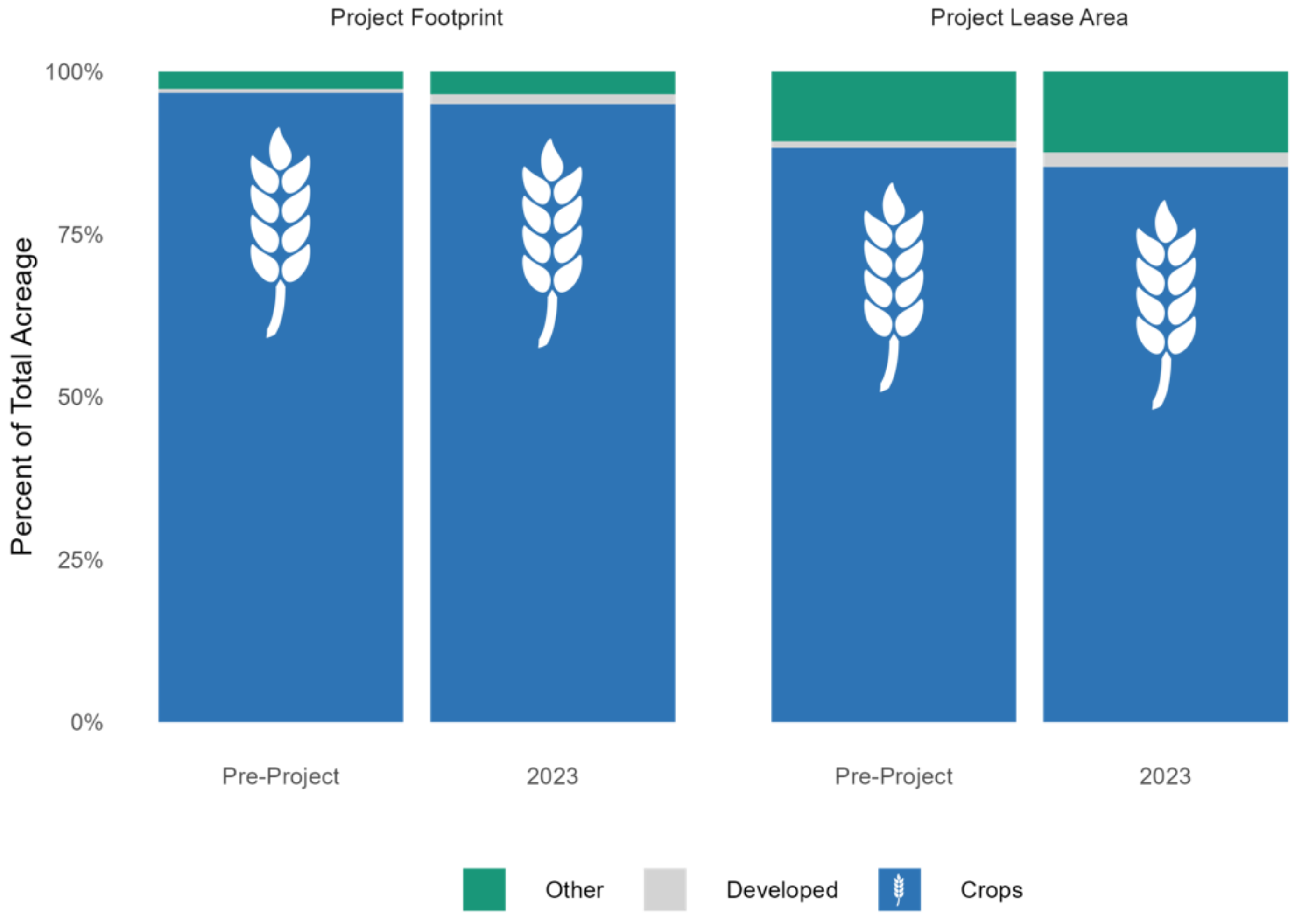
Table B8. Cropland acres within project area before (2019) and after project (2022) construction.

Area	Pre-project, 2019 (Acres, percent of total)	Post-Project, 2022 (Acres, percent of total)	Change (%)
Lease Area			
Crops	21,645 (91.4%)	21,177 (89.5%)	**-2.2%**
Developed	201 (0.8%)	453 (1.9%)	+125.7%
Other	1,826 (7.7%)	2,042 (8.6%)	+11.8%
Total	**23,672 (100%)**	**23,672 (100%)**	**0%**
Project Footprint			
Crops	8,678 (96.7%)	8,529 (95.1%)	**-1.7%**
Developed	56 (0.6%)	132 (1.5%)	138.0%
Other	237 (2.6%)	310 (3.5%)	30.8%
Total	**8,972 (100%)**	**8,972 (100%)**	**0%**

Source: 2022 Cropland Data

[185] The project footprint is defined as including parcels on which turbines are located.
[186] 2022 Cropland Data Layer, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on June 22, 2023 at https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.
[187] 2019 Cropland Data Layer, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on March 18, 2024 at https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.

Figure B7. Change in Rattlesnake Flat Project Area Land Use (2019 to 2022).



Source: 2022 Cropland Data

Financial Returns to Property Owners

THE ISSUES // Community members and lawmakers have inquired as to whether and to what extent the leasing of lands for renewable energy projects is beneficial or harmful to landowners. Primary concerns include both the short- and long-term community impacts, as well as whether adjacent landowners could be affected by these projects. Answering this question is made somewhat challenging due to the confidential nature of the agreements made between landowners and project developers and is further complicated by the variety of characteristics that affect neighboring property values. This section evaluates what we can determine about the effects of Rattlesnake Flat Wind Project on landowners in Adams County.

As is common practice with wind energy project development in rural areas, land parcels in the Rattlesnake Flat Wind Project area are leased by the project owner and most retain their original land ownership status. As discussed above, parcels in this area continue to be farmed following project implementation. Property owners within the leased areas typically enter into lease agreements with the project owners for a pre-development period (typically ranging from two to five years in duration). After the design of the project is established, landowners for which physical infrastructure is developed are further compensated on a per acre basis at an established fee. While these agreements are generally confidential to the parties engaged, some agreements made with public entities are made public that provide insights into these payments.

One lease agreement was publicly available for a single 640-acre parcel in the Rattlesnake Flat Wind Project area that is owned by the Washington State Department of Natural Resources. Under this agreement, payments change throughout the lifecycle of the project. Specifically:

1. Predevelopment: The owner is paid $7,500 up front, plus $5,000 annually.
2. Construction: The owner is paid $4,000 per MW capacity for each turbine installed on the premises.
3. Operations: The State is paid a percentage of quarterly gross revenues.

The Adams County Building Department suggests that the project was permitted in 2020, with construction lasting from April 2020 through approximately January 2021.[188] Assuming a four-year pre-development period, and a two-year construction period, we estimate the payments to the WADNR for this parcel to be $92,000 during predevelopment and construction phases, given that there were three 2.9 MW turbines and a meteorological station installed on the parcel.[189] Payments associated with gross project revenues are uncertain during the production period. Using average annual energy production of 396,000 MWh from all 57 turbines and an approximate power purchase agreement (PPA) price of $27/MWh the lease would provide DNR with approximately $28,000 in years one to 10 of 127 operation and up to $40,000 per year in later years (all values 2023 dollars).[190],[191]

We are not certain whether the landowner payments to WADNR reflect the market for private parcels but suspect that they are roughly equal to the private market leasing rate.[192]

Table B9. Estimated WADNR payments for parcel with three turbines.

Year	Value	Total
Year 1 (Predevelopment)	$12/acre	$7,500
Year 2 (Predevelopment)	$8/acre	$5,000
Year 3 (Predevelopment)	$8/acre	$5,000
Year 4 (Predevelopment)	$8/acre	$5,000
Year 5 (Construction)	$4000 x 2.9MW/turbine = $11,600/turbine x 3	$34,800
Year 6 (Construction)	$11,600/turbine x 3	$34,800
Year 7 – 30 (Operations)	5-7% of gross quarterly revenues	Uncertain, ~$28,000 up to $40,000 per year

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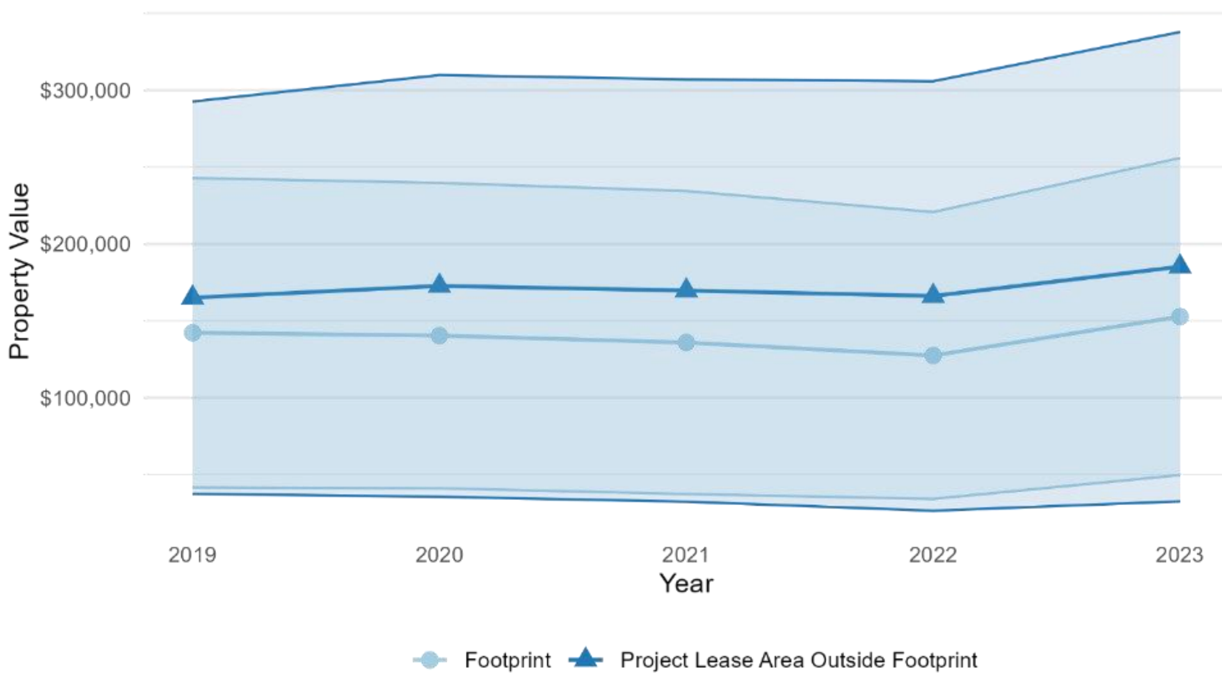
188 Personal communication with Adams County Building Department on March 7, 2024.
189 Rattlesnake Flat Wind Power Development Lease, 2019. Provided by WA DNR on March 25, 2024.
190 "Emissions & Generation Resource Integrated Database (eGRID), 2022." United States Environmental Protection Agency (EPA). Office of Atmospheric Protection, Clean Air Markets Division, 2024, Washington DC. https://www.epa.gov/egrid.
191 Wiser, Ryan, et al. Land-based wind market report: 2023 edition. Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA (United States), 2023.
192 While it is difficult to directly compare leases given the variety of factors likely considered in individual agreements, several publicly available estimates provided similar annual values. Wind Exchange from the DOE estimated $7,800 in the west (https://windexchange.energy.gov/economic-development-guide), Windustry estimates $4,000 to $8,000 per turbine or $3,000 to $4,000 per MW (https://www.windustry.org/how_much_do_farmers_get_paid_to_host_wind_turbines) and a recent presentation at a USDA forum presented $10,000 as an example (https://www.usda.gov/sites/default/files/documents/2023aof-Sherrick.pdf).

Sources: Wind Power Development Lease [2019]; Accessed on March 20, 2024 at https://adamswa-taxsifter.publicaccessnow.com/Search/Results.aspx; "Emissions & Generation Resource Integrated Database (eGRID), 2022." United States Environmental Protection Agency (EPA). Office of Atmospheric Protection, Clean Air Markets Division, 2024, Washington DC. https://www.epa.gov/egrid. Wiser, Ryan, et al. Land-based wind market report: 2023 edition. Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA (United States), 2023.

We also evaluated assessed values of the parcels within the project lease area prior to and following Rattlesnake Flat Wind Project construction. As shown, parcels in the project footprint and parcels in the parcel lease area had similar assessed values on a per acre basis prior to project implementation, with slightly lower average parcel values for the 30 parcels in the project footprint ($141,318) compared with the other parcels in the project lease area ($168,876). Following project construction in December 2020, we did not observe clear changes to the property values, which averaged $138,705 for parcels within the project footprint and $173,685 for parcels within the project boundary in 2022.[193]

Figure B8. Property values of Rattlesnake Flat Wind Project leased areas over time.



Source: Adams County TaxSifter, 2019-2023. Range of per property values for all properties in footprint and lease area. Accessed on March 20, 2024 at https://adamswa-taxsifter.publicaccessnow.com/Search/Results.aspx.

Taxes

THE ISSUES // Projects bring tax revenues to counties. However, there have been questions raised about whether the impacts are sustained over time and how the changes to tax payments over time affect the counties in which they are located, particularly as projects depreciate over time.

Since construction, Rattlesnake Flat Wind Project taxes have been assessed as personal property by Adams

[193] Adams County TaxSifter. Accessed on March 20, 2024 at https://adamswa-taxsifter.publicaccessnow.com/Search/Results.aspx.

County. The project is assessed by the county, the project footprint is entirely within Adams County.[194] The initial assessed value was $129.8 million in 2021.

Personal property tax payments initiated post-construction at over $1.2 million per year in 2022, 2023, and (assessed) in 2024. Because the infrastructure is anticipated to depreciate over time, the personal property tax payments made to the county will decline over time. Although improvements to the project may alter the schedule, the depreciation is anticipated to decline at a rate that is approximately consistent with the published state schedule of four percent for utility-scale renewable energy development.[195] Based on this schedule, the project would depreciate to 50 percent of its original value by year 12 and 15 percent by year 22 and beyond. By years 22 and beyond, this would result in approximate personal property tax payments of one sixth of their current tax payments (e.g., approximately $200,000 to $250,000 per year) using the current tax levies and valuation guidelines.

Landowners of leased parcels are responsible for paying annual property taxes to the county. As noted above, these real property taxes are likely to be paid or reimbursed by the project owner as part of the lease agreements. A small number of parcels also list Rattlesnake Flat LLC as owner and are taxed as real property to Rattlesnake Flat. As shown in **Table B10**, real property tax payments from the project occurred in 2019 through today.

Table B10. Rattlesnake Flat wind project tax payments, 2019 – 2023 (2023 dollars).

Year	Real Property Tax	Personal Property Tax	Total Adams County Tax Collected	% of County Tax Roll
2019	$8,094	N/A	$25,596,339	0.0%
2020	$8,149	N/A	$27,842,050	0.0%
2021	$7,879	N/A	$28,281,960	0.0%
2022	$23,923	$1,337,217	$28,388,668	4.8%
2023	$23,446	$1,222,303	$30,148,629	4.1%
Total	**$71,491**	**$2,559,520**	**$140,257,646**	**4.4% (since 2022)**

Parcels assigned to Rattlesnake Flat: 2635090130001, 4000001103950, 4000001103951, 4000001103952, 4000001103953, 2735220100001, 2735230000001, 2735150000001, 2735150000002. The projected 2024 assessment for the personal property taxes for the project is $1.39 million.

Sources: Adams County TaxSifter, accessed on March 20, 2024 at https://adamswa-taxsifter.publicaccessnow.com/Search/Results.aspx., Washington State Department of Revenue Property Tax Statistics, 2019-2023. Accessed March 2024.

Jobs

THE ISSUES // Community members and representative interests have inquired about how much effect renewable energy projects have on local employment. This section describes information that we have

[194] Personal communication with Washington State Department of Revenue on March 25, 2024.
[195] Personal Property Valuation Guidelines, Washington State department of Revenue. Accessible at: https://dor.wa.gov/taxes-rates/property-tax/personal-property-valuation-guidelines

gathered about the extent of impacts that project construction and operations have had on employment in Adams County.

Direct Investments

The costs of the project were reported by GlobalData's Power Intelligence Center as being $267 million, which includes local spending, direct operating and maintenance costs, and other annual costs such as land leases.[196]

Clearway Energy states that, as of December 2023, the Rattlesnake Flat project invested approximately $13 million into the local economy and will continue to invest $350,000 annually while the wind farm is operating.[197] It is not clear from this source whether this figure refers to County tax payments, lease payments or other sources of investment.

Employment

Table B11 presents occupations of residents within the project lease area census tract, Adams County, and the State of Washington, as broadly grouped by the American Community Survey. As shown, occupations that include natural resources and construction are high in the relevant census tract (25 percent) as well as Adams County (29 percent) when compared with the Washington State average (9.4 percent).

Table B11. Occupation of residents on and nearby the Rattlesnake Flat Wind Project, 2018 - 2022.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Adams County (% of total)	Employment in State of Washington (% of total)
Management/Business/Science/Arts	226 (24.9%)	2,011 (24.2%)	1,664,322 (44.4%)
Sales/Office	133 (14.6%)	1,271 (15.3%)	697,384 (18.6%)
Service	137 (15.1%)	1,137 (13.7%)	595,994 (15.9%)
Production/Transportation/Material Moving	155 (17.1%)	1,482 (17.8%)	443,300 (11.8%)
Natural Resources/ Construction/Maintenance	257 (28.3%)	2,404 (28.9%)	351,076 (9.4%)
Total	**908 (100%)**	**8,305 (100%)**	**3,752,076 (100%)**

*The project intersects Census Tract 9502.
Source: 2022 ACS 5-Year Survey.

Clearway Energy states that the Rattlesnake Flat Wind Project created 250 jobs as well as providing 10 full-time employees who operate and maintain the farm [the consultant team was unable to communicate with

[196] "Rattlesnake Flat Wind Farm, US," Power Technology, December 7, 2021. Accessed at https://www.power-technology.com/marketdata/rattlesnake-flat-wind-farm-us/?cf-view.

[197] "Clearway Energy Group, Avista Host Ribbon-Cutting to Mark Commencement of Commercial Operations for Rattlesnake Flat Wind Farm", Clearway Energy Group, December 15, 2020. Accessed on April 1, 2024 at https://www.clearwayenergygroup.com/press-releases/clearway-energy-group-avista-host-ribbon-cutting-to-mark-commencement-of-commercial-operations-for-rattlesnake-flat-wind-farm/.

Clearway to independently verify this].[198] Communication with Grow Adams County verified that there are 9 to 10 full time employees on the project site as of 2024 that include a site manager and maintenance crews, who live in nearby areas.[199] The specific source of the 250-job estimate is not clear, as is the extent of these jobs that were created locally to the project. The construction company used for the project was Blattner Energy, Inc., which is headquartered in Minnesota, and which advertises expertise in wind and solar contracting services nationwide. Current employment listings include what appear to be positions in specific construction sites in various western states, but do not include Washington State as of March 2024.[200] Anecdotal evidence suggests that the crews that conducted the construction of the project were generally not local to Adams County, although some local general contract labor may have been used.

Avista published a modeled estimate using an input-output built by NREL to evaluate the impacts of the project on the Washington State economy. This model estimates the direct, as well as the indirect (supplier) and induced (consumer spending) effects associated with project expenditures. **Table B12** presents the estimate for the Rattlesnake Flat project. As shown, Avista estimated that the project development resulted in 348 jobs and contributed $72 million to the State of Washington. However, the assumptions about the initial expenditures on the project and the assumptions about the origins of capital expenditures, including construction labor, are not clear.

To the extent that 250 construction jobs were created during a one-year period for the project, these would have represented an increase of three percent in total employment in the County.

This project also was reported to have a Project Labor Agreement, which is an agreement between the contractor and its employees which establishes worksite conditions and routes to resolve labor disputes. These agreements typically include goals that promote the hiring of local community members, veterans, disadvantaged workers, and/or small businesses. This helps focus economic impacts of the project in the local community. However, we were unable to procure any specifics of this agreement [the consultant team was unable to communicate with Clearway to independently verify this]. [201],[202]

Table B12. JEDI-derived job creation estimates for the Rattlesnake Flat Wind Project from Avista Report in the State of Washington.

Economic Impact	Jobs	Earnings	Output
Direct (per MW)	0.56	$41,319	$45,486
Indirect (per MW)	1.50	$41,319	$316,042
Induced (per MW)	0.66	$46,528	$143,819

[198] "Clearway Energy Group, Avista Host Ribbon-Cutting to Mark Commencement of Commercial Operations for Rattlesnake Flat Wind Farm", Clearway Energy Group, December 15, 2020. Accessed on April 1, 2024 at https://www.clearwayenergygroup.com/press-releases/clearway-energy-group-avista-host-ribbon-cutting-to-mark-commencement-of-commercial-operations-for-rattlesnake-flat-wind-farm/.
[199] Personal communication with Adams County Development Council on March 29, 2024.
[200] Blattner Energy Career Opportunities. Accessed on March 29, 2024 at https://blattner.wd5.myworkdayjobs.com/BlattnerEnergy .
[201] "Clearway Energy Group, Avista Host Ribbon-Cutting to Mark Commencement of Commercial Operations for Rattlesnake Flat Wind Farm", Clearway Energy Group, December 15, 2020. Accessed on April 1, 2024 at https://www.clearwayenergygroup.com/press-releases/clearway-energy-group-avista-host-ribbon-cutting-to-mark-commencement-of-commercial-operations-for-rattlesnake-flat-wind-farm/.
[202] City of Seattle, Department of Finance and Administrative Services, What is a Project Labor Agreement?" Accessed at https://www.seattle.gov/documents/Departments/FAS/PurchasingAndContracting/Labor/LaborAgreement.pdf on March 14, 2024.

Economic Impact	Jobs	Earnings	Output
Total (per MW)	**2.72**	**$129,166**	**$505,347**
Implied Impacts of Rattlesnake Flat Wind Project (144 MW)	392	$18,599,904	$72,769,968

Source: DNV, "Supply Side Non-Energy Impacts Report," prepared for Avista, April 8, 2022.

Mitigation Impact Payments/Economic Development Assistance

THE ISSUES // Communities and representative interests have inquired whether and to what extent renewable energy projects provide investments to communities in which they are located. As discussed above, the projects typically provide payments to landowners in lease areas. In addition, the projects pay personal property taxes that are collected by the counties in which they are located. This section discusses some additional payments that the Rattlesnake Flat Wind Project has provided to communities.

According to a Clearway Energy press release, Clearway and Avista donated to local organizations including the Washtucna Heritage Museum and Community Center, the Adams County Fire Protection District #7, and the Lind Senior Center [the consultant team was unable to independently verify this]. To address challenges created by the COVID-19 pandemic, Clearway additionally donated to local food banks. Furthermore, because the project is built partially on public land, the Department of Natural Resources elected to use the revenue from land leases to directly fund local government services and construction of schools.[203]

[203] "Clearway Energy Group, Avista Host Ribbon-Cutting to Mark Commencement of Commercial Operations for Rattlesnake Flat Wind Farm", Clearway Energy Group, December 15, 2020. Accessed on April 1, 2024 at https://www.clearwayenergygroup.com/press-releases/clearway-energy-group-avista-host-ribbon-cutting-to-mark-commencement-of-commercial-operations-for-rattlesnake-flat-wind-farm/.

Case Study: Skookumchuck Wind Project

Photo: Courtesy of Southern Power

Type of Project	Location	Current Owner	Nameplate Capacity	Years of Operation	Size	Facilities
Wind energy facility	Thurston and Lewis County, Washington	Southern Power Company	136 MW	2020–present	10,206 leased acres on 27 land parcels	38 turbines, O&M Yard, access roads, transmission lines

Project Summary

Skookumchuck Wind Project is a 144-megawatt (MW) capacity wind energy facility that spans Lewis and Thurston County in Washington. The construction process, which included the installation of 38 turbines, multiple access roads, transmission lines, and a five-acre Operation and Maintenance Yard, was completed in December 2020.[204] Though the project was developed by Renewable Energy Systems, Southern Power Company acquired the project in August 2019 and saw it through to completion.[205] Weyerhaeuser Company, a timber company, is the landowner; this is the sixth wind project to be constructed on their timberlands across

[204] "Notice of Application", Thurston County Resource Stewardship Department. May 30, 2017.
[205] "Skookumchuck Wind Facility Fact Sheet", Southern Power Company. August 2019.

the United States.[206] The energy produced by the wind farm is sold to Puget Sound Energy for distribution to several counties in Western Washington, including Thurston and Lewis counties.[207] Skookumchuck Wind Energy Project LLC is the project applicant and taxpayer.[208]

The project lease area is approximately 10,206 acres in size and intersects 27 land parcels, all of which are owned by Weyerhaeuser for logging purposes. The turbines occupy portions of 15 land parcels that encompass 7,538 acres, or 73.8 percent of the total project area.

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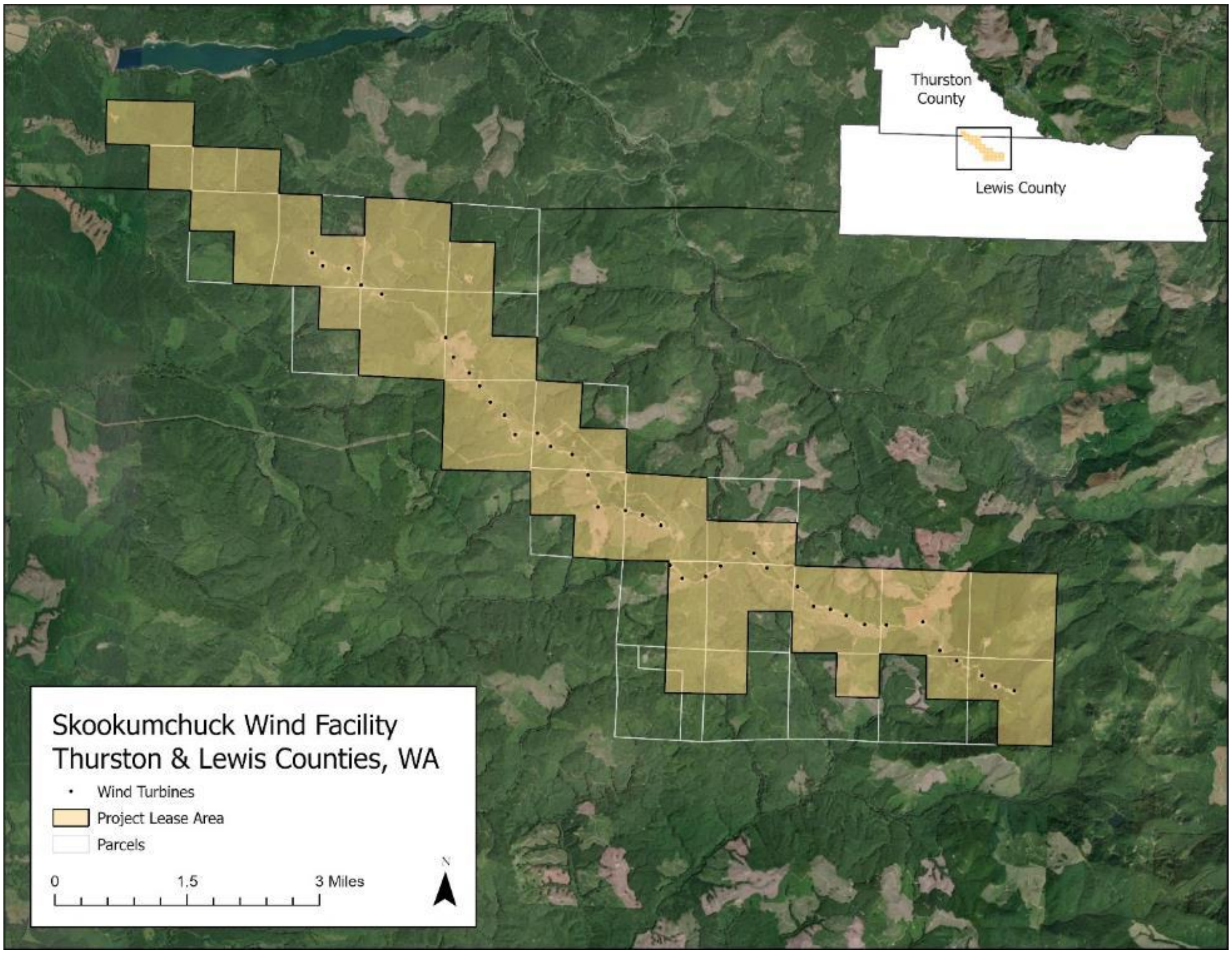
[206] "Un-Vail-ing Our First Wind Farm in the West", Weyerhaeuser Company. January 21, 2022. Accessed on April 25, 2024 at https://www.weyerhaeuser.com/blog/un-vail-ing-our-first-wind-farm-in-the-west/.
[207] "PSE Locations", Puget Sound Energy. Accessed on April 25, 2024 at https://www.pse.com/en/Customer-Service/pse-locations-2.
[208] Skookumchuck Wind Energy Notice of Application. May 2017.

Figure B9. Skookumchuck Wind Project in Lewis and Thurston Counties, WA (Washington State Geospatial Portal,[209] U.S. Wind Turbine Database,[210]Skookumchuck Supplemental[211])



Geographic Location/Community Context

Skookumchuck Wind Project occupies land in Thurston and Lewis Counties. Though both counties are technically contained within the project boundaries, the analysis focused on Lewis County as it accounts for 92.2 percent of project lease area, which includes the entirety of the turbines.

Skookumchuck Wind Project occupies land in Lewis County in western Washington. Lewis County is an urban county, with a population of 82,663 as of 2022, making it the 16th largest county in the State based on population. The project is located about 15 miles east of Centralia, the most populous city in the county with a

[209] Washington State Geospatial Portal, Property Parcel data, Updated February 7, 2024. Accessed at https://geo.wa.gov/datasets/wa-geoservices::current-parcels/about on February 12, 2024.
[210] Hoen, B.D., Diffendorfer, J.E., Rand, J.T., Kramer, L.A., Garrity, C.P., and Hunt, H.E., 2018, United States Wind Turbine Database (ver. 6.1, November 2023): U.S. Geological Survey, American Clean Power Association, and Lawrence Berkeley National Laboratory data release, https://doi.org/10.5066/F7TX3DN0. Accessed on February 12, 2024.
[211] "Skookumchuck Supplemental Application", Thurston County Resource Stewardship. April 28, 2014.

population of 18,773. The county seat is Chehalis, with a population of 7,645 in 2022.[212] The county government employs 541 full-time and 54 part-time individuals and has an annual budget of $207.7 million.[213],[214]

Table B13 summarizes community population statistics for the project area. As shown, the population in Lewis County has a lower median income, higher white and non-Hispanic population, and higher energy burden relative to the state population overall.

Table B13. Community population statistics for Skookumchuck Project Area (2018 - 2022).

Metric	Census tracts intersected by project[a]	Lewis County	State of Washington
Population (2022)	8,339	82,663	7,688,549
10-Year Population Change (2012 – 2022)	+ 15.8%	+ 9.6%	+ 14.1%
Median Household Income	$83,740	$67,247	$90,325
Population identifying as other than white and non-Hispanic	13.7%	18.8%	34.5%
Population with income below federal poverty level	6.2%	12.3%	9.9%
Population with less than high school diploma or equivalent	11.1%	10.5%	7.9%
Population that is unemployed	2.1%	3.5%	3.2%
Population without health insurance	11.1%	10.6%	9.2%
Population over 65 years old	21.5%	21.0%	16.0%
Population with low English proficiency	3.0%	2.8%	7.7%
Energy burden [b]	2.3%	2.5%	1.5%

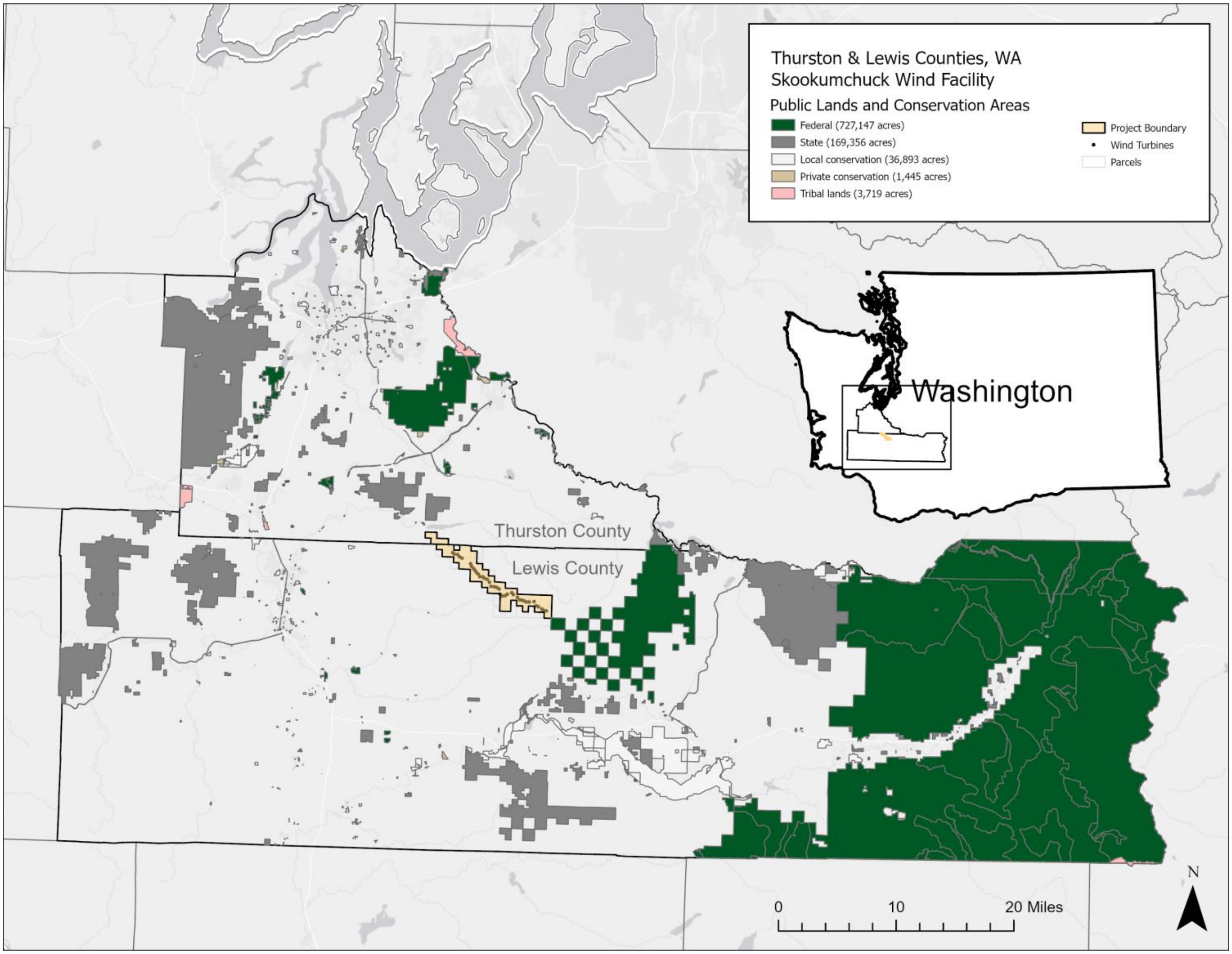
[a] The project intersects Census Tracts 9711 and 9718. The statistics above represent a population-weighted average.
[b] Energy burden is defined as the percentage of gross household income spent on energy cost.
Sources: 2022 ACS 5-Year Survey, 2012 ACS 5-Year Survey; U.S Department of Energy LEAD Tool.[215]

[212] 2022 ACS 5-Year Survey, U.S. Census Bureau.
[213] "2023 Budget Report", Lewis County. Accessed on April 25, 2024 at https://lewiscountywa.opengov.com/transparency#/73152/accountType=expenses&embed=n&breakdown=c89511c3-d239-44fd-9d00-a5200b590ce7&currentYearAmount=cumulative&currentYearPeriod=years&graph=bar&legendSort=desc&proration=true&saved_view=518274&selection=E5EED350B4EBA880046EB18304C3A416&projections=null&projectionType=null&highlighting=null&highlightingVariance=null&year=2023&selectedDataSetIndex=null&fiscal_start=earliest&fiscal_end=latest.
[214] 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
[215] Low-income Energy Affordability Data Tool, Office of State and Community Energy Programs, 2022. Accessed on March 27, 2024 at https://www.energy.gov/scep/slsc/lead-tool.

As shown in **Figure B10**, approximately 46.4 percent of the combined land of Thurston and Lewis Counties is publicly owned, including approximately 36.0 percent owned federally, 8.4 percent owned by the state, 1.8 owned by the local government for conservation, and 0.2 percent owned by tribes.[216]

Lewis County is home to the Port of Centralia, which houses many businesses. The county also generates income via ecotourism from visitors looking to explore Gifford Pinchot National Forest.[217] Coal mining and lumber harvest and processing are also major economic activities in this county.[218]

Figure B10. Land ownership in Thurston and Lewis County, Washington.



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[216] U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
[217] 2019 Lewis County Economic Profile. Western Washington University Center for Economic and Business Research.
[218] "Lewis County Spotlight", Washington State Association of Counties. Accessed on April 26, 2024 at https://wsac.org/county-spotlights/county-spotlight-lewis/.

Figure B11. Forestry land use surrounding turbines in Skookumchuck Wind Project area (Google Earth, 2023).

Land Use

THE ISSUES // Some community members and other representative interests have expressed concerns that renewable energy projects may adversely affect local communities, both in terms of losses to productive lands for agriculture, as well as potentially resulting in reductions in the attractiveness of the area to tourism, recreation, or other development activities. In this section, we evaluate the impacts of the Skookumchuck Wind Project on land uses within the project lease area and discuss the likelihood of other potential effects on nearby land uses.

Unlike many other renewable energy projects in the State, the land in the lease area is zoned as forest resource land.[219] Of the 10,206 total acres in the lease area, 72.4 percent is evergreen forest, 20.8 percent shrubland, 2.3 percent grassland/pastureland, 0.3 percent mixed forest, and 0.2 percent deciduous forest.220 The largest land cover class, evergreen forest, includes tree species common to managed forests in this region, such as Douglas fir, western hemlock, and western red cedar.

[219] Personal communication with Lewis County Community Development Office on March 8, 2024.
[220] 2023 Washington State Agriculture Overview, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on March 6, 2024 at https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=WASHINGTON.

Prior to project construction and operation, all commercial timber lands in the lease area have been cut at least once, with certain areas on their third or fourth rotation.[221] In comparison, only 2.9 acres of land in the lease area (less than one percent) were used to grow crops, including blueberries, Christmas trees, and corn. Though the project is understood to be situated on lower value timber lands,[222] the land still provides Weyerhaeuser with significant revenue. At average timber values, timber in the project footprint in 2022 (7,182 acres)[223] was worth approximately $15.2 million (2023 USD), or an average of $2,116 per acre in value, which stayed the same as the value in 2019 due to the difference of just two acres of forest cover based on satellite imagery.[224,225] See **Table B14** note 1 for additional discussion of satellite imagery at this site.

In addition to timber value, Weyerhaeuser Company gains recreational value from the land by selling permits granting annual access to recreational users of their forests.[226] Annual permit prices in the area roughly $125 per permit for non-motorized permits, as the region has permit area restrictions that limit recreational users to non-motorized use only.[227]

In 2019, land cover in both the lease area and the project footprint area[228] were primarily forestland, with 96.0 percent and 95.3 percent of these areas forested, respectively.[229,230] As shown in **Table B14** and highlighted in **Figure B12**, following project implementation, data indicates that forested acres are essentially unchanged from before project construction, with one acre of forestland in the project lease area lost following construction, and two acres lost in the project footprint area, a minimal decrease of 0.02 percent in forestland for both cases. **Figure B11** shows other land uses surrounding a turbine in the Skookumchuck Wind Project area in 2023.

Table B14. Forestland within project area before (2019) and after project (2022) construction.

Area	Pre-project, 2019 (Acres, percent of total)	Post-Project, 2022 (Acres, percent of total)	Change (%)
Lease Area	-	-	-
Forest[1]	9,798 (96.0%)	9,796 (96.0%)	-0.02%
Developed	386 (3.8%)	388 (3.8%)	+0.50%

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221 "Skookumchuck Wind Energy Project Proposed Habitat Conservation Plan and Incidental Take Permit for Marbled Murrelet, Bald Eagle, and Golden Eagle Lewis and Thurston Counties, Washington: Final Environmental Impact Statement", Anchor QEA LLC. 2019. Prepared for U.S. Fish and Wildlife Service.
222 Personal communication with Lewis County Community Development Office on March 8, 2024.
223 We arrived at this acreage figure through analysis of GIS data showing the area that is forest cover in the project area, assuming that all forest cover is producing timberland because it is owned by Weyerhaeuser Company.
224 "Timber Asset Class", Deloitte. 2018.
225 The total value we estimate (adjusted to 2023 dollars) is based on the timber value per net acre (2018 dollars) in the State of Washington derived from the portion of the total acreage size in trust-owned timberland available for harvest given restrictions and limitations such as federal laws, forest practice rules, and more.
226 "Our Programs", Weyerhaeuser. Accessed on April 24, 2024 at https://recreation.weyerhaeuser.com/Programs.
227 "Vail Permit Area Details", Weyerhaeuser. Accessed on April 24, 2024 at https://recreation.weyerhaeuser.com/Permits/Search/c15e15be-08df-4621-a09a-9abb827a8869.
228 The project footprint is defined as including parcels on which turbines are located.
229 2022 Cropland Data Layer, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on June 22, 2023 at https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.
230 2019 Cropland Data Layer, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on March 18, 2024 at https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.

Area	Pre-project, 2019 (Acres, percent of total)	Post-Project, 2022 (Acres, percent of total)	Change (%)
Other	22 (0.2%)	22 (0.2%)	0.00%
Total	**10,206 (100%)**	**10,206 (100%)**	**0%**
Project Footprint			
Forest[1]	7,184 (95.3%)	7,182 (95.3%)	-0.02%
Developed	339 (4.5%)	341 (4.5%)	+0.67%
Other	14 (0.2%)	14 (0.2%)	+0.00%
Total	**7,537 (100%)**	**7,537 (100%)**	**0%**

Source: 2022 Cropland Data

[1] The category "Forest" describes land visualized by satellite imagery as either "Forest," "Grass" or "Shrub" due to the nature of the leased area and quality of available satellite imagery. Through reviewing satellite data, the forests within the leased area appear actively managed, with evidence of 2019 selective logging followed by 2022 canopy cover restoration. Around 1,900 acres classified as forest in 2022 were categorized as shrub in 2019 by satellite data. Despite minimal visible changes in these areas (2019 to 2022), historical imagery reveals they were cut 20 years ago. These areas likely transitioned from barren land to grass, then to shrub, and eventually to forest. The classification algorithms use both visible and invisible spectral data and may fail to distinguish new forest from shrub or eventually mature forest. Our analysis assumes that land currently categorized by satellite imagery as "Grass" or "Shrub" are essentially "Forest," just in earlier successional phases following harvest.

Figure B12. Change in Skookumchuck Project Area Land Use (2019 to 2022).

Source: 2022 Cropland Data

Financial Returns to Property Owners

THE ISSUES // Community members and lawmakers have inquired as to whether and to what extent the leasing of lands for renewable energy projects is beneficial or harmful to landowners. Primary concerns include both the short- and long-term community impacts, as well as whether adjacent landowners could be affected by these projects. Answering this question is made somewhat challenging due to the confidential nature of the agreements made between landowners and project developers and is further complicated by the variety of characteristics that affect neighboring property values.

Unlike many other wind energy project developments, land parcels in the Skookumchuck Wind Project area are owned by a single corporation, Weyerhaeuser Timber Holdings Inc., rather than individual landowners. The area is part of the Vail Tree Farm. It is unclear when Weyerhaeuser acquired these parcels. As discussed above, most of this area was used for timberlands previously and it is unlikely that project implementation resulted in any material change in land use patterns.

Based on a power purchase agreement (PPA) price of $41/MWh, Skookumchuck would generate approximately $15 million in annual revenue based on average production to date (approximately 360,000 MWh per year). This equates to nearly $400,000 per year, per turbine.

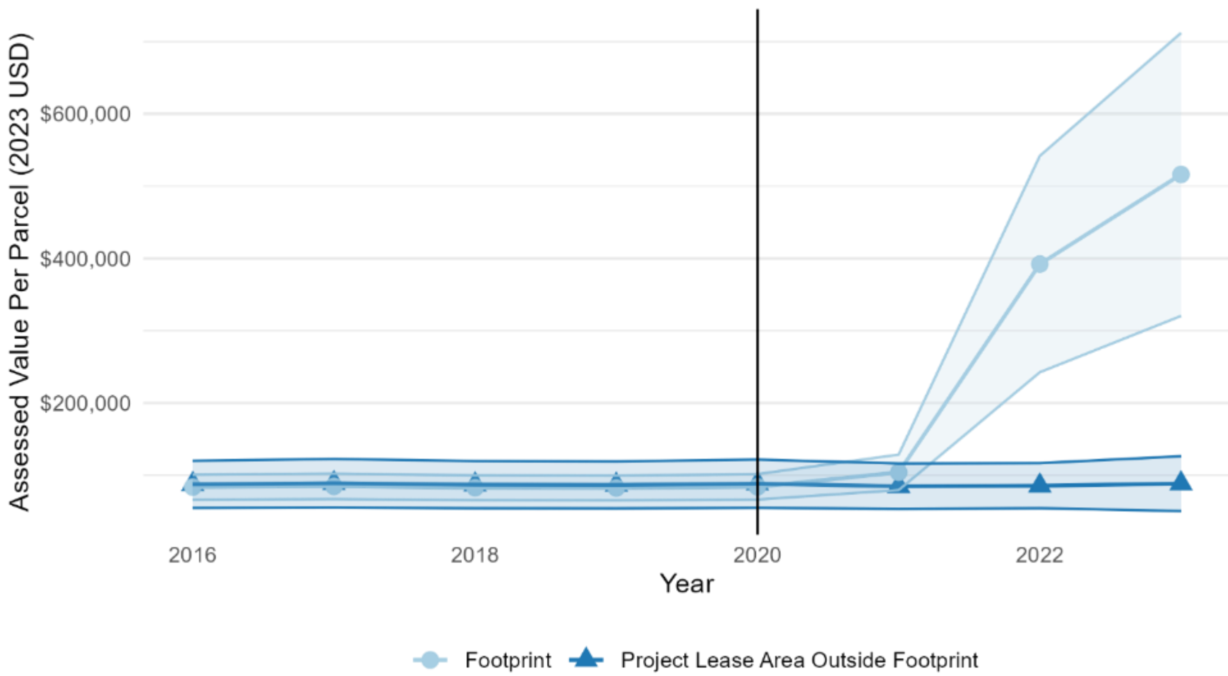
We were unable to gather leasing data or clarify any agreements between Weyerhaeuser and Southern Power following development. Assuming Southern Power pays Weyerhaeuser leasing fees as a percentage of revenues (e.g., three to seven percent), the project could earn Weyerhaeuser $500,000 to $1 million per year. In addition, Weyerhaeuser noted that a lease was in place since 2012, but that construction didn't begin until seven years later.[231] The company likely also received small lease payments per acre (e.g., less than $500/acre) during this time.

Overall, the entire project area is estimated to have a timber value of $14.1 million. It is difficult to estimate the lost timber value without confirmed knowledge of continued access to the site and plans for future harvesting as well as concerns about changes in the forest area based on satellite imagery, discussed above. Unless Weyerhaeuser cannot harvest any of the project area forest, they would easily recoup their timber losses via lease payments over several years of leasing payments. Based on the satellite data, the loss of two acres would only cost Weyerhaeuser $4,000 in timber value, recouped in a year of lease payments for one turbine. If more areas of timber are inaccessible and then the lost value could be higher, however Weyerhaeuser's lease payments will exceed these losses. In an illustrative example, should 3 percent of timber area be inaccessible (i.e., a loss of approximately 400 acres values at over $800,000) the lease payments could provide Weyerhaeuser up to $15 million in net revenue at the higher leasing rate over 30 years.[232]

We also evaluated assessed values of the parcels within the project lease area prior to and following Skookumchuck Wind Project construction. As shown below in **Figure B13**, parcels in and out of the footprint had similar assessed value prior to project implementation. Following project construction in December 2020, the average value of parcels within the project footprint increased significantly, reaching $392,166 per parcel in 2022, while parcels outside the footprint averaged a value of $85,550 per parcel in 2022.[233]

[231] "Un-Vail-ing Our First Wind Farm in the West", Weyerhaeuser Company. January 21, 2022. Accessed on April 25, 2024 at https://www.weyerhaeuser.com/blog/un-vail-ing-our-first-wind-farm-in-the-west/.
[232] This revenue estimate is based on a 30-year payment period for the higher leasing rate using a 5 percent discount rate consistent with DCF discounting practices described in the Timber Asset Class report. At the lowest lease payment rate (3%) the value would be still be over $5 million. For the project not to be financially viable over half of the forest area in the entire lease area would have to be inaccessible.
[233] Lewis County Parcels. Accessed on April 15, 2024 at https://parcels.lewiscountywa.gov/.

Figure B13. Property values of Skookumchuck Wind Project leased areas over time.



Source: Lewis County Parcels, 2016-2023. Standard deviation of average per parcel values for all properties in footprint and lease area. Accessed on April 30, 2024 at https://parcels.lewiscountywa.gov/.

Taxes

THE ISSUES // Projects bring tax revenues to counties. However, there have been questions raised about whether the impacts are sustained over time and how the changes to tax payments over time affect the counties in which they are located, particularly as projects depreciate over time.

Since construction, Skookumchuck Wind personal property taxes have been centrally assessed by the state Department of Revenue. The project is assessed by the state because the project footprint spans two counties (Thurston and Lewis). However, the following section describes Lewis taxes exclusively as they account for nearly all (over 95 percent) of the assessed value. The initial assessed value for the personal property of the wind turbines was $268 million in 2021 ($281 million in 2023 dollars).[234]

Beginning in 2021, once construction was complete, we estimate personal property tax payments at approximately $2 million per year based on the 10-year historical average levy rate for Lewis County of $8.13/$1,000 and the state assessment value for the project in 2021 of $268 million. Because the infrastructure is anticipated to depreciate over time, personal property tax payments made to the county will decline over time. Although improvements to the project may alter the schedule, depreciation is anticipated to decline at an annual rate consistent with the published state schedule of four percent for utility-scale renewable energy development.[235] Based on this schedule, the project would depreciate to 50 percent of its

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[234] State-assessed utility valuations. Washington State Department of Revenue. Accessible at: https://dor.wa.gov/about/statistics-reports/state-assessed-utility-valuations.

[235] Personal Property Valuation Guidelines, Washington State Department of Revenue. Accessible at: https://dor.wa.gov/taxes-rates/property-tax/personal-property-valuation-guidelines

original value by year 12 and 15 percent by year 22 and beyond. By years 22 and beyond, this would result in personal property tax payments approximately one sixth of current tax payments (e.g., approximately $300,000 to $350,000 per year) using the current tax levies and valuation guidelines.

Landowners of leased parcels continue to be responsible for paying annual property taxes to the county. As noted above, these real property taxes are likely to be paid or reimbursed by the project owner as part of the lease agreements. As shown in **Table B15**, real property tax payments from 2019 through the present were relatively minor compared to personal property tax payments.

The sale of machinery and equipment also generates sales tax revenue for both the State and county. Lewis County had a 1.3 percent sales tax in 2020; combined with the state 6.5 percent rate, the overall levy totals to 7.8 percent sales tax. This sales tax on materials and equipment would generate approximately $12.6 million (2023 USD) in sales tax (based on a total sales figure of approximately $162 million).[236] However, based on a 75 percent state exemption for renewable energy, payments would be closer to $2 million, of which approximately $525,000 would go to the County. The project will continue to generate sales tax revenue on a periodic basis, whenever project machinery or equipment is replaced or refurbished.

With these assumptions, we can observe changes in total property and sales tax revenues from the year before and after project construction was completed in 2020. From 2019 to 2021, we find total Lewis County taxes increased by approximately eight percent and increased further by five percent and three percent in 2022 and 2023, respectively.

Table B15. Skookumchuck wind property project tax payments, Lewis County, 2019 – 2023.

Year	Real Property Tax	Estimated Personal Property Tax*	Total Project Collections	Total County Tax Collected	Total Project Collections (2023 dollars)	Total County Taxes Collected (2023 dollars)	% of County Tax Roll
2019	$17,770	--	$17,770	$89,781,497	$20,891	$105,548,159	0.02%
2020	$38,782	--	$38,782	$102,166,475	$44,999	$118,543,204	0.04%
2021	$19,543	$2,055,279	$2,074,822	$102,622,672	$2,301,858	$113,852,104	2.0%
2022	$60,913	$2,064,407	$2,125,319	$115,315,597	$2,202,785	$119,518,737	1.8%
2023	$58,901	$1,924,676	$1,983,577	$123,556,938	$1,983,577	$123,556,938	1.6%
Total	**$195,910**	**$6,044,361**	**$6,240,271**	**$533,443,179**	**$6,554,110**	**$581,019,143**	**1.1% (average)**

Over 20 parcels are assigned to Skookumchuck.
* Personal property tax payments were estimated using the average levy rate for the past 10 years (8.13/$1,000) in Lewis County and the state assessment value for Skookumchuck in Lewis County for each year.
Sources: Lewis County Treasurer Parcel Database, WA Department of Revenue. State-assessed Utility Valuations and WA DOR Average levy rates by county.

[236] IEc analysis. We assume qualified expenditures that would generate sales taxes include material and equipment cost categories specified in the onshore wind JEDI model. Costs for each category are estimated by first taking the product of the project's rated capacity (136.8 MW) and the onshore wind JEDI model's default average cost value of $1,531 per kW (including sales tax) in the State of Washington, then by distributing the estimate by the default proportions of total costs for each cost category.

Jobs

THE ISSUES // Community members and representative interests have inquired about how much effect renewable energy projects have on local employment. This section describes information that we have gathered about the extent of impacts that project construction and operations have had on employment in Lewis County.

Direct Investments

We estimate total Skookumchuck Wind Project costs using the Jobs and Economic Development Impact (JEDI) input-output model built by NREL for on-shore wind energy development. For this estimate, we use the model assumption that wind energy project installation and capital expenditure costs are $1,531 per kW in the State of Washington (2023 USD). Similarly, we assume that project operation and maintenance (O&M) costs are $38 per kW. Using these assumptions, we estimate total Skookumchuck Wind Project construction and installation costs to be approximately $209.4 million. O&M costs are estimated to be $5.4 million.

As part of the 2019 Final Environmental Impact Statement (EIS) prepared for the U.S. Fish and Wildlife Service, Anchor QEA LLC estimated the total construction cost of the project to be approximately $235 million (2018 USD), of which $118 million (50 percent) would be purchased outside of the State of Washington due to the lack of local availability of specialized equipment. Anchor QEA LLC estimates spending in the regional study area (defined as Lewis County, Thurston County, and counties for which the economic centers of Olympia, Tacoma, and Seattle are located), including site preparation and construction, to be around $60 million (2018 USD). Anchor QEA LLC also estimates project operation costs to be on average approximately $7.4 million per year, which includes equipment O&M, lease payments on the Project footprint, insurance, and other expenses such as decommissioning costs.[237]

Employment

Table B16 presents occupations of residents within the project lease area census tract, Lewis County, and the State of Washington, as broadly grouped by the American Community Survey. As shown, occupations that include natural resources and construction are high in the relevant census tract (14.5 percent) as well as Lewis County (14.9 percent) when compared with the Washington State average (9.4 percent). Production, transportation, and material moving industries are also more common in the relevant census tract (22.7 percent) and county (16.8 percent) compared to the Washington State average (11.8 percent).

Table B16. Occupation of residents on and nearby the Skookumchuck Wind Project, 2018 - 2022.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Lewis County (% of total)	Employment in State of Washington (% of total)
Management/Business/Science/Arts	559 (30.9%)	10,956 (31.8%)	1,664,322 (44.4%)
Sales/Office	290 (16.0%)	6,604 (19.1%)	697,384 (18.6%)
Service	290 (16.0%)	5,981 (17.3%)	595,994 (15.9%)

[237] "Skookumchuck Wind Energy Project Proposed Habitat Conservation Plan and Incidental Take Permit for Marbled Murrelet, Bald Eagle, and Golden Eagle Lewis and Thurston Counties, Washington: Final Environmental Impact Statement", Anchor QEA LLC. 2019. Prepared for U.S. Fish and Wildlife Service.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Lewis County (% of total)	Employment in State of Washington (% of total)
Production/Transportation/Material Moving	411 (22.7%)	5,802 (16.8%)	443,300 (11.8%)
Natural Resources/ Construction/Maintenance	263 (14.5%)	5,146 (14.9%)	351,076 (9.4%)
Total	**1,813 (100%)**	**34,489 (100%)**	**3,752,076 (100%)**

*The project intersects Census Tracts 9711 and 9718. The statistics above represent a population-weighted average.
Source: 2022 ACS 5-Year Survey.

In support of the 2019 Final EIS, ECONorthwest performed an economic impacts analysis in 2018 and estimated $235 million in project-related construction expenditures to be associated with $90 million in economic contributions to the regional study area, and 300 full-time and part-time workers. Out of the 300 workers, the 2019 Final EIS states that about half would come from outside the regional study area. However, the exact nature of how expenditures were distributed across industries and space in the analysis are unclear.

According to the 2019 Final EIS, Southern Power Company expected between eight to 10 workers to be needed to support project O&M and could be hired locally or brought in from outside Lewis County to fill those positions. However, the Final EIS also includes an economic impacts analysis conducted through the input-output model IMPLAN that estimates 34 total job-years associated with $7.4 million in annual operation expenditures. It is unclear what the explanation is for the listed discrepancy in job impacts in the 2019 Final EIS.[238]

We developed a modeled estimate of job effects of the project using JEDI to evaluate the impacts of the project on the Washington State economy (**Tables B17** and **B18**). The JEDI model estimates the direct, as well as the indirect (supplier) and induced (consumer spending) effects associated with project expenditures. **Table B17** presents the estimate for the Skookumchuck Wind project for the construction phase. As shown, we estimate that project construction may have resulted in 381 full-time equivalent (FTE) jobs and contributed $69 million (2023 USD) to the State of Washington. As shown in **Table B18**, we also estimate annual O&M to be associated with 21 FTE jobs and $3.7 million (2023 USD) in contributions to the State of Washington. We do not have specific estimates of more localized job effects.

Table B17. Regional economic impacts of the Skookumchuck Wind Project in Washington, Construction Phase

Economic Impact	Estimated Project Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$209,400,000**	**381**	**$27,100,000**	**$69,300,000**

Source: IEc analysis. Project costs are estimated by taking the product of the project's rated capacity (136.8 MW) and the onshore wind JEDI model's default average cost value of $1,531 per kW (including sales tax) in the State of Washington. Impacts include direct, indirect, and induced effects of construction spending, which are assumed to include spending on labor, materials, equipment, development, and taxes. While some construction costs are assumed to be spent in the State of Washington, equipment costs and some material costs are assumed not to be spent locally. Estimated project

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[238] "Skookumchuck Wind Energy Project Proposed Habitat Conservation Plan and Incidental Take Permit for Marbled Murrelet, Bald Eagle, and Golden Eagle Lewis and Thurston Counties, Washington: Final Environmental Impact Statement", Anchor QEA LLC. 2019. Prepared for U.S. Fish and Wildlife Service.

costs include both in-state and out-of-state expenditures. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Table B18. Regional economic impacts of the Skookumchuck Wind Project in Washington, O&M Phase, Annual

Economic Impact	Operation and Maintenance Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$5,400,000**	**21**	**$1,500,000**	**$3,700,000**

Source: IEC analysis. O&M costs are estimated by taking the product of the project's rated capacity (136.8 MW) and the onshore wind JEDI model's default average cost value of $38 per kW in the State of Washington. Impacts include direct, indirect, and induced effects of O&M spending, which are assumed to include spending on personnel, insurance, replacement parts and equipment, taxes, and other materials and services. O&M expenditures are assumed to be spent in the State of Washington. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Mitigation Impact Payments/Economic Development Assistance

THE ISSUES // Communities and representative interests have inquired whether and to what extent renewable energy projects provide investments to communities in which they are located. As discussed above, the projects typically provide payments to landowners in lease areas. In addition, the projects pay personal property taxes that are collected by the counties in which they are located. This section discusses some additional payments that the Skookumchuck Wind Project has provided to communities.

According to communications with representatives from the Lewis County's Community Development Office, Southern Power Company worked with them to develop the Environmental Impact Statement. Additionally, the two entities entered into a development agreement where revenue building permits purchased by the developer covered the Community Development Office's costs. The County also facilitated interactions between Southern Power Company and its fire services regarding the former paying for the cost of mitigation with the fire chiefs.[239]

[239] Personal communication with Lewis County Community Development Office on March 8, 2024.

Case Study: Lund Hill Solar Project

Photo: Courtesy of Iberdrola Group

Type of Project	Location	Current Owner	Nameplate Capacity	Years of Operation	Size	Facilities
Solar energy facility	Klickitat County, Washington	Avangrid Renewables, LLC	150 MW	2022–present	1,080-acre solar array within a 1,618-acre fenced area and 3,243-acre lease area	515,700 solar modules, substation, O&M facility, and 75 inverters

Project Summary

Lund Hill Solar Project is a solar energy facility in Klickitat County, Washington. Project construction began in 2019 and operation commenced in November of 2022.[240] The project has a capacity of 150 megawatts (MW). Construction was led by Aurora Solar, LLC, a wholly owned subsidiary of Avangrid Renewables, LLC, both of which are based in Portland. Avangrid Renewables, LLC is a subsidiary of Connecticut-based AVANGRID, Inc, which in turn is owned by the Iberdrola Group, a company headquartered in Spain.[241],[242] Avangrid Renewables

240 "Green Direct Projects", Puget Sound Energy. Accessed at https://www.pse.com/en/green-options/Renewable-Energy-Programs/green-direct.
241 "Company Profile", Avangrid. Accessed on May 30, 2024 at https://www.avangrid.com/es/aboutus/companyprofile.
242 "Corporate Headquarters", Iberdrola. Accessed on May 30, 2024 at https://www.iberdrola.com/about-us/where-we-are/corporate-headquarters

reached a purchase agreement with Puget Sound Energy (PSE) in 2019 to supply PSE's innovative renewable energy program, Green Direct, with 100% of the project's energy output.[243] Initially, 41 customers subscribed to the Green Direct program in 2019, then 18 additional customers were added in March 2021, for a total of 59 customers receiving power from the Green Direct program, generated by facilities including Lund Hill.[244]

The project lease area is approximately 3,243 acres and intersects 12 land parcels, eight of which are owned by local businesses (LLCs), three by individuals, and one by the Washington State Department of Natural Resources (WDNR). Prior to the project, most of the project area outside the project fence line was and continues to be used as rangeland and undeveloped open space. As shown in **Figure B14** below, solar panels occupy portions of seven land parcels that encompass 1,080 acres (estimated using satellite imagery), or 33.3 percent of the total lease area. The project fence line, which surrounds the panels, encompasses 1,618 acres (49.9 percent of the total lease area). The fence line does not exactly follow parcel lines, and as a result there are several parcels where only a portion of the parcel is within the fence line.

Over two thirds of Klickitat County, including the project area, is contained within the county's Energy Overlay Zone (EOZ). The County established the EOZ in 2005 to provide an expedited pathway for development of renewable energy projects. Within the EOZ, this zone, developers can bypass county zoning applications and approvals because economic and environmental impact analyses have already been completed for the entire EOZ area.[245],[246]

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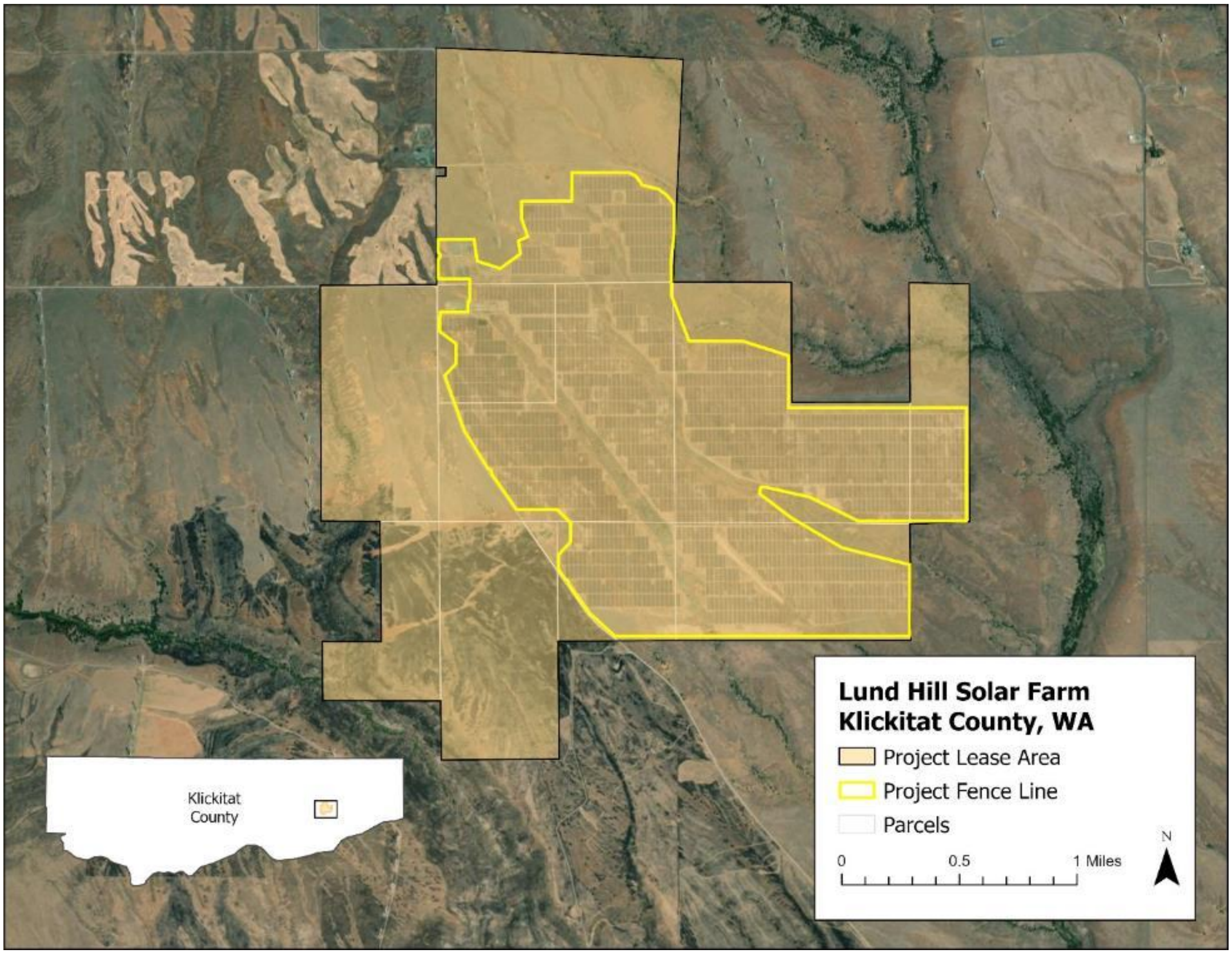
[243] "Avangrid Renewables and PSE Announce Largest Solar Project in Washington", Avangrid, October 31, 2019. Accessed on May 21, 2024 at https://www.avangrid.com/es/w/avangrid-renewables-and-pse-announce-largest-solar-project-in-washington.
[244] "Green Direct Projects", Puget Sound Energy. Accessed on May 21, 2024 at https://www.pse.com/en/green-options/Renewable-Energy-Programs/green-direct.
[245] "Klickitat County's Energy Overlay Zone Streamlines Future Siting of Energy Projects", Institute for Local Self-Reliance. July 6, 2005. Accessed on May 21, 2024 at https://ilsr.org/klickitat-countys-energy-overlay-zone-streamlines-future-siting-energy-projects/.
[246] "Energy Overlay Zone wins county approval", Columbia Gorge News, March 17, 2005. Accessed on May 29, 2024 at https://www.columbiagorgenews.com/archive/energy-overlay-zone-wins-county-approval/article_5cf3206c-aacc-5c2c-9edc-aa3a322770e9.html

Figure B14. Lund Hill Solar Project lease area in Klickitat County, WA (Washington State Geospatial Portal,[247] Lund Hill Solar Project Energy Overlay Zone Application[248])



Geographic Location/Community Context

Klickitat County is a rural county, located along the border between Washington and Oregon, with a population of 23,271 in 2022. [249] The project is located about 10 miles southeast of the 92-person incorporated community of Bickleton and 30 miles east of Goldendale, the county seat, which has a population of 3,453. The county government employs 229 full-time and 24 part-time employees and has an annual budget of $59.5 million as of 2023.[250,251]

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[247] Washington State Geospatial Portal, Property Parcel data, updated February 7, 2024. Accessed on February 12, 2024 at https://geo.wa.gov/datasets/wa-geoservices::current-parcels/about.
[248] Lund Hill Solar Project Energy Overlay Zone Application, Tetra Tech, October 2018.
[249] 2022 ACS 5-Year Survey, U.S. Census Bureau.
[250] 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
[251] 2023 Annual Budget. Klickitat County.

Table B19 summarizes community population statistics for the project area. As shown, the population in Klickitat County has a lower median income, higher population living below the poverty level, higher population over 65, and a higher energy burden than the state population overall.

Klickitat County is home to more operating and planned utility-scale clean energy projects than most other counties in Washington; Lund Hill is just one of these projects. Existing wind projects include Linden Ranch Wind Farm (58 MW), Hoctor Ridge Wind Farm (60 MW), Harvest Wind (100 MW), Windy Flats (190 MW), White Creek (206 MW), Windy Point I (242.5 MW) and II (130 MW), Big Horn Wind Farm (249.5 MW), Windy Flats (190 MW), and Juniper Canyon (250 MW). Most of these projects were permitted between 2003 and 2008.[252] Juniper Canyon is one of the largest of these projects at 128 turbines with a combined capacity of 250 megawatts and is located just east of Lund Hill.[253] Big Horn Wind Farm, with a capacity of 249.5 MW and 133 turbines, is also located nearby. Nine turbines from Big Horn Wind Farm overlap with the northern portion of the Lund Hill lease area outside the fenced area, which could potentially limit determination of the direct impacts of Lund Hill's presence in this area. Bluebird Solar Project, which is also developed by Aurora Solar and has not yet begun construction, has a planned capacity of 100 megawatts.[254] Carriger Solar Project, a 1,150-megawatt solar farm, is expected to complete construction in 2025.

Table B19. Community population statistics for Lund Hill Project Area (2018 - 2022).

Metric	Census tracts intersected by project[a]	Klickitat County	State of Washington
Population (2022)	1,630	22,798	7,688,549
10-Year Population Change (2012 – 2022)	N/A	+11.6%	+ 14.1%
Median Household Income	$59,792	$66,581	$90,325
Population identifying as other than white and non-Hispanic	24.3%	19.8%	34.5%
Population with income below federal poverty level	7.1%	13.8%	9.9%
Population with less than high school diploma or equivalent	9.2%	10.6%	7.9%
Population that is unemployed	1.5%	3.7%	3.2%
Population without health insurance	15.1%	12.2%	9.2%
Population over 65 years old	29.3%	24.4%	16.0%
Population with low English proficiency	8.3%	4.9%	7.7%
Energy burden [b]	2.6%	2.6%	1.5%

[252] "Wind Projects", Klickitat County Washington, February 8, 2022. Accessed on May 30, 2024 at http://klickitatcounty.org/273/Wind-Projects.
[253] "Juniper Canyon Wind Farm", Renewable Technology. Accessed on May 21, 2024 at https://www.renewable-technology.com/projects/juniper-canyon-wind-farm/.
[254] "EIS Comment Period Ends for Planned Avangrid Solar Project in Klickitat County", NewsData, February 11, 2022. Accessed on May 21, 2024 at https://www.newsdata.com/clearing_up/briefs/eis-comment-period-ends-for-planned-avangrid-solar-project-in-klickitat-county/article_5bb4892a-8b68-11ec-b7d1-aba443f902f6.html.

[a] The project intersects Census Tract 9501.01
[b] Energy burden is defined as the percentage of gross household income spent on energy cost.
Sources: 2022 ACS 5-Year Survey, 2012 ACS 5-Year Survey; U.S Department of Energy LEAD Tool.[255]

As shown in **Figure B15**, approximately 70.3 percent of Klickitat County lands are privately owned; 12.9 percent are lands of the Yakama Nation, with the remaining lands including federal lands (18.9 percent), state lands (10.1 percent), and county or locally owned lands (less than one percent).[256]

The primary commodities produced in Klickitat County vary: in the west, unmanned aerial vehicles, wood products, and fruit crops; in the center, windsurfing and kite boarding beaches; in the east, vegetable crops and the regional landfill. Agriculture is present across the county, with fruits, tree nuts, berries, and wine grapes being the most profitable crops. Agriculture and forestry industries are major employers in the county.[257]

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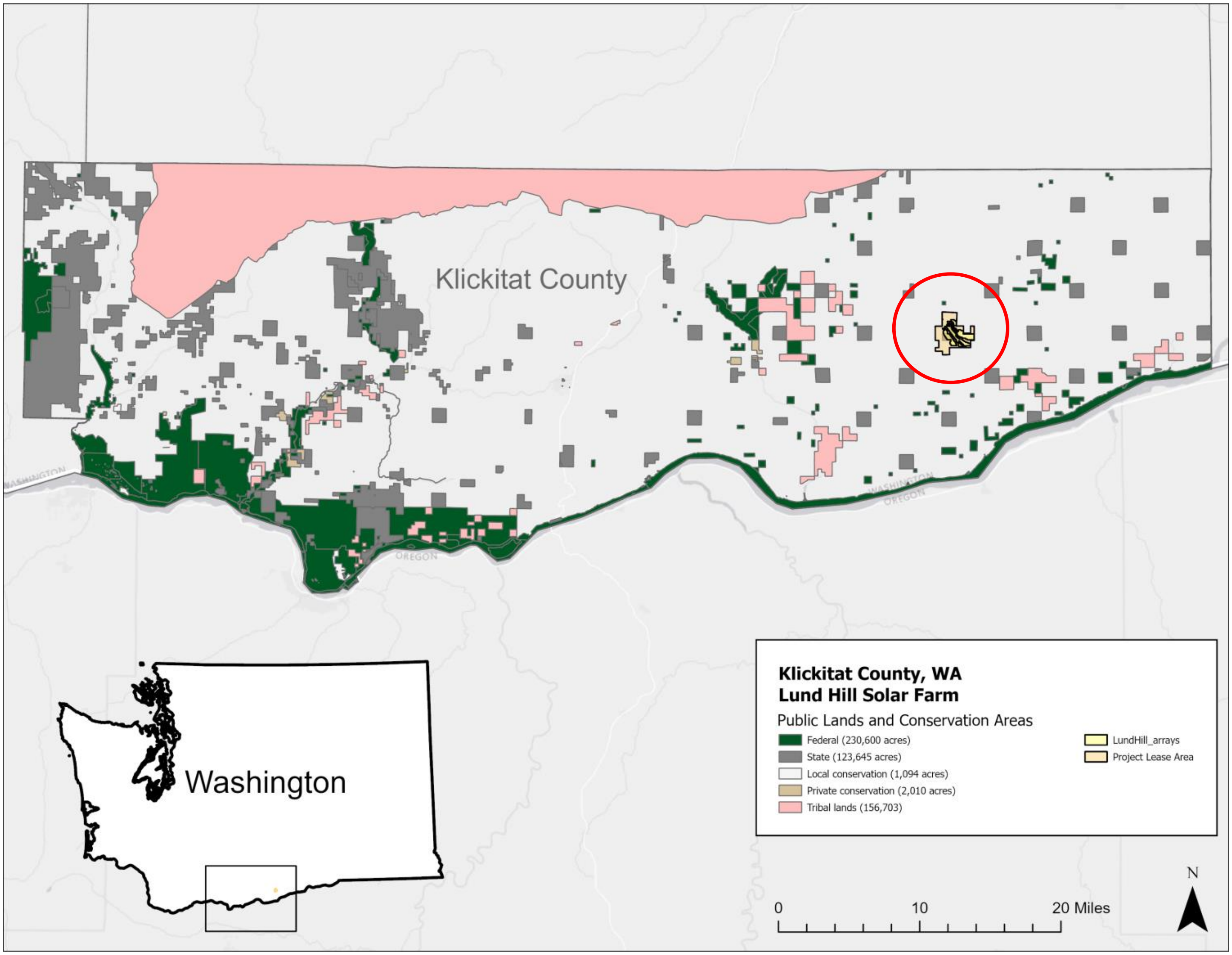
[255] Low-income Energy Affordability Data Tool, Office of State and Community Energy Programs, 2022. Accessed on March 27, 2024 at https://www.energy.gov/scep/slsc/lead-tool.
[256] U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
[257] "Klickitat County Profile", Employment Security Department of Washington State, updated July 2022. Accessed on May 21, 2024 at https://esd.wa.gov/labormarketinfo/county-profiles/klickitat.

Figure B15. Land ownership in Klickitat County, Washington.[258]



[258] U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B .

Land Use

Figure B16. Land use surrounding panels in portion of Lund Hill Solar Project area (Google Earth, 2023).

THE ISSUES // Some community members and other representative interests have expressed concerns that renewable energy projects may adversely affect local communities, both in terms of losses to productive lands for agriculture, as well as potentially resulting in reductions in the attractiveness of the area to tourism, recreation, or other development activities. In this section, we evaluate the impacts of the Lund Hill Solar Project on land uses within the project lease area and discuss the likelihood of other potential effects on nearby land uses.

Most of the land within the project lease area is grassland, pasture, and scrub. The project footprint itself contained no cropland acreage prior to project development.[259,260]

This analysis suggests that the main source of profit from this land is likely derived from its use as pasture. Approximately 927 acres land classified as "other" is scrubland; the remaining 687 acres are most likely used as either open space or rangeland. In 2023, average rent for pasture in Washington was $9 per acre, per

[259] 2016 Cropland Data Layer, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on May 3, 2024 at https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.
[260] 2023 Cropland Data Layer, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on May 5, 2023 at https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php.

year.[261] To the extent that the entire 687 acres were used as a rangeland prior to the project development, this suggests an annual revenue to landowners of $6,200.

Table B20. Land use acres within project footprint before (2016) and after project (2023) construction.

Project Footprint Area (Area Within Fenceline)	Pre-project, 2016 (Acres, percent of total)	Post-Project, 2023 (Acres, percent of total)
Crops	0 (0.0%)	0 (0.0%)
Developed	3 (0.0%)	1,618 (100%)
Other	1,615 (100%)	0 (0.0%)
Total	**1,618 (100%)**	**1,618 (100%)**

Source: USDA 2016 Land Cover Data,[262] USDA 2023 Cropland Data.[263]

Financial Returns to Property Owners

THE ISSUES // Community members and lawmakers have inquired as to whether and to what extent the leasing of lands for renewable energy projects is beneficial or harmful to landowners. Primary concerns include both the short- and long-term community impacts, as well as whether adjacent landowners could be affected by these projects. Answering this question is made somewhat challenging due to the confidential nature of the agreements made between landowners and project developers and is further complicated by the variety of characteristics that affect neighboring property values. This section evaluates what we can determine about the effects of Lund Hill Solar Project on landowners in Klickitat County.

As is common practice with solar energy project development in rural areas, land parcels in the Lund Hill Solar Project area are leased to the project owner while retaining their original land ownership status. The parcels without panels continue to be zoned as agricultural; under Washington's Current Use taxation laws, landowners receive a tax break for using land for agricultural purposes as long as compatible incidental uses (including solar panels) do not exceed 20 percent of the classified land.[264] While developers indicate that agricultural activities such as growing strawberries or grazing sheep can continue under the panels in order to reap the property tax benefits of this law, farmers in Klickitat County have not effectively used land with solar panels for agricultural purposes given current designs.[265] As a result, parcels in the project footprint have not been able to maintain their agricultural land use designation and are thus charged a penalty fee encompassing 20 percent of the property value plus seven years of back taxes.[266] Per the tax records listed in the Klickitat

[261] 2023 Cash Rent Per Acre, Pasture in Washington State. United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). Updated August 2023. Accessed May 31, 2024 at https://quickstats.nass.usda.gov/.
[262] 2016 Land Cover, National Land Cover Database (NLCD), Multi-Resolution Land Characteristics (MRLC) Consortium. Accessed May 23, 2023 at https://www.mrlc.gov/.
[263] 2022, 2023 Cropland Data Layer. United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). Accessed June 22, 2023 at https://datagateway.nrcs.usda.gov/.
[264] "Do You Qualify For Reduced Property Taxes? Current Use Taxation", WSU Extension Clark County, 2014. Accessed on May 30, 2024 at https://s3.wp.wsu.edu/uploads/sites/2079/2014/04/current-use-15.pdf.
[265] Personal communication with Klickitat County Assessor's Office on March 8, 2024.
[266] "Do You Qualify For Reduced Property Taxes? Current Use Taxation", WSU Extension Clark County, 2014. Accessed on May 30, 2024 at https://s3.wp.wsu.edu/uploads/sites/2079/2014/04/current-use-15.pdf

County Property Search, all parcels with panels taking up over 20 percent of the parcel area were charged a one-time fee of $4,200 to 7,000 per parcel in 2021.[267] Though the fee is technically charged to the landowner, county officials believe that the developer likely covered the cost avoiding any additional financial burden for the landowner.[268]

Property owners within the leased areas typically enter into lease agreements with the project owners for a pre-development period (typically ranging from two to five years in duration). After the design of the project is established, landowners of parcels on which physical infrastructure is developed are further compensated on a per acre basis at an established fee. While these agreements are generally confidential to the parties engaged, agreements made with public entities are sometimes made public and can provide insights into these payments. One such lease agreement is publicly available for a single 480-acre parcel in the Lund Hill Solar Project area owned by the WDNR.[269] Under this agreement, payments change throughout the lifecycle of the project. Specifically:

1. Predevelopment & Construction: The State is paid $50,000 up front, plus $5,000 annually, increasing by $1,000 annually after the second year of pre-development/construction. The State is additionally paid $2 per acre for non-developed acreage.
2. Operations: The State is paid $300 per acre in years 1-10, $350 per acre in years 11-20, and $400 per acre for years 21-40. If the project is terminated before the 15th year of the lease, the project owner will pay the State a one-time fee based on years elapsed.

The project was approved in September 2019. Construction began in 2019 and ended in November 2022, with the project becoming commercially operable in February 2023.[270],[271],[272] Assuming a four-year pre-development period, and a three-year construction period, we estimate the payments to the WDNR for this parcel to be $100,000 during the predevelopment and construction phases.[273] Assuming that all 480 acres were developed and that the project continues past the 15th year of the lease, the lease would provide DNR with approximately $144,000 annually for years 1 through 10, $168,000 annually for years 11 through 20, and $192,000 annually for years 21 through 40.

To the extent that landowner payments to WADNR are reflective of the market for private parcels,[274] total lease payments to property owners for the entire lease area (including WADNR's parcel) would be $484,400 annually for years 1through 10, increasing to $566,300 annually for years 11 through 20 and $647,200 annually for years 21 through 40. Given the estimated pasture rent of $6,200 per year, these lease payments would represent a

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[267] Klickitat County Property Search. Accessed on April 15, 2024 at http://www.klickitatcountytreasurer.org/PropertySearch.aspx.
[268] Personal communication with Klickitat County Planning Department on March 11, 2024.
[269] Lund Hill Solar Power Development Lease, 2019. Provided by WA DNR on March 25, 2024.
[270] "Green Direct Projects", Puget Sound Energy. Accessed on May 21, 2024 at https://www.pse.com/en/green-options/Renewable-Energy-Programs/green-direct.
[271] Lund Hill Solar Energy Project approval memorandum, Klickitat County Planning Department, September 19, 2019.
[272] "AVANGRID's Lund Hill, Washington State's Largest Utility-Scale Solar Farm, Achieves Commercial Operation", Avangrid, February 28, 2023. Accessed on April 3, 2024 at https://www.avangrid.com/w/avangrid-s-lund-hill-washington-state-s-largest-utility-scale-solar-farm-achieves-commercial-operation.
[273] Lund Hill Solar Power Development Lease, 2019. Provided by WA DNR on March 25, 2024.
[274] While it is difficult to directly compare leases given the variety of factors likely considered in individual agreements, publicly available estimates provide similar annual values. BLM rents range from $18.61 per acre up to $62,000 per acre depending on the zone with a median of $400 per acre in zone 8. Klickitat is zone 4 where the rent is $106 per acre in 2023 from BLM (https://www.blm.gov/sites/default/files/policies/IM2021-005_att5.pdf, https://www.blm.gov/sites/default/files/policies/IM2021-005_att1_0.pdf). The Strategic Solar Group lists a broad range of $300 to $2,000 per acre as a standard range, noting that a variety of factors, including proximity to a substation influence the leasing rate (https://strategicsolargroup.com/what-is-the-average-solar-farm-lease-rate/). They note that in California's Central Valley leases are typically around $1,000 per acre.

notable increase in revenues for landowners over renting the land as pasture. Even if all the scrubland was also rented as pasture (i.e., $9 rent on 1,618 acres totaling $14,600 annually), landowners would increase their revenues by $470,000 in years 1 through10 from lease payments.

Table B21. Estimated WADNR payments for project lease area.

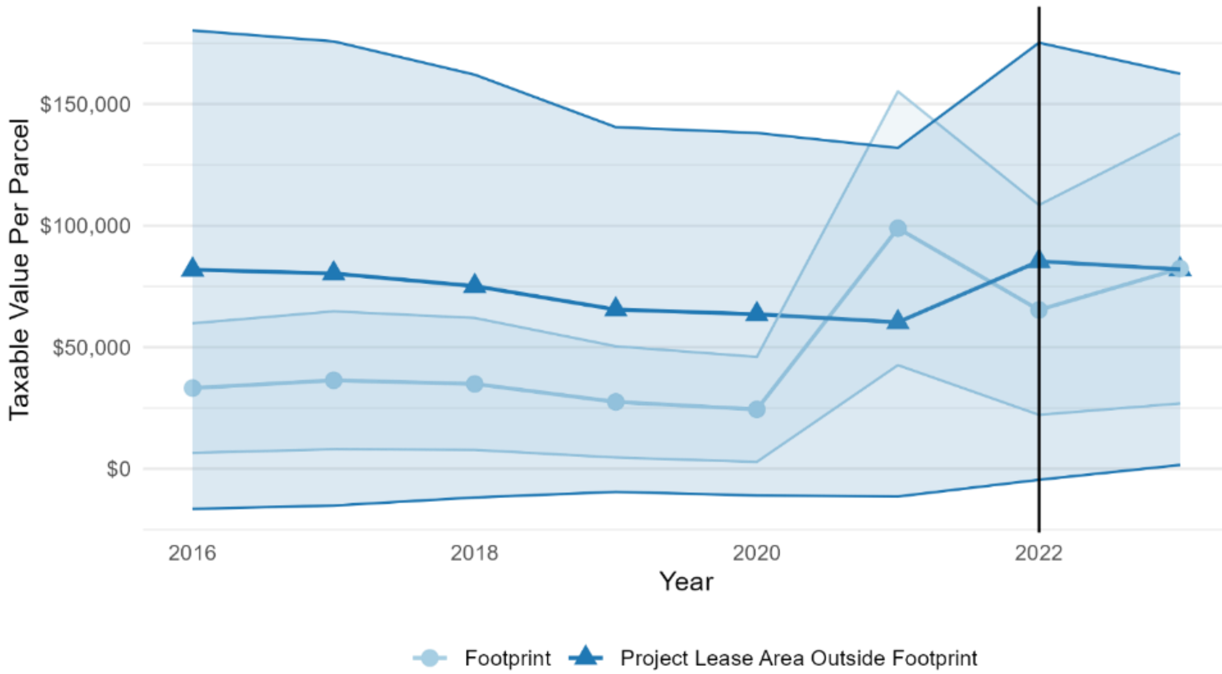
Year	Value	WA DNR Total	All Acres (DNR Rate) Total
Year 1 (Predevelopment)	$50,000 initial payment + $5,000 rent	$55,000	*
Year 2 (Predevelopment)	$5,000 rent	$5,000	*
Year 3 (Predevelopment)	$6,000 rent	$6,000	*
Year 4 (Predevelopment)	$7,000 rent	$7,000	*
Year 5 (Construction)	$8,000 rent	$8,000	*
Year 6 (Construction)	$9,000 rent	$9,000	*
Year 7 (Construction)	$10,000 rent	$10,000	*
Year 8 – 17 (Operations)	$300 per acre	$144,000/year	$484,400/year
Year 18 – 27 (Operations)	$350 per acre	$168,000/year	$566,300/year
Year 28 – 47 (Operations)	$400 per acre	$192,000/year	$647,200/year

* Payments for the entire project are not estimated prior to operations since they are not at a specific scale (e.g., per acre). Sources: Solar Power Development Lease (2019)

We also evaluated assessed values of the parcels within the project lease area prior to and following Lund Hill Solar Project construction. As shown, parcels in the project footprint and parcels in the parcel lease area had similar assessed values on a per acre basis prior to project implementation. Though parcel values were slightly lower in the project footprint generally, the average value of a parcel in the project footprint exceeded that of a parcel within the lease area but outside the project footprint in 2021, the year before the project became operational. Following the conclusion of project construction in November 2022, we observed similar or slightly increased property values, which averaged $82,357 for parcels within the project footprint and $82,002 for parcels within the lease but outside the footprint in 2023.[275]

[275] Klickitat County Property Search. Accessed on April 15, 2024 at http://www.klickitatcountytreasurer.org/PropertySearch.aspx.

Figure B17. Assessed property values of Lund Hill Solar Project leased areas over time (2023 dollars).



Source: Klickitat County Property Search, 2016-2024. Standard deviation of average per property values for all properties in footprint and lease area. Accessed on April 15, 2024 at http://www.klickitatcountytreasurer.org/PropertySearch.aspx

Taxes

THE ISSUES // Projects bring tax revenues to counties. However, there have been questions raised about whether the impacts are sustained over time and how the changes to tax payments over time affect the counties in which they are located, particularly as projects depreciate over time.

Since construction, Lund Hill Solar taxes have been assessed by Klickitat County, as the project footprint is entirely within Klickitat County.[276],[277] The leased land is assessed and taxed as utility and industrial property, though the land is still zoned for agriculture, while all equipment, structures, and construction costs are assessed and taxed as personal property. The assessed value of the personal property for the project is approximately $148.2 million 2023 USD in 2024. Assuming a typical project depreciation of four percent per year as described below, the initial assessed value was likely to have been $156.8 million in 2023.

While the project applicant was Aurora Solar, LLC, taxes are paid by the parent entity, Avangrid Renewables. Personal property tax payments initiated post-construction in 2023 at about $1 million. Because the assessed value of the infrastructure is anticipated to depreciate over time, the personal property tax payments made to the county are anticipated to decline over time. Although improvements to the project may alter the schedule, the depreciation is anticipated to decline at a rate that is approximately consistent with the published state

[276] Personal communication with Klickitat County Assessor's Office on March 8, 2024.
[277] Personal communication with Washington State Department of Revenue on March 25, 2024.

schedule of four percent for utility-scale renewable energy development.[278] Based on this schedule, the project would depreciate to 50 percent ($78.4 million) of its original value by Year 12 and 15 percent ($23.5 million) by Year 22 where it would be constant for the remaining life of the project. This reduction in assessed value would result in proportional reductions of personal property tax payments (e.g., to $170,000 in Year 22) using the current tax levies and valuation guidelines.

The annual real property taxes on the leased parcels are paid by the developer, Avangrid Renewables, as a part of the contract between the developer and the landowners of leased parcels.[279] As shown in **Table B22**, real property tax payments from the project parcels occurred in 2019 through today with a notable increase in 2021 due to the change in current use designation, as described above. This change in classification is also likely the cause of the observed increase in real property value and associated taxes in most recent years.

The sale of machinery and equipment also generated sales tax revenue for both the state and county. Klickitat County had a one percent sales tax rate in 2023; combined with the state's 6.5 percent tax rate, the overall sales tax levy was 7.5 percent in 2023. As such, the sales tax on materials and equipment for the project are estimated to have generated approximately $7.4 million (2023 USD) in total state and county sales tax (based on a total sales figure of approximately $99 million).[280] However, because there is a 75 percent state exemption for sales tax for renewable energy projects, projects may submit receipts to the state for reimbursement.[281] This means that after initially paying the sales taxes, the state and county will return revenues to the projects. In this case, final sales tax payments are likely to have been closer to $1 million, of which approximately $250,000 were retained by the County. [282] The project will continue to generate sales tax revenue on a periodic basis, whenever project machinery or equipment is replaced or refurbished.

Table B22. Lund Hill solar project tax payments to Klickitat County, 2019 – 2024.

Tax Year*	Real Property Tax	Estimated Personal Property Tax**	Total Project Collections	Total County Tax Collected	Total Project Collections (2023 dollars)	Total County Taxes Collected (2023 dollars)	% of County Tax Roll
2019	$3,973	--	$3,973	$67,958,566	$4,749	$81,233,932	0.01%
2020	$3,989	--	$3,989	$76,852,548	$4,689	$90,348,701	0.01%
2021	$45,478	--	$45,478	$85,659,448	$52,768	$99,390,229	0.05%
2022	$7,811	--	$7,811	$90,183,189	$8,666	$100,051,394	0.01%
2023	$5,640	$1,028,690	$1,034,330	$101,167,788	$1,072,030	$104,855,253	1.02%

278 Personal Property Valuation Guidelines, Washington State department of Revenue. Accessible at: https://dor.wa.gov/taxes-rates/property-tax/personal-property-valuation-guidelines
279 Personal communication with Klickitat County Assessor's Office on March 8, 2024; Lund Hill Solar Power Development Lease, 2019. Provided by WA DNR on March 25, 2024.
280 IEc analysis. We assume qualified expenditures that would generate sales taxes include material and equipment cost categories specified in the solar photovoltaic JEDI model. Costs for each category are estimated by first taking the product of the project's rated capacity (150 MW) and the solar photovoltaic JEDI model's default average cost value of $1,030 per kW (including sales tax) in the State of Washington, then by distributing the estimate by the default proportions of total costs for each cost category.
281 The sales tax exemption was modified in 2019 to allow for a refund of 50%, 75%, or 100% of the state and local sales tax paid on machinery, equipment, and labor and services related to the installation of certain renewable energy systems purchased or installed after January 1, 2020. Depending on the source of their involved workforce, project owners may qualify for one of the three available tiers of this exemption. Due to data limitations, we are unable to allocate total sales tax collections to individual refund tiers and assume 75% of local sales tax paid on qualified expenditures are refunded to project owners.
282 The timing of the repayment of the county taxes has been highlighted as difficult for County Assessors to anticipate, particularly as the value of project sales are not specifically reported to the counties.

Tax Year*	Real Property Tax	Estimated Personal Property Tax**	Total Project Collections	Total County Tax Collected	Total Project Collections (2023 dollars)	Total County Taxes Collected (2023 dollars)	% of County Tax Roll
2024	$7,115	$987,542	$994,657	--	$994,657	--	--
Total	**$74,006**	**$2,016,232**	**$2,090,238**	**$421,821,539**	**$2,137,559**	**$475,879,509**	**0.22% (avg)**

*Tax year refers to the year that taxes were collected, not the year in which the activities that incurred the taxes were conducted; e.g. in Tax Year 2024, taxes were collected for activities from calendar year 2023.
**Personal property assigned to Lund Hill: 56-00-0022-0011/00 (2023), 56-00-2022-0011/00 (2024). The 2023 personal property page was unavailable; thus, all 2023 values are estimated based on 2024 values and standard depreciation estimates.
Sources: Klickitat County Property Search, accessed on May 9, 2024 at http://www.klickitatcountytreasurer.org/propertysearch.aspx, Washington State Department of Revenue Property Tax Statistics, 2019-2023. Accessed March 2024.

Jobs

THE ISSUES // Community members and representative interests have inquired about how much effect renewable energy projects have on local employment. This section describes information that we have gathered about the extent of impacts that project construction and operations have had on employment in Klickitat County.

Direct Investments

We estimate total Lund Hill Solar Project costs using the Jobs and Economic Development Impact (JEDI) input-output model built by NREL for solar photovoltaic energy development. For this estimate, we use the model assumption that solar photovoltaic energy project installation and capital expenditure costs are $1,030 per kW in the State of Washington. Similarly, we assume that project operation and maintenance (O&M) costs are $20 per kW of installed capacity. Using these assumptions, we estimate total Lund Hill Solar Project construction and installation costs to be approximately $154.5 million. Annual O&M costs are estimated to be $3 million.[283]

Employment

Table B23 presents occupations of residents within the project lease area census tract, Klickitat County, and the State of Washington, as broadly grouped by the American Community Survey. As shown, occupations that include natural resources and construction are high in the relevant census tract (25 percent) as well as Klickitat County (16 percent) when compared with the Washington State average (9.4 percent).

Table B23. Occupation of residents on and nearby the Lund Hill Solar Project, 2018 - 2022.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Klickitat County (% of total)	Employment in State of Washington (% of total)
Management/Business/Science/Arts	246 (38.9%)	4,211 (44.1%)	1,664,322 (44.4%)
Sales/Office	104 (16.4%)	1,392 (14.6%)	697,384 (18.6%)
Service	54 (8.5%)	1,370 (14.4%)	595,994 (15.9%)

[283] According to Avangrid Renewables, the Lund Hill photovoltaic plant "required an investment of more than $100 million." "Lund Hill, Washington's biggest solar project," Iberdrola, Accessed at https://www.iberdrola.com/about-us/what-we-do/solar-photovoltaic-energy/lund-hill-photovoltaic-plant#2.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Klickitat County (% of total)	Employment in State of Washington (% of total)
Production/Transportation/Material Moving	73 (11.5%)	1,094 (11.5%)	443,300 (11.8%)
Natural Resources/ Construction/Maintenance	156 (24.6%)	1,480 (15.5%)	351,076 (9.4%)
Total	**633 (100%)**	**9,547 (100%)**	**3,752,076 (100%)**

*The project intersects Census Tract 9501.01. Source: 2022 ACS 5-Year Survey.

We developed a modeled estimate of job effects of the project using JEDI to evaluate the impacts of the project on the Washington State economy (**Tables B24** and **B25**). The JEDI model estimates the direct, as well as the indirect (supplier) and induced (consumer spending) effects associated with project expenditures. **Table B24** presents the estimate for the Lund Hill Solar project for the construction phase. As shown, we estimate that project construction may have resulted in 681 full-time equivalent (FTE) jobs and contributed $95 million (2023 USD) to the State of Washington. As shown in **Table B25**, we also estimate annual O&M expenditures to be associated with 37 jobs (FTE) and $4.1 million (2023 USD) in sales contributions to the State of Washington.

Table B24. Regional economic impacts of the Lund Hill Solar Project in Washington, Construction Phase

Economic Impact	Estimated Project Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$154,500,000**	**681**	**$46,100,000**	**$95,300,000**

Source: IEC analysis. Project costs are estimated by taking the product of the project's rated capacity (150 MW) and the solar photovoltaic JEDI model's default average cost value of $1,030 per kW (including sales tax) in the State of Washington. Impacts include direct, indirect, and induced effects of construction spending, which are assumed to include spending on labor, materials, equipment, permitting, and taxes. Materials and equipment costs are assumed to be spent out of state. Other estimated project costs include both in-state and out-of-state expenditures. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Table B25. Regional economic impacts of the Lund Hill Solar Project in Washington, O&M Phase, Annual

Economic Impact	Operation and Maintenance Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$3,000,000**	**37**	**$2,300,000**	**$4,100,000**

Source: IEC analysis. O&M costs are estimated by taking the product of the project's rated capacity (150 MW) and the solar photovoltaic JEDI model's default average cost value of $20 per kW in the State of Washington. O&M spending is assumed to include labor, materials, equipment, and other services. Impacts include direct, indirect, and induced effects of this spending. O&M expenditures are assumed to be spent in the State of Washington. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Mitigation Impact Payments/Economic Development Assistance

THE ISSUES // Communities and representative interests have inquired whether and to what extent renewable energy projects provide investments to communities in which they are located. As discussed above, the projects typically provide payments to landowners in lease areas. In addition, the projects pay personal property taxes that are collected by the counties in which they are located. This section discusses some additional payments that the project has provided to communities.

According to the Klickitat County Assessor's Office, the project's benefits to the community are limited to its county and local taxing district property tax payments, including the Road Fund, School District, and Fire District.[284]

[284] Personal communication with Klickitat County Assessor's Office on March 8, 2024.

Case Study: Horn Rapids Solar, Storage, & Training Project

Photo: Courtesy of Energy Northwest

Type of Project	Location	Current Owner	Nameplate Capacity	Storage Capacity	Years of Operation	Size	Footprint	Facilities
Solar, storage, and training facility	Benton County, Washington	Tucci Energy Services (solar); Energy Northwest (battery)	4 MW	1 MW	2020–present	73 leased acres on 2 land parcels	20 acres	1 solar array of 11,400 panels, battery storage, training facilities

Project Summary

Horn Rapids Solar, Storage & Training Project (HRSST) is a four-megawatt (MW) capacity solar facility in Benton County, Washington with an additional one MW battery storage capacity. The Horn Rapids site also includes a training facility, where solar and battery storage technicians can receive education on related topics such as plant construction, operations, maintenance, and safety. This facility includes training classrooms and

30 acres of transmission and distribution equipment for training purposes. Construction began in February 2020; by November 2020, the project was operating.[285]

Construction and engineering were led by Potelco Inc. The solar portion of the project is owned and operated by Tucci Energy Services, who have a 25-year Power Purchase Agreement with the City of Richland. The energy generated and stored at HRSST is used to level energy loads in Richland during peak hours. Energy Northwest, the City of Richland, and Pacific Northwest National Laboratories collaborate to research and optimize energy storage at the facility. [286] The land is owned by the International Brotherhood of Electrical Workers (IBEW), Local 77, and leased to the project owner.[287]

The project lease area is 73 acres, with the solar panels occupying 20 acres of this area. As **Figure B1** shows, the project lease area intersects two land parcels. The Battery Energy Storage System (BESS) is located on the southeastern corner of the solar array and is circled in red on the map below. Construction and engineering were led by Potelco Inc. The solar portion of the project is owned and operated by Tucci Energy Services, who have a 25-year Power Purchase Agreement with the City of Richland. The energy generated and stored at HRSST is used to level energy loads in Richland during peak hours. Energy Northwest, the City of Richland, and Pacific Northwest National Laboratories collaborate to research and optimize energy storage at the facility. [288] The land is owned by the International Brotherhood of Electrical Workers (IBEW), Local 77, and leased to the project owner.[289]

The project lease area is 73 acres, with the solar panels occupying 20 acres of this area. As **Figure B18** shows, the project lease area intersects two land parcels. The Battery Energy Storage System (BESS) is located on the southeastern corner of the solar array and is circled in red on the map below.

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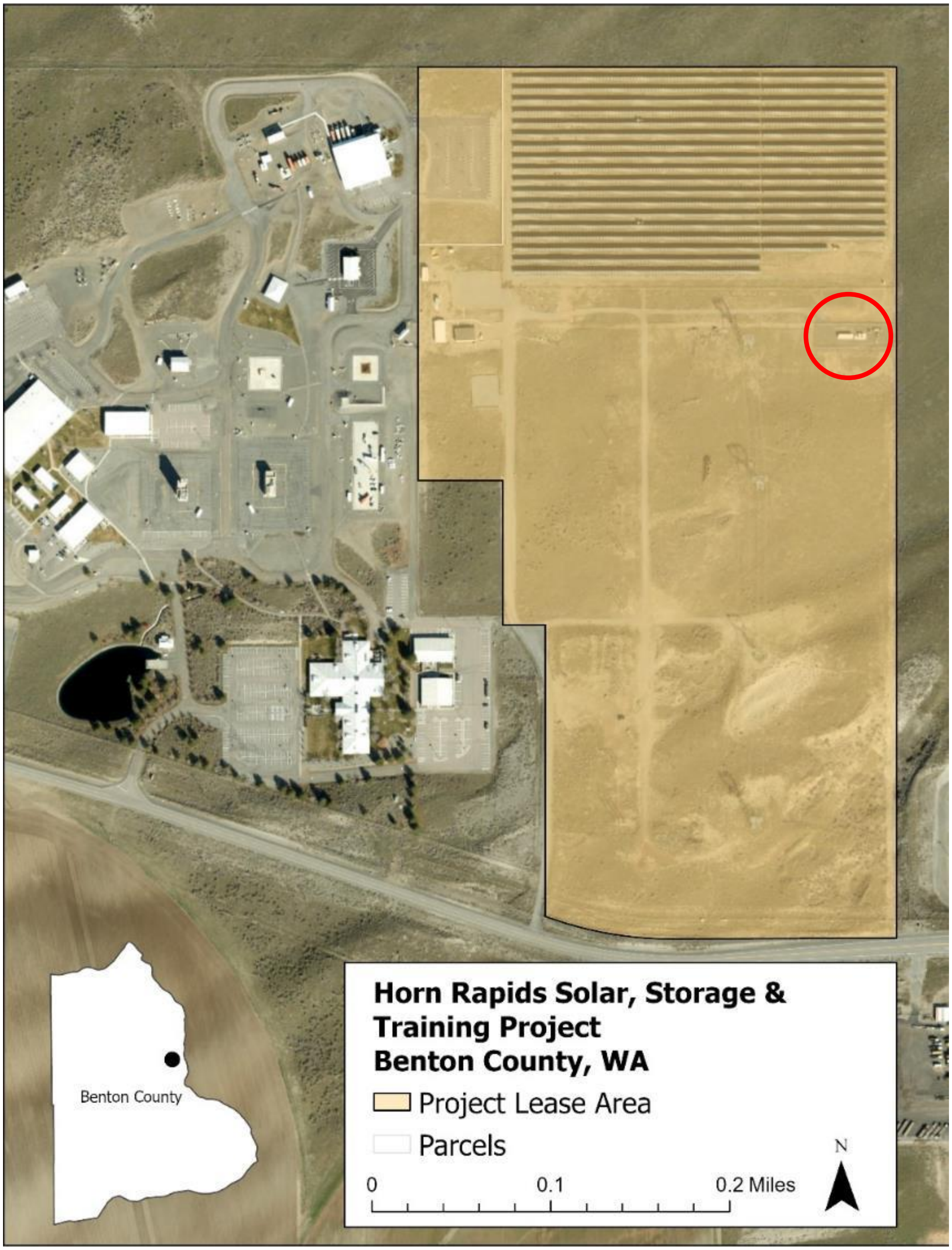
[285] "Horn Rapids Solar, Storage, & Training Project", Energy Northwest. Accessed on April 29, 2024 at https://www.energy-northwest.com/energyprojects/horn-rapids/Pages/default.aspx.
[286] "Horn Rapids Solar Farm", Potelco Inc. Accessed on April 19, 2024 at https://www.potelco.net/projects/horn-rapids-solar-farm/.
[287] "New Energy Project Powers Up in Richland", Energy Northwest. November 9, 2020. Accessed on April 29, 2024 at https://www.energy-northwest.com/whoweare/news-and-info/Pages/New-energy-project-powers-up-in-Richland.aspx.
[288] "Horn Rapids Solar Farm", Potelco Inc. Accessed on April 19, 2024 at https://www.potelco.net/projects/horn-rapids-solar-farm/.
[289] "New Energy Project Powers Up in Richland", Energy Northwest. November 9, 2020. Accessed on April 29, 2024 at https://www.energy-northwest.com/whoweare/news-and-info/Pages/New-energy-project-powers-up-in-Richland.aspx.

Figure B18. Horn Rapids Project in Benton County, WA (Washington State Geospatial Portal[290])



[290] Washington State Geospatial Portal, Property Parcel data, Updated February 7, 2024. Accessed at https://geo.wa.gov/datasets/wa-geoservices::current-parcels/about on February 12, 2024.

Geographic Location/Community Context

HRSST is in Benton County, a county with a population of 212,791 as of 2022, making it the 10th most populous county in Washington. Benton County is located at the confluence of the Yakima, Snake, and Columbia rivers. The project is located on the northern boundary of Richland, Washington. Richland has a population of 62,821 as of 2022 and is the second most populous city in the county, second to the 84,750-person city of nearby Kennewick.[291] The County government employs 594 full time and 20 part-time individuals and has a biennial budget of $497.6 million as of the 2023-2024 term.[292],[293]

Table B26 summarizes community population statistics for the project area. As shown, the population in Benton County has a higher population without health insurance (12.7 percent) and a somewhat higher population with less than a high school diploma or equivalent (9.9 percent) relative to the state population overall (9.2 percent and 7.9 percent, respectively).

HRSST is one of two operating utility-scale clean energy projects in Benton County. The second project, Columbia Generating Station, is a 1,207-MW nuclear power plant constructed in 1984.[294] Multiple other utility-scale clean energy projects, including Horse Heaven Wind Farm, Wautoma Solar Energy Project, and Hop Hill Solar, have been proposed to be built in Benton County and are at various stages of permitting and development.[295]

Table B26. Community population statistics for Horn Rapids Project Area (2018 - 2022).

Metric	Census tracts intersected by project[a]	Benton County	State of Washington
Population (2022)	6,128	207,560	7,688,549
10-Year Population Change (2012 – 2022)	+48.6%	+18.3%	+14.1%
Median Household Income	$104,861	$83,778	$90,325
Population identifying as other than white and non-Hispanic	22.6%	32.6%	34.5%
Population with income below federal poverty level	3.5%	10.5%	9.9%
Population with less than high school diploma or equivalent	2.4%	9.9%	7.9%
Population that is unemployed	3.5%	3.0%	3.2%
Population without health insurance	9.3%	12.7%	9.2%

291 2022 ACS 5-Year Survey, U.S. Census Bureau.
292 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
293 "2023-2024 Final Budget", Benton County. November 29, 2022.
294 "Columbia Generating Station produces record amount of energy in 2022", Energy Northwest. February 9, 2023. Accessed on April 29, 2024 at https://www.energy-northwest.com/whoweare/news-and-info/Pages/Tri-Cities-nuclear-power-plant-produces-record-amount-of-energy-for-Northwest.aspx.
295 "Energy Facilities", Energy Facility Site Evaluation Council. Accessed on April 29, 2024 at https://www.efsec.wa.gov/energy-facilities.

Metric	Census tracts intersected by project[a]	Benton County	State of Washington
Population over 65 years old	16.8%	15.4%	16.0%
Population with low English proficiency	4.1%	8.2%	7.7%
Energy burden [b]	1.6%	1.7%	1.5%

[a] The project intersects Census Tract 120; this census tract has a population of zero, so this analysis focuses on Census Tract 102.01, which is immediately adjacent to the project site.
[b] Energy burden is defined as the percentage of gross household income spent on energy cost.
Sources: 2022 ACS 5-Year Survey, 2012 ACS 5-Year Survey; U.S Department of Energy LEAD Tool.[296]

As shown in **Figure B19**, approximately 42.9 percent of Benton County is publicly owned, with nearly 75 percent of the public lands being federally managed, 9.7 percent state, and about one percent county or locally owned lands.[297] Agriculture is important to the local economy, particularly with the relatively recent growth of the wine industry. Benton County is also home to the Hanford Nuclear Reservation, which brought many skilled engineers and scientists to the area and contributed to a strong economic basis in energy production and medical equipment manufacturing. Recreational and tourism industries are also developing in the county. [298]

[296] Low-income Energy Affordability Data Tool, Office of State and Community Energy Programs, 2022. Accessed on March 27, 2024 at https://www.energy.gov/scep/slsc/lead-tool.
[297] U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
[298] "Benton County Profile", Employment Security Department of Washington State. March 2022. Accessed on April 29, 2024 at https://esd.wa.gov/labormarketinfo/county-profiles/Benton.

Figure B19. Land ownership in Benton County, Washington.

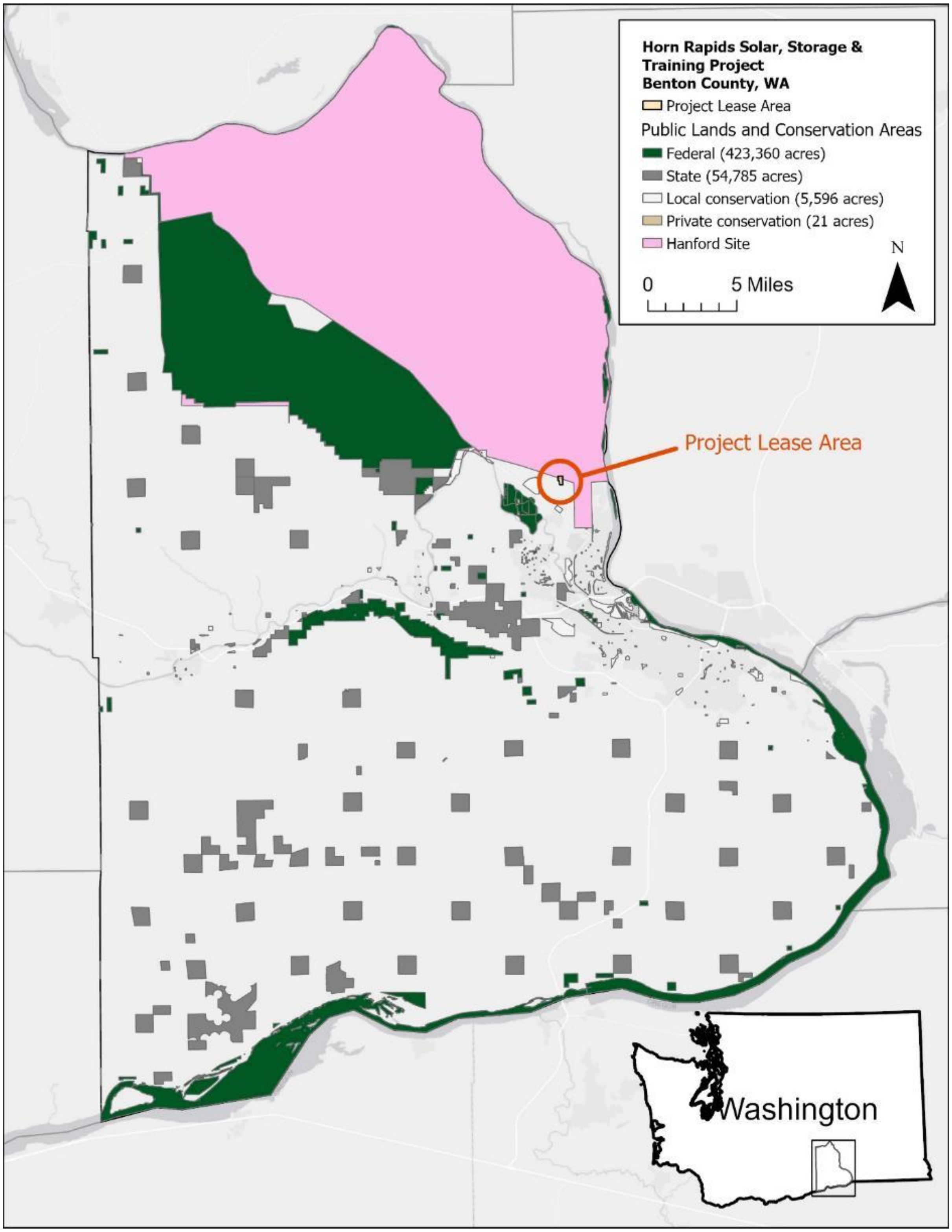


Figure B20. Land use surrounding solar array in Horn Rapids Project area (Google Earth, 2023).

Land Use

THE ISSUES // Some community members and other representative interests have expressed concerns that renewable energy projects may adversely affect local communities, both in terms of losses to productive lands for agriculture, as well as potentially resulting in reductions in the attractiveness of the area to tourism, recreation, or other development activities. In this section, we evaluate the impacts of the Horn Rapids Solar, Storage & Battery Project on land uses within the project lease area and discuss the likelihood of other potential effects on nearby land uses.

No crops have been grown within the project lease area in the recent past as the land was unusable for agricultural purposes, likely to it its proximity to the Hanford Nuclear Reservation.[299] It is currently zoned as educational land and has been developed since the turn of the century. As the project utilized previously unproductive land, it had no impact on local crop production, thus we conclude that revenue from previous alternative land use was unaffected by the project's installation.

Financial Returns to Property Owners

THE ISSUES // Community members and lawmakers have inquired as to whether and to what extent the leasing of lands for renewable energy projects is beneficial or harmful to landowners. Primary concerns include both the short- and long-term community impacts, as well as whether adjacent landowners could be

[299] Personal communication with Benton County Treasurer's Office on March 11, 2024.

affected by these projects. Answering this question is made somewhat challenging due to the confidential nature of the agreements made between landowners and project developers and is further complicated by the variety of characteristics that affect neighboring property values. This section evaluates what we can determine about the effects of Horn Rapids Solar, Storage & Training Project on landowners in Benton County.

As is common practice with clean energy project development in rural areas, land parcels in the HRSST project area are leased by the project owner and most retain their original land ownership status. The land is owned by IBEW-77, with leases to Energy Northwest (ENW) and Tucci.[300] Property owners within the leased areas typically enter into lease agreements with the project owners for a pre-development period (typically ranging from two to five years in duration). After the design of the project is established, landowners for which physical infrastructure is developed are further compensated on a per acre basis at an established fee. While these agreements are generally confidential to the parties engaged, some agreements made with public entities are made public that provide insights into these payments. We have been unable to locate specific lease agreements for this site.

Taxes

THE ISSUES // Projects bring tax revenues to counties. However, there have been questions raised about whether the impacts are sustained over time and how the changes to tax payments over time affect the counties in which they are located, particularly as projects depreciate over time.

Our understanding is that the Horn Rapids site is tax exempt due to its status as an educational facility.[301] However, even though there is no real or personal property tax applied to the project, the sale of machinery and equipment does generate sales tax revenue for both the State and county. Benton County had a 2.2 percent sales tax in 2022; combined with the state 6.5 percent rate, the overall levy totals to 8.7 percent sales tax. This sales tax on materials and equipment associated with the solar photovoltaic component of the project would generate approximately $630,000 (2023 USD) in sales tax (based on a total sales figure of approximately $7.2 million).302 However, based on a 75 percent state exemption for renewable energy, payments would be closer to $160,000, of which approximately $40,000 would go to the County.[303] The project will continue to generate sales tax revenue on a periodic basis, whenever project machinery or equipment is replaced or refurbished. Due to data limitations, we are unable to estimate potential sales tax revenues associated with the battery energy storage system component of the project.

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[300] "New Energy Project Powers Up in Richland", Energy Northwest. November 9, 2020. Accessed on April 29, 2024 at https://www.energy-northwest.com/whoweare/news-and-info/Pages/New-energy-project-powers-up-in-Richland.aspx.
[301] Personal communication with Benton County Treasurer's Office on March 11, 2024.
[302] IEc analysis. We assume qualified expenditures that would generate sales taxes include material and equipment cost categories specified in the solar photovoltaic JEDI model. Costs for each category are estimated by first taking the product of the project's rated capacity (4 MW) and the solar photovoltaic JEDI model's default average cost value of $1,030 per kW (including sales tax) in the State of Washington, then by distributing the estimate by the default proportions of total costs for each cost category.
[303] The sales tax exemption was modified in 2019 to allow for a refund of 50%, 75%, or 100% of the state and local sales tax paid on machinery, equipment, and labor and services related to the installation of certain renewable energy systems purchased or installed after January 1, 2020. Depending on the source of their involved workforce, project owners may qualify for one of the three available tiers of this exemption. Due to data limitations, we are unable to allocate total sales tax collections to individual refund tiers and assume 75% of local sales tax paid on qualified expenditures are refunded to project owners.

Jobs

THE ISSUES // Community members and representative interests have inquired about how much effect renewable energy projects have on local employment. This section describes information that we have gathered about the extent of impacts that project construction and operations have had on employment in Benton County.

Direct Investments
For the solar photovoltaic component of the system, we estimate costs using the Jobs and Economic Development Impact (JEDI) input-output model built by NREL for on-shore wind energy development. For this estimate, we use the model assumption that solar photovoltaic project installation and capital expenditure costs are $1,030 per kW in the State of Washington (2023 USD). Similarly, we assume that project operation and maintenance (O&M) costs are $20 per kW (2023 USD).

For the battery energy storage system (BESS) component of the system, we estimate costs using BESS capital cost estimates from PNNL (2022).[304] We then use the input-output model IMPLAN to evaluate the impacts of this component on the Washington State economy.[305]

Using these assumptions, we estimate total HRSST construction and installation costs to be approximately $10.5 million (2023 USD). Annual O&M costs for the solar photovoltaic component of the system is estimated to be $80,000 (2023 USD).[306]

Employment
Table B27 presents occupations of residents within the project lease area census tract, Benton County, and the State of Washington, as broadly grouped by the American Community Survey. As shown, occupations that include natural resources and construction are low in the relevant census tract (4.8 percent) relative to the Washington State average (9.4 percent), though employment in the natural resources and construction sector across Benton County overall is higher (12.2 percent) than the Washington State average.

Table B27. Occupation of residents on and nearby the Horn Rapids Solar, Storage, & Training Project, 2018 - 2022.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Benton County (% of total)	Employment in State of Washington (% of total)
Management/Business/Science/Arts	1,648 (55.3%)	39,271 (41.6%)	1,664,322 (44.4%)
Sales/Office	579 (19.4)	16,937 (17.9%)	697,384 (18.6%)
Service	340 (11.4%)	15,241 (16.1%)	595,994 (15.9%)

[304] Pacific Northwest National Laboratory. 2022. "Energy Northwest – Horn Rapids Solar and Storage: A Techno-economic Assessment. Prepared for U.S. Department of Energy. Available at: https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-ACT-10125.pdf.
[305] For this estimate, we classify our input expenditures as a Commodity Input to the "Storage Batteries" category (IMPLAN Industry 3333) within the State of Washington. This IMPLAN Industry assumes 48.3 percent of expenditures are spent in the State of Washington per IMPLAN's Social Accounting Matrix (SAM).
[306] We were unable to identify expenditures associated with the O&M costs of the BESS component. PNNL (2022) estimates the total capital cost of the combined solar photovoltaic and BESS system to be approximately $12.5 million (2023 USD). PNNL (2022) also projected the annual operation and maintenance of the combined system to cost approximately $100,000 (2023 USD), which would escalate with each successive year.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Benton County (% of total)	Employment in State of Washington (% of total)
Production/Transportation/Material Moving	270 (9.1%)	11,422 (12.1%)	443,300 (11.8%)
Natural Resources/ Construction/Maintenance	142 (4.8%)	11,553 (12.2%)	351,076 (9.4%)
Total	**2,979 (100%)**	**94,424 (100%)**	**3,752,076 (100%)**

* The project intersects Census Tract 120; this census tract has a population of zero, so this analysis focuses on Census Tract 102.01, which is immediately adjacent to the project site.
Source: 2022 ACS 5-Year Survey.

Both JEDI and IMPLAN estimate the direct, as well as the indirect (supplier) and induced (consumer spending) effects associated with project expenditures. **Table B28** presents the estimate for the Horn Rapids Solar, Storage, and Training project for the construction phase. As shown, we estimate that project construction may have resulted in 40 full-time equivalent (FTE) jobs and contributed $7 million (2023 USD) to the State of Washington. As shown in **Table B29**, we also estimate annual O&M of the solar photovoltaic component of the system to be associated with one FTE and $110,000 (2023 USD) in contributions to the State of Washington.

Energy Northwest (2020) stated that the project would "bring $3 million into the Tri-Cities economy each year."[307] However, we were unable to procure any specifics as to how this estimate was calculated and what impact categories comprised the $3 million estimate.

Table B28. Regional economic impacts of the Horn Rapids Solar, Storage, & Training Project in Washington, Construction Phase

Economic Impact	Estimated Project Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$11 million**	**40**	**$3 million**	**$7 million**

Source: IEC analysis. Project costs for the solar photovoltaic component of the system are estimated by taking the product of the project's rated capacity (4 MW) and the solar photovoltaic JEDI model's default average cost value of $1,030 per kW (including sales tax) for the State of Washington. Impacts include direct, indirect, and induced effects of construction spending, which are assumed to include spending on labor, materials, equipment, permitting, and taxes. Materials and equipment costs are assumed not to be spent locally. Job impacts associated with the battery energy storage system (BESS) component are estimated by inputting BESS capital cost estimates from PNNL (2022) into the input-output model IMPLAN, assuming 48.34% of expenditures are spent in the State of Washington per IMPLAN's Social Accounting Matrix (SAM).

Note - Estimated project costs include both in-state and out-of-state expenditures. Both JEDI and IMPLAN are run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

[307] Tri-Cities Research District. 2020. "Horn Rapids Solar, Storage and Training Project." Available at https://www.tricitiesresearchdistrict.org/horn-rapids-solar-storage-and-training-project/.

Table B29. Regional economic impacts of the Horn Rapids Solar, Storage, & Training Project in Washington, O&M phase, Annual

Economic Impact	Operation and Maintenance Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$80,000**	**1**	**$62,000**	**$110,000**

Source: IEC analysis. O&M costs are estimated by taking the product of the project's rated capacity (4 MW) and the solar photovoltaic JEDI model's default average cost value of $20 per kW for the State of Washington. Impacts include direct, indirect, and induced effects of O&M spending, which are assumed to include spending on labor, materials, equipment, and other services. O&M expenditures are assumed to be spent in the State of Washington. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Note: Due to data limitations, estimates reflect annual job impacts associated with operation and maintenance of the solar photovoltaic component of the system, but do not include impacts associated with the O&M of the battery storage facility.

Mitigation Impact Payments/Economic Development Assistance

THE ISSUES // Communities and representative interests have inquired whether and to what extent renewable energy projects provide investments to communities in which they are located. As discussed above, the projects typically provide payments to landowners in lease areas. In addition, the projects pay personal property taxes that are collected by the counties in which they are located. This section discusses some additional payments that the project has provided to communities.

Unlike many other utility-scale renewable energy projects in Washington, project energy goes to local communities. The developers established an agreement with the nearby City of Richland that guarantees all energy generated by the project will go directly to the city. The energy is expected to assist with load leveling during peak use periods.[308]

PNNL estimates the total value benefits from electricity bill reduction provided by the project to the residents of Richland to be $7,386,098. Additionally, the Washington Department of Commerce awarded the City of Richland with a $3,000,000 Clean Energy Fund (CEF) grant, which directly reduces the cost burden on the City.[309]

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[308] "New Energy Project Powers Up in Richland", Energy Northwest. November 9, 2020. Accessed on April 29, 2024 at https://www.energy-northwest.com/whoweare/news-and-info/Pages/New-energy-project-powers-up-in-Richland.aspx.
[309] "Energy Northwest – Horn Rapids Solar and Storage: A Techno-economic Assessment", Pacific Northwest National Laboratory, August 2022. Prepared for the U.S. Department of Energy.

Case Study: Tucannon River Wind Project

Type of Project	Location	Current Owner	Nameplate Capacity	Years of Operation	Size	Facilities
Wind energy facility	Columbia County, Washington	Portland General Electric	267 MW	2014–present	22,780 leased acres on 111 land parcels	116 turbines, 2 meteorological stations, support facilities

Project Summary

Tucannon River Wind Project is a 267-megawatt (MW) capacity wind energy facility in Columbia County, Washington. The project began construction in September 2013 and became commercially operational in December of 2014. The project consists of 116 2.3-megawatt turbines along with various power collection/distribution infrastructure and several administrative offices. The turbines and blades were manufactured by Siemens Gamesa Renewable Energy and assembled in Kansas and Iowa, respectively. The project was developed by Puget Sound Energy; rights were acquired by the current owner, Portland General Electric (PGE), before construction began. Construction was led by Renewable Energy Systems Americas Construction with additional engineering and technical consulting support from Burns & McDonnell and construction inspection by Washington-based MacKay Sposito.[310] The project is intended to supplement PGE's

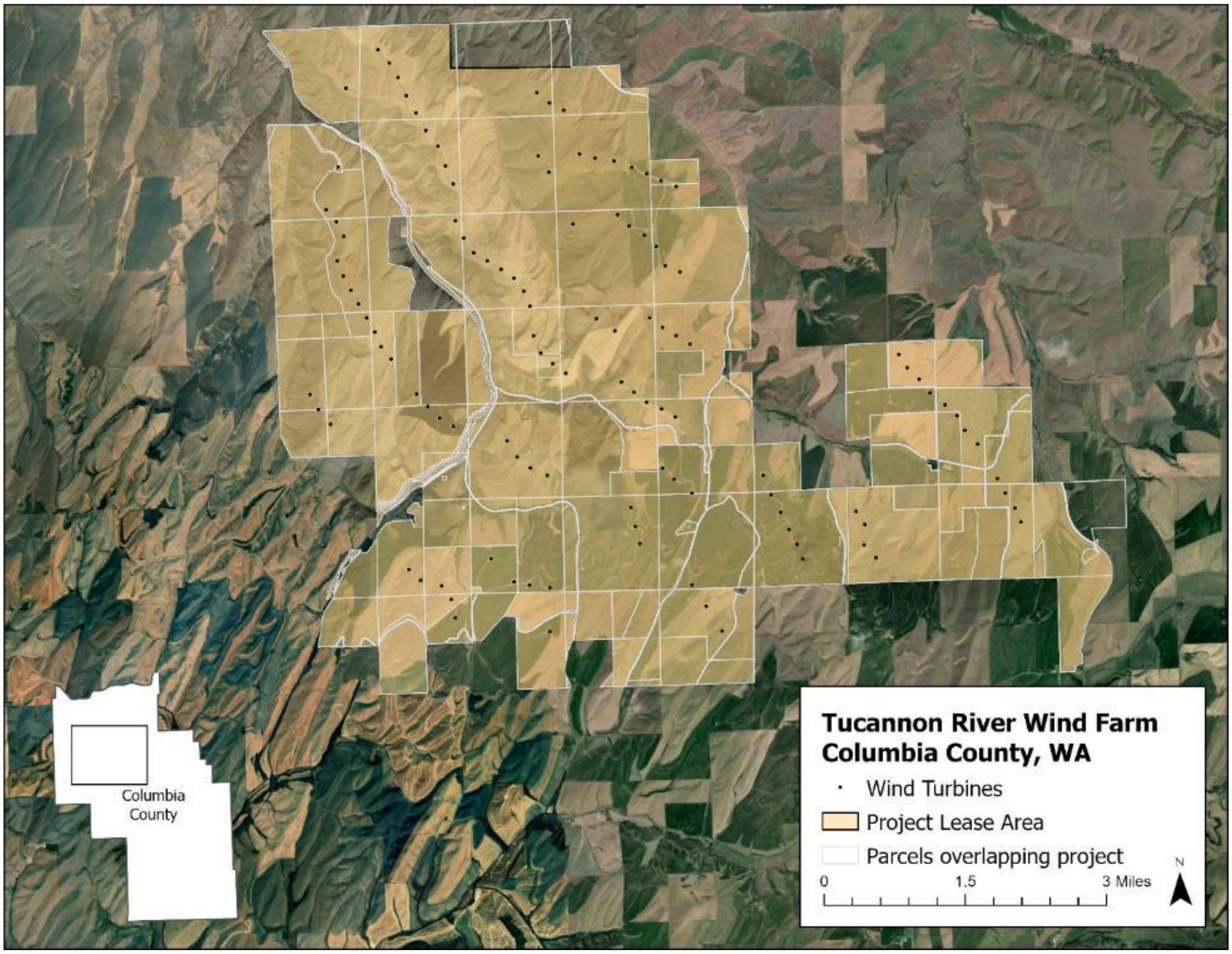
[310] "Tucannon River Wind Farm, Washington", Power Technology. Accessed on April 17, 2024 at https://www.power-technology.com/projects/tucannon-river-wind-farm-washington/?cf-view&cf-closed.

renewable energy portfolio in Oregon.[311] PGE serves approximately 900,000 customers, which largely live in Portland and other urban areas.[312]

The project lease area is approximately 23,000 acres, across 111 land parcels, nearly three-quarters of which are farmed (see below evaluation of impacts to impacts to agricultural crop areas). Most of the project area continues to be used as farmland. As shown in **Figure B21** below, the turbines occupy portions of 50 land parcels that encompass 16,073 acres, or 68.8 percent of the total project area.

[311] "PGE Announces Completion of Tucannon River Wind Farm", Portland General. Accessed on April 17, 2024 at https://investors.portlandgeneral.com/news-releases/news-release-details/pge-announces-completion-tucannon-river-wind-farm.
[312] "PGE Service Area", Portland General Electric. Accessed on April 17, 2024 at https://portlandgeneral.com/about/info/service-area.

Figure B21. Tucannon River Wind Project in Columbia County, WA (Washington State Geospatial Portal,[313] U.S. Wind Turbine Database,[314] Tucannon River Wind Farm Access Map[315])



Geographic Location/Community Context

Tucannon River Wind Project occupies land in Columbia County, which lies in the southeast portion of Washington state. Columbia County is a rural county, with a population of 4,026 as of 2022.[316] The project is located near Dayton, which is the county seat and is the county's most populous city at a population of 2,512

[313] Washington State Geospatial Portal, Property Parcel data, Updated February 7, 2024. Accessed at shttps://geo.wa.gov/datasets/wa-geoservices::current-parcels/about on February 12, 2024.
[314] Hoen, B.D., Diffendorfer, J.E., Rand, J.T., Kramer, L.A., Garrity, C.P., and Hunt, H.E., 2018, United States Wind Turbine Database (ver. 6.1, November 2023): U.S. Geological Survey, American Clean Power Association, and Lawrence Berkeley National Laboratory data release, https://doi.org/10.5066/F7TX3DN0. Accessed on February 12, 2024.
[315] Tucannon River Wind Farm Recreational Access Map. March 2017.
[316] 2022 ACS Survey, U.S. Census Bureau.

as of 2022.[317] The county government employs 77 full time and 14 part time individuals and has an annual budget of $4.8 million as of 2022.[318]

Table B30 summarizes community population statistics for the project area. As shown, the population in Columbia County has a lower median income, higher population without a high school diploma, higher population over 65 years old, and a somewhat higher energy burden relative to the state population overall.

There are three other similarly sized wind projects nearby: Hopkins Ridge Wind Farm in Columbia County, which began operations in 2005 and has a generating capacity of 157 megawatts;[319] Marengo Wind Farm in Columbia County, which began operations in 2007 and has a generating capacity of 211 megawatts;[320] and Lower Snake River Wind Project, spanning both Columbia and Garfield County, which began operations in 2012 and has a generating capacity of 343 megawatts.[321]

Table B30. Community population statistics for Tucannon Project Area (2018 - 2022).

Metric	Census tracts intersected by project[a]	Columbia County	State of Washington
Population (2022)	3,980	3,980	7,688,549
10-Year Population Change (2012 – 2022)	- 0.5%	- 0.5%	+ 14.1%
Median Household Income	$68,825	$68,825	$90,325
Population identifying as other than white and non-Hispanic	18.3%	18.3%	34.5%
Population with income below federal poverty level	9.3%	9.3%	9.9%
Population with less than high school diploma or equivalent	10.1%	10.1%	7.9%
Population that is unemployed	2.0%	2.0%	3.2%
Population without health insurance	14.6%	14.6%	9.2%
Population over 65 years old	28.9%	28.9%	16.0%
Population with low English proficiency	5.2%	5.2%	7.7%
Energy burden [b]	2.6%	2.6%	1.5%

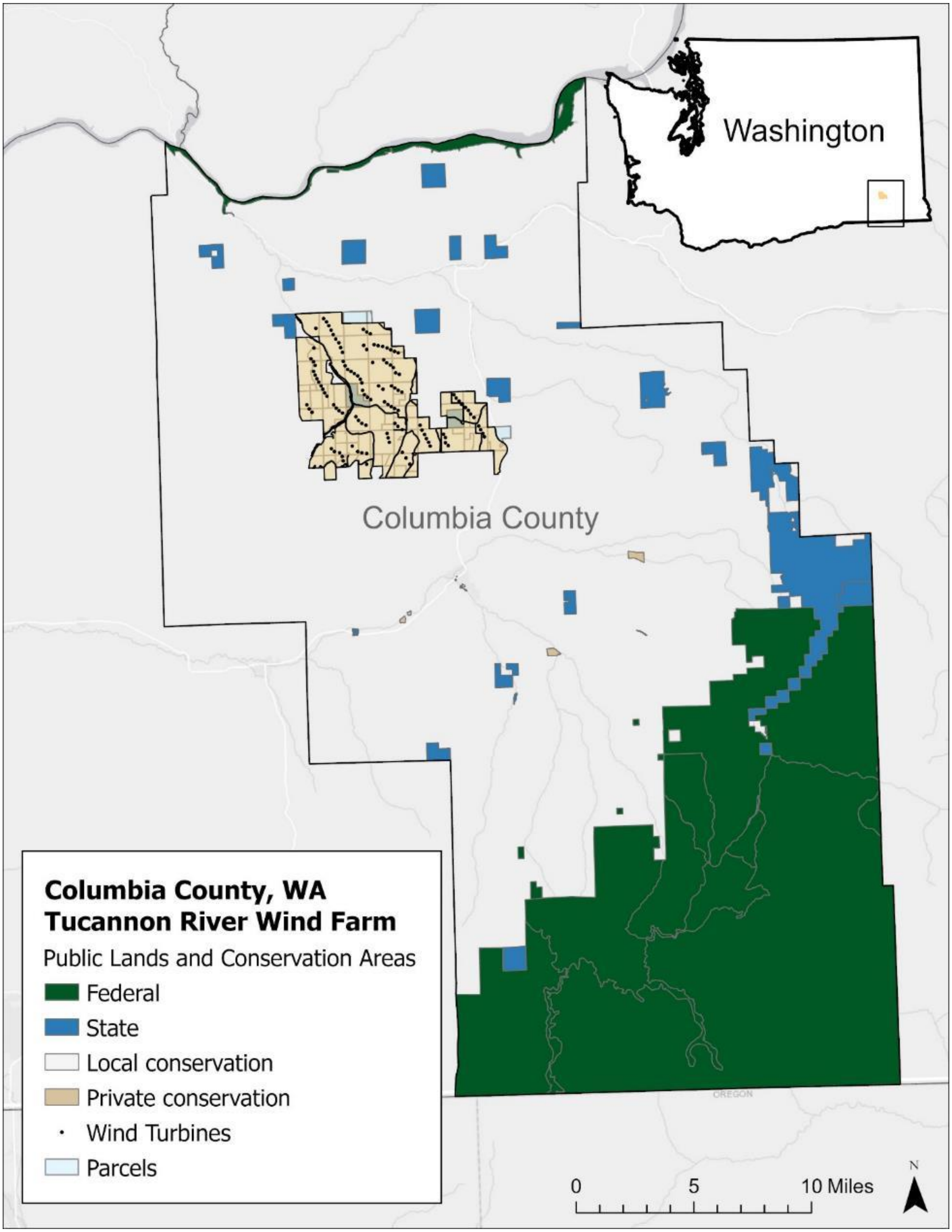
317 2022 ACS Survey, U.S. Census Bureau.
318 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
319 "Hopkins Ridge Wind Facility", Puget Sound Energy. Accessed on April 25, 2024 at https://www.pse.com/en/pages/facilities/hopkins-ridge.
320 "Marengo, US", Power Technology. December 2, 2021. Accessed on April 25, 2024 at https://www.power-technology.com/marketdata/marengo-us/.
321 "Lower Snake River Wind Facility", Puget Sound Energy. Accessed on April 25, 2024 at https://www.pse.com/en/pages/facilities/lower-snake-river.

[a] The project intersects Census Tract 9602, which is the only census tract in Columbia County.
[b] Energy burden is defined as the percentage of gross household income spent on energy cost.
Sources: 2022 ACS 5-Year Survey, 2012 ACS 5-Year Survey; U.S Department of Energy LEAD Tool.[322]

As shown in **Figure B22**, approximately 29.3 percent of Columbia County is federally owned, two percent state, and two percent county or locally owned lands.[323] Agriculture is the primary economic activity in this county. Agricultural areas include land for ranching and crop production, with wheat and peas being the most common crops. Ski Bluewood, a local ski area, is an important source of tourism and seasonal employment for the county .[324]

[322] Low-income Energy Affordability Data Tool, Office of State and Community Energy Programs, 2022. Accessed on March 27, 2024 at https://www.energy.gov/scep/slsc/lead-tool.
[323] Written communication with Columbia County Treasurer on July 19, 2024. Map source: U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
[324] "Columbia County Profile", Employment Security Department of Washington State. Accessed on April 17, 2024 at https://esd.wa.gov/labormarketinfo/county-profiles/Columbia.

Figure B22. Land ownership in Columbia County, Washington.



Land Use

Figure B23. Agricultural land use surrounding turbines in Tucannon River Wind Project area (Google Earth, 2023).

THE ISSUES // Some community members and other representative interests have expressed concerns that renewable energy projects may adversely affect local communities, both in terms of losses to productive lands for agriculture, as well as potentially resulting in reductions in the attractiveness of the area to tourism, recreation, or other development activities. In this section, we evaluate the impacts of the Tucannon River Wind Project on land uses within the project lease area and discuss the likelihood of other potential effects on nearby land uses.

Like other areas in the county, NASS data from 2016 suggests that most crops grown in the lease area are winter wheat (53.9 percent), but also include spring wheat, peas, and small areas of other crops. At average 2023 values, the crop value in the lease area (16,665 crop acres) were approximately $5.7 million annually,[325] or an average of $443 per acre in revenues.[326]

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[325] The total value of this cropland was determined by using satellite imagery to approximate the acreage of each crop in the area; then, each crop was multiplied by its reported value. These values were summed to find the total approximate value of this cropland. Most of this value comes from winter wheat ($2.3 million) and peas ($2.0 million).
Our analysis of crop value does not include revenue generated from woody wetlands, grapes, oats, apples, sod/grass seed, triticale, and other crops, which are grown in a total of 11.3 acres of the project footprint and account for less than one percent of the total crop acreage, due to the lack of relevant data in the 2023 Washington State-level USDA and NASS data set we rely on.

[326] "2023 Washington State Agriculture Overview", United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on March 6, 2024 at https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=WASHINGTON.

Net farm income would be a fraction of these total revenues. USDA 2022 data suggests that net revenues for Washington farms were approximately 18 percent of gross receipts, which would equate to net farm income of approximately $79 per acre at current crop prices.[327],[328]

In 2011, land use in both the lease area and the project footprint[329] were used primarily for agriculture, with 69.5 percent and 71.7 percent of these areas farmed, respectively.[330],[331] As shown in **Table B31** and highlighted in **Figure B24**, following project implementation, data indicates that crop acres have increased slightly from before the project was constructed, with 16,796 acres of cropland harvested in the project lease area following construction, and 11,888 acres in the project footprint, an increase of 3.4 and 3.1 percent in cropland, respectively. **Figure B23** shows agricultural land use surrounding a turbine in the Tucannon River Wind Project area in 2023.

In addition to its agricultural value, some areas of the Tucannon River Wind Farm are also open to public access for hunting of deer, elk, turkey, upland game and other species,[332] birdwatching, and other recreational activities.[333] To ensure public safety and safety of the wind project itself, special rules apply and signed Access Permission Agreement permits (in addition to a hunting license from the State of Washington) are required.[334] While no access of any kind is permitted within 300 ft of the facilities and no hunting is allowed in select areas of the project lease area, different regions of the wind farm may be accessed with permits of three kinds: a) public access with permits obtained from a local store, b) restricted access with permits obtained directly from landowners, and c) private access permits only, where public access is unavailable.[335]

Table B31. Cropland acres within project area before (2011) and after project (2016) construction.

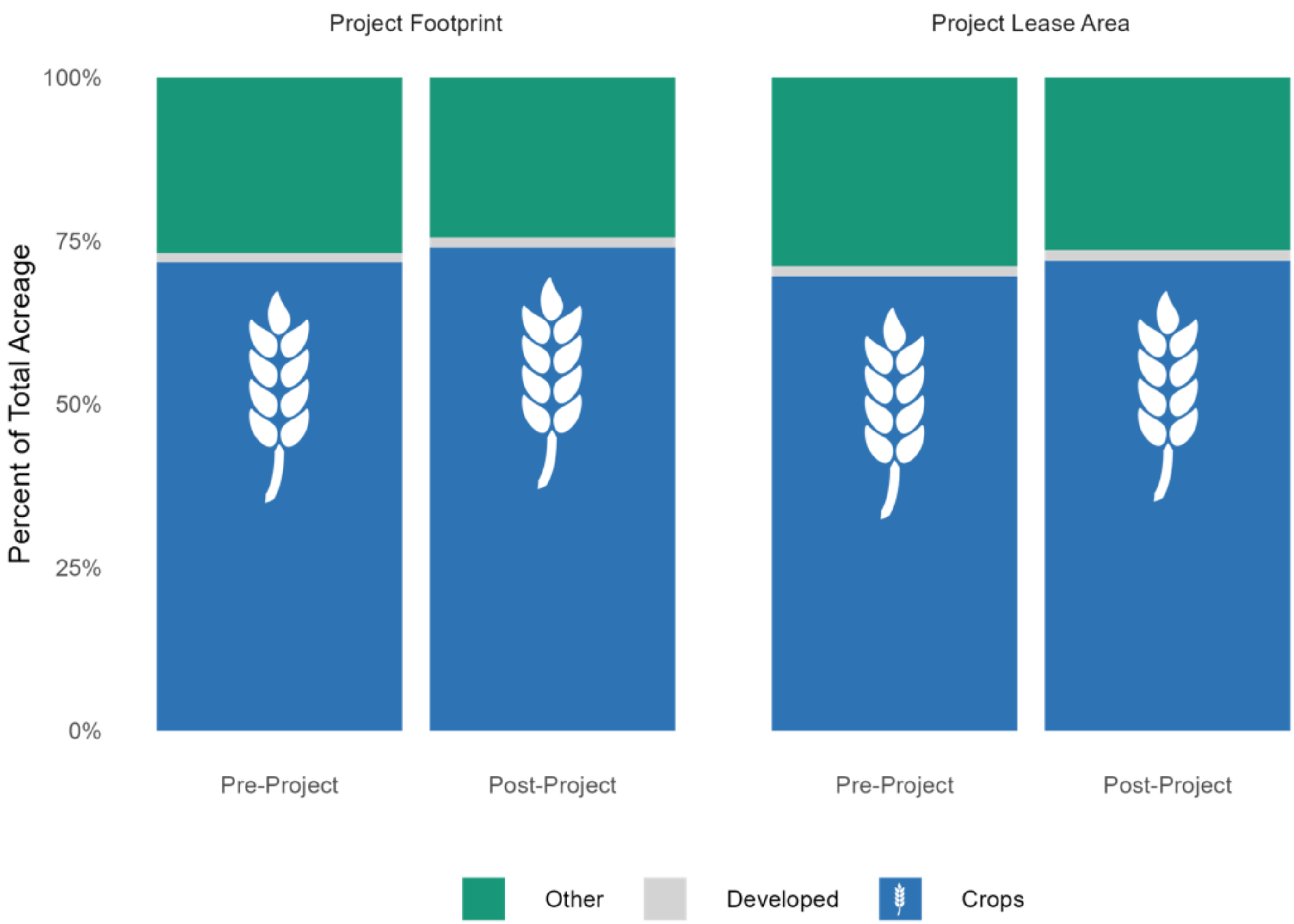
Area	Pre-project, 2011 (Acres, percent of total)	Post-Project, 2016 (Acres, percent of total)	Change (%)
Lease Area			
Crops	16,239 (69.5%)	16,796 (71.9%)	+3.4%
Developed	365 (1.6%)	391 (1.7%)	+7.1%
Other	6,749 (28.9%)	6,167 (26.4%)	-8.6%
Total	23,353 (100%)	23,353 (100%)	0%

327 United States Department of Agriculture (USDA) Farm sector financial indicators, Gross farm receipts and net farm income for the State of Washington, 2022. Accessed at https://data.ers.usda.gov/reports.aspx?ID=17839#P497d065d34af4dde8a5dd22d58d70ae9_3_185iT0R0x0 May 31, 2024.
328 One reviewer of this case study suggested that a five-to-ten-year average value for farm production in this area would be higher, or approximately $150 to $200 per acre. Written communication with Columbia County Treasurer's Office on July 19, 2024.
329 The project footprint is defined as including parcels on which turbines are located.
330 2011 Land Cover, National Land Cover Database (NLCD), Multi-Resolution Land Characteristics (MRLC) Consortium. Accessed on May 23, 2023 at https://www.mrlc.gov/.
331 2016 Land Cover, National Land Cover Database (NLCD), Multi-Resolution Land Characteristics (MRLC) Consortium. Accessed on May 23, 2023 at https://www.mrlc.gov/.
332 "Hunting at Tucannon", Portland General Electric. Accessed on April 24, 2024 at https://portlandgeneral.com/hunting-at-tucannon.
333 "Register to Visit Tucannon", Portland General Electric. Accessed on April 24, 2024 at https://portlandgeneral.com/hunting-at-tucannon/register-to-visit-tucannon.
334 "Access rules: Tucannon River Wind Farm, Hopkins Ridge Wind Facility & Marengo Wind Facility", Portland General Electric. Accessed on April 24, 2024.
335 "Tucannon River Wind Farm Recreational Access Map", Portland General Electric. Accessed on April 24, 2024.

Area	Pre-project, 2011 (Acres, percent of total)	Post-Project, 2016 (Acres, percent of total)	Change (%)
Project Footprint			
Crops	11,529 (71.7%)	11,888 (74.0%)	+3.1%
Developed	226 (1.4%)	251 (1.6%)	+11.3%
Other	4,321 (26.9%)	3,936 (24.5%)	-8.9%
Total	**16,076 (100%)**	**16,076 (100%)**	**0%**

Source: 2016 Cropland Data

Figure B24. Change in Tucannon River Project Area Land Use (2011 to 2016).



Source: 2016 Cropland Data

Financial Returns to Property Owners

THE ISSUES // Community members and lawmakers have inquired as to whether and to what extent the leasing of lands for renewable energy projects is beneficial or harmful to landowners. Primary concerns include both the short- and long-term community impacts, as well as whether adjacent landowners could be

affected by these projects. Answering this question is made somewhat challenging due to the confidential nature of the agreements made between landowners and project developers and is further complicated by the variety of characteristics that affect neighboring property values. This section evaluates what we can determine about the effects of Tucannon River Wind Project on landowners in Columbia County.

As is common practice with wind energy project development in rural areas, land parcels in the Tucannon River Wind Project area are leased by the project owner and most retain their original land ownership status. This is done through an assignment of easement from the landowner to Portland General Electric Company, thereby allowing PGE to use the private land for the project. Distinct from a lease, some easements allow use of land in perpetuity and may be paid in a lump sum or regular payments (e.g., annual payments).[336] We were unable to determine specific agreements PGE may have with landowners for Tucannon.

As discussed above, parcels in this area continue to be farmed following project implementation. Property owners within the leased areas typically enter into lease agreements with the project owners for a pre-development period (typically ranging from two to five years in duration). After the design of the project is established, landowners for which physical infrastructure is developed are further compensated on a per acre basis at an established fee. While these agreements are generally confidential to the parties engaged, some agreements made with public entities are made public that provide insights into these payments.

Agreements can be on a per MW basis or as a percentage of revenues. We were unable to find a power purchase agreement for Tucannon (likely because it is owned and operated by a utility) and do not estimate revenues. Estimating returns to property owners for the lease easement payments by MW capacity, a landowner could receive approximately $7,000 to $9,000 per turbine ($3,000 to $4,000 per MW).[337] Across the entire project (116 turbines or 267 MW) this would equate to $800,000 up to $1.05 million in lease easement payments per year.

Compared to the conservative estimate of $79 average per acre crop net income within the lease area, easement payments per turbine in this estimated range would be notably higher annual payments for landowners, even after accounting for the lost agricultural production. For example, taking a conservative approach, if the turbines remove 385 productive acres from "Other" without including any potential crop increases (see **Table B31**), this results in an annual loss of approximately $30,000. However, the net gain would remain $770,000 up to $1 million per year for landowners. Lease terms would have to be less than $110 per installed turbine (or approximately $50 per MW) for landowners not to break even based on these valuations.

We also evaluated assessed values of the parcels within the project lease area prior to and following Tucannon River Wind Project construction. As shown in **Figure B25**, parcels in the project footprint had higher and more variable assessed values on average than parcels within the lease area but outside of the project footprint. Values remained generally stable across both categories until 2011, when parcels in the project

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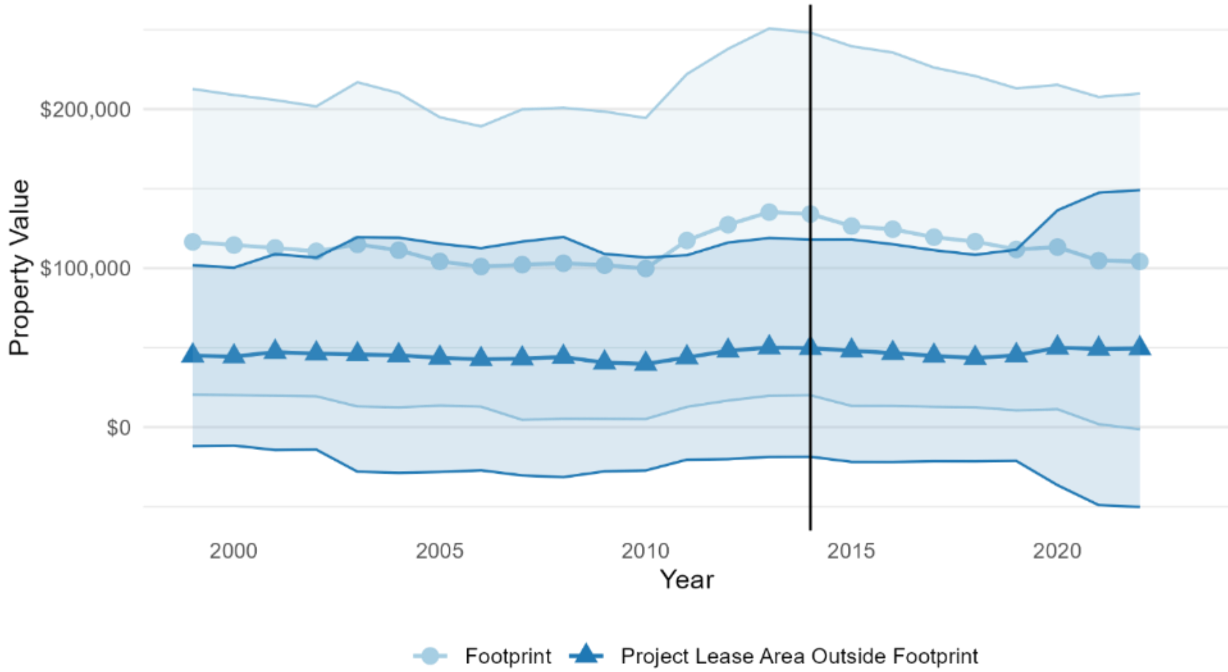
336 Wind Energy Easement and Lease Agreements. Windustry. September 2005. Windustry's Wind Easement Work Group.
337 While it is difficult to directly compare leases given the variety of factors likely considered in individual agreements, several publicly available estimates provided similar annual values. Wind Exchange from the DOE estimated $7,800 in the west (https://windexchange.energy.gov/economic-development-guide), Windustry estimates $4,000 to $8,000 per turbine or $3,000 to $4,000 per MW (https://www.windustry.org/how_much_do_farmers_get_paid_to_host_wind_turbines) and a recent presentation at a USDA forum presented $10,000 as an example (https://www.usda.gov/sites/default/files/documents/2023aof-Sherrick.pdf). For this analysis, we use the range of $3,000 to $4,000 per MW.

footprint began to increase in value. Footprint parcels peaked in value at $135,233 in 2013 and have been slowly declining back to pre-project levels since. Parcels outside of the project footprint did not significantly change year to year.[338]

Figure B25. Property values of Tucannon River Wind Project leased areas over time.



Source: Columbia County Property Search, 2000-2024. Standard deviation of average per parcel values for all properties in footprint and lease area. Accessed on April 12, 2024 at http://64.184.153.98/PropertyAccess/PropertySearch.aspx?cid=0.

Taxes

THE ISSUES // Projects bring tax revenues to counties. However, there have been questions raised about whether the impacts are sustained over time and how the changes to tax payments over time affect the counties in which they are located, particularly as projects depreciate over time.

Tucannon Wind Project is owned by Portland General Electric, a regional utility which operates across state/county lines. Consequently, taxes for the project are centrally assessed as personal property by the state Department of Revenue. The State assessed the initial personal property value for the 116 turbines at $225 million (2023 dollars) in 2015.[339]

Personal property tax payments initiated post-construction at over $2.2 million per year from 2016 to 2022. Because the infrastructure is anticipated to depreciate over time, the personal property tax payments made to the county will also decline over time. Although improvements to the project may alter the schedule,

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[338] Columbia County Assessor & Treasurer. Accessed on April 12, 2024 at http://64.184.153.98/PropertyAccess/PropertySearch.aspx?cid=0.

[339] State-assessed utility valuations. Washington State Department of Revenue. Accessible at: https://dor.wa.gov/about/statistics-reports/state-assessed-utility-valuations.

depreciation is anticipated to reduce the taxable value of the project at a rate that is approximately consistent with the published state schedule of four percent for utility-scale renewable energy development.[340] Based on this schedule, the project would depreciate to 50 percent of its original value by year 12 and to 15 percent by year 22 and beyond. By years 22 and beyond, this would result in approximate personal property tax payments of one sixth of their initial tax payments (e.g., approximately $350,000 to $430,000 per year) using the current tax levies and valuation guidelines.

Tucannon represents a significant portion of tax revenues for Columbia County. On average, between 2016 and 2024, personal and real property taxes from the project represented 19.4 percent of total property taxes. However, with depreciation this percent has gone down from averaging 20.6 percent between 2016 and 2019 to 18.2 percent between 2020 and 2023. Over this period, the real property taxes have remained relatively stable, though they are a small portion of the tax levied from the Tucannon project site. As noted above, these real property taxes are likely to be paid or reimbursed by the project owner as part of the lease agreements. As shown in **Table B32**, real property tax payments from 2019 through the present were relatively minor compared to personal property tax payments.

The development of projects can also contribute to sales taxes for the materials purchased. In 2014, the year Tucannon was development there was a notable jump in sales taxes from $500,000 to $4.6 million in Columbia County. However, due to state sales tax rebates, Columbia County had to reimburse a large portion of sales taxes (the state has a 75 percent exemption for renewable energy). This resulted in net sales tax revenue of $1.6 million for 2014, with approximately $3 million returned to the state due to the existing renewable energy exemption.[341]

With these data, we can observe changes in total property and sales tax revenues from the year before and after project construction was completed in 2015. From 2014 to 2016, we find total Columbia County taxes increased by approximately one percent and increased further by four percent and twelve percent in 2017 and 2018, respectively.

Table B32. Tucannon wind project property tax payments, 2014 – 2023.

Tax Year	Real Property	Personal Property	Total Project Collections	Total County Property Taxes	Total Project Taxes Collected (2023 dollars)	Total County Property Taxes (2023 dollars)	% of County Tax Roll
2014	$61,796	--	$61,796	$7,207,091	$79,537	$9,276,219	<1%
2015	$107,256	--	$107,256	$7,851,435	$137,885	$10,093,571	1.4%
2016	$67,268	$1,813,858	$1,881,127	$9,322,995	$2,388,193	$9,322,995	25.6%
2017	$64,657	$1,884,057	$1,948,714	$9,709,871	$2,422,394	$9,709,871	24.9%
2018	$63,884	$2,381,144	$2,445,028	$10,897,809	$2,966,882	$10,897,809	27.2%
2019	$65,598	$2,479,744	$2,146,202	$11,003,731	$2,557,927	$11,003,731	23.2%
2020	$48,639	$2,670,276	$2,316,747	$11,848,046	$2,727,540	$11,848,046	23.0%
2021	$91,732	$2,257,181	$2,099,031	$12,184,455	$2,360,332	$12,184,455	19.4%

340 Personal Property Valuation Guidelines, Washington State department of Revenue. Accessed on April 25, 2024 at https://dor.wa.gov/taxes-rates/property-tax/personal-property-valuation-guidelines.
341 History of Sales Tax Distribution in Columbia County, 2024. Obtained from Columbia County Treasurer's Office on March 15, 2024.

Tax Year	Real Property	Personal Property	Total Project Collections	Total County Property Taxes	Total Project Taxes Collected (2023 dollars)	Total County Property Taxes (2023 dollars)	% of County Tax Roll
2022	$67,619	$2,246,574	$2,225,370	$11,736,137	$2,316,976	$11,736,137	19.7%
2023	$91,525	$1,866,475	$1,958,000	$11,438,795	$1,958,000	$11,438,795	17.1%
Total	**$729,974**	**$17,599,309**	**$18,329,283**	**$103,200,365**	**$19,915,666**	**$107,511,629**	**18.5%**

Over 100 unique property parcels were assigned to Tucannon for real property tax.
Sources: IEc GIS analysis and Columbia County Treasurer's Office, 2024.

Jobs

THE ISSUES // Community members and representative interests have inquired about how much effect renewable energy projects have on local employment. This section describes information that we have gathered about the extent of impacts that project construction and operations have had on employment in Columbia County.

Direct Investments
We estimate total Tucannon River Wind Project costs using the Jobs and Economic Development Impact (JEDI) input-output model built by NREL for on-shore wind energy development. For this estimate, we use the model assumption that wind energy project installation and capital expenditure costs are $1,531 per kW in the State of Washington (2023 USD). Similarly, we assume that project operation and maintenance (O&M) costs are $38 per kW (2023 USD). Using these assumptions, we estimate total Tucannon River Wind Project construction and installation costs to be approximately $409 million (2023 USD). O&M costs are estimated to be $11 million (2023 USD).[342]

PGE has mentioned their team purchased "a significant portion" of the construction materials from local sources, reducing transportation costs. However, the definition of local is unclear, as well as the exact nature of the construction materials in question.[343]

Employment
Table B33 presents occupations of residents within the project lease area census tract, Columbia County, and the State of Washington, as broadly grouped by the American Community Survey. As shown, occupations that include natural resources and construction are high in the relevant census tract in Columbia County (13.4 percent) when compared with the Washington State average (9.4 percent).

[342] PGE's 2015 Annual Report forecasted the capital expenditures of the project to be $525 million to set customer prices. "2015 Annual Report," Portland General Electric. January 29, 2016. Accessed on April 24, 2024 at https://investors.portlandgeneral.com/static-files/9fa1b132-62aa-4ad1-a9c1-6a1b7e95b137.
[343] "Tucannon River Wind Farm", Portland General Electric. November 9, 2015. Accessed on April 24, 2024 at https://www.portlandgeneral.com/our_company/news_issues/news_releases/11_09_2015_Tucannon_River_Wind_Farm.aspx.

Table B33. Occupation of residents on and nearby the Tucannon Wind Project, 2018 - 2022.

Occupation	Employment in Census tracts intersected by project* (% of total)	Employment in Columbia County (% of total)	Employment in State of Washington (% of total)
Management/Business/Science/Arts	657 (35.8%)	657 (35.8%)	1,664,322 (44.4%)
Sales/Office	325 (17.7%)	325 (17.7%)	697,384 (18.6%)
Service	305 (16.6%)	305 (16.6%)	595,994 (15.9%)
Production/Transportation/Material Moving	300 (16.4%)	300 (16.4%)	443,300 (11.8%)
Natural Resources/ Construction/Maintenance	246 (13.4%)	246 (13.4%)	351,076 (9.4%)
Total	**1,833 (100%)**	**1,833 (100%)**	**3,752,076 (100%)**

*The project intersects Census Tract 9602, which is the only census tract in Columbia County.
Source: 2022 ACS 5-Year Survey.

According to PGE, the project generated approximately 300 jobs during construction and 18 permanent jobs during the O&M phase.[344] The specific source of these job estimates is not clear, as is the extent of these jobs that were created locally to the project. PGE selected Renewable Energy Systems Americas (RES Americas) as the general contractor, which advertises experiences in wind and solar contractor services nationwide.[345] Current employment listings include what appear to be positions in specific construction sites in various western states, but do not include Washington State as of March 2024.[346]

We developed a modeled estimate of job effects of the project using JEDI to evaluate the impacts of the project on the Washington State economy (**Tables B34** and **B35**). The JEDI model estimates the direct, as well as the indirect (supplier) and induced (consumer spending) effects associated with project expenditures. **Table B34** presents the estimate for the Tucannon River Wind project for the construction phase. As shown, we estimate that project construction may have resulted in 744 full-time equivalent (FTE) jobs and contributed $133 million (2023 USD) to the State of Washington. As shown in **Table B35**, we also estimate annual O&M activities to be associated with 38 FTE jobs and $7 million (2023 USD) in contributions to the State of Washington. We do not have estimates of how much of this activity occurred in localized areas.

Table B34. Regional economic impacts of the Tucannon River Wind Project in Washington, Construction Phase

Economic Impact	Estimated Project Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$409 million**	**744**	**$51 million**	**$133 million**

344 "2015 Annual Report," Portland General Electric. January 29, 2016. Accessed on April 24, 2024 at https://investors.portlandgeneral.com/static-files/9fa1b132-62aa-4ad1-a9c1-6a1b7e95b137.
345 "Tucannon River Wind Farm, Washington," Power Technology. December 30, 2014. Accessed on April 24, 2024 at https://www.power-technology.com/projects/tucannon-river-wind-farm-washington/?cf-view.
346 "Current opportunities", Renewable Energy Systems Group. Accessed on April 24, 2024 at https://www.res-group.com/careers/current-opportunities.

Source: IEc analysis. Project costs are estimated by taking the product of the project's rated capacity (266.8 MW) and the onshore wind JEDI model's default average cost value of $1,531 per kW (including sales tax) in the State of Washington. Impacts include direct, indirect, and induced effects of construction spending, which are assumed to include spending on labor, materials, equipment, development, and taxes. While some construction costs are assumed to be spent in the State of Washington, equipment costs and some material costs are assumed not to be spent locally. Estimated project costs include both in-state and out-of-state expenditures. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts rather than at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Table B35. Regional economic impacts of the Tucannon River Wind Project in Washington, O&M Phase, Annual

Economic Impact	Operation and Maintenance Costs (2023 USD)	Jobs (Full-time equivalents)	Earnings (2023 USD)	Output (2023 USD)
Total	**$11 million**	**38**	**$3 million**	**$7 million**

Source: IEc analysis. O&M costs are estimated by taking the product of the project's rated capacity (266.8 MW) and the onshore wind JEDI model's default average cost value of $38 per kW in the State of Washington. Impacts include direct, indirect, and induced effects of O&M spending, which are assumed to include spending on personnel, insurance, replacement parts and equipment, taxes, and other materials and services. O&M expenditures are assumed to be spent in the State of Washington. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts rather than at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Mitigation Impact Payments/Economic Development Assistance

THE ISSUES // Communities and representative interests have inquired whether and to what extent renewable energy projects provide investments to communities in which they are located. As discussed above, the projects typically provide payments to landowners in lease areas. In addition, the projects pay personal property taxes that are collected by the counties in which they are located. This section discusses some additional payments that the Tucannon River Wind Project has provided to communities.

Mike Talbott, the Former Columbia County Commissioner, considers the Tucannon River Wind Farm to be "a great addition to Columbia County and the Dayton community."[347] Through a Memorandum of Agreement between Columbia County, the State of Washington, the Washington Department of Fish and Wildlife, the Blue Mountain Community Foundation, PGE established the Portland General Electric Tucannon River Wind Farm Habitat Project Fund in 2015.[348] The Fund provides grants for conservation projects in Columbia County focused on habitat conservation, restoration, monitoring, management, and enhancement benefitting the wildlife, natural habitats, and residents of the County.[349] In 2021, the annual budget was estimated to be up to $20,000.[350] According to communications with the Columbia County Assessor's and Treasurer's Office, PGE invested in the fire district and funded several other small-scale initiatives, but does not currently have a presence in Columbia County.[351]

347 "PGE announces Completion of Tucannon River Wind Farm", Portland General Electric. December 15, 2014. Accessed on April 24, 2024 at https://investors.portlandgeneral.com/static-files/df0d1c4b-1de3-40c4-87b8-4779cd35e7a6.
348 "PGE Tucannon River Wind Farm Habitat Project Fund: Request for Proposal", Blue Mountain Community Foundation. Accessed on April 24, 2024.
349 "Grant opportunity for Habitat restoration in Columbia County", Dayton Chronicle. February 11, 2021. Accessed on April 24, 2024 at https://www.daytonchronicle.com/story/2021/02/11/news/grant-opportunity-for-habitat-restoration-in-columbia-county/1515.html.
350 "Request for Proposals: PGE Tucannon River Wind Farm Habitat Project Fund (U.S.)", FundsforNGOs. Accessed on April 24, 2024 at https://www2.fundsforngos.org/latest-funds-for-ngos/request-for-proposals-pge-tucannon-river-wind-farm-habitat-project-fund-u-s/.
351 Personal communication with Columbia County Treasurer's Office on March 15, 2024.

Planned Clean Energy Projects: Case Study

Photo: Rattlesnake Flat Wind Farm, courtesy of Grow Adams County

Project Name	Project Type	Planned Location	Current Owner	Planned Nameplate Capacity	Planned Storage Capacity	Planned Construction Year	Planned Size
Carriger Solar	Solar & battery storage	Klickitat County	Cypress Creek Renewables	160 MW	63 MW	2025	2,409 acres across 25 parcels
Horse Heaven Clean Energy Center	Solar, Wind, & battery storage	Benton County	Scout Clean Energy	975 – 1,150 MW	300 MW	2025	74,948 acres across 235 parcels
Desert Claim Wind	Wind	Kittitas County	Desert Claim Wind Power LLC (subsidiary of enXco)	100 MW	-	Completed by Nov. 2028	4,352 acres across 36 parcels

Summary of Projects

As renewable energy expands across the United States, at least 16 additional utility-scale renewable energy projects are planned or proposed in Washington State as of summer 2024. Below, we review three of these planned projects: Carriger Solar, Horse Heaven Clean Energy Center, and Desert Claim Wind.

Carriger Solar

Carriger Solar is a proposed 63-megawatt (MW) capacity solar energy and storage facility in Klickitat County, Washington. The project is currently awaiting approval, with construction expected to commence in 2025.

Cypress Creek Renewables, the project developer and current owner, bypassed the county's moratorium on new solar projects by siting through EFSEC.[352]

The Carriger Solar project area is made up of 25 parcels containing a total of about 2,400 acres. The Maximum Project Extent (MPE), or the largest possible area that will be disturbed by the project, is a smaller area of 1,323 acres that will contain all solar array areas, the Battery Energy Storage System (BESS) facilities, and other related transmission equipment. This land is mostly located within the Klickitat County Extensive Agriculture District with two parcels and an access road located in the Klickitat County General Rural District. The southern portion of the project area is located within the Klickitat County Energy Overlay Zone.[353] Because economic and environmental impact analyses have already been completed for the entire EOZ area, developers can automatically bypass county zoning applications and approvals, thus expediting the installation of renewable energy projects in the region.[354] Historically, the project area and surrounding land has primarily been used for crop production and pasture, though the extent and quality of these lands has been the subject of recent debate between the project developer and the Washington State Department of Agriculture.[355],[356]

Horse Heaven Clean Energy Center

Horse Heaven Clean Energy Center is planned to be built in Benton County, Washington and is currently owned by Scout Clean Energy. The project will incorporate solar, wind, and battery storage facilities to produce up to 1,150 MW of energy. Originally, the project included two solar arrays, 244 wind turbines, and two battery storage systems.[357] Due to the project's potential impact on historical and cultural resources, EFSEC proposed to halve the number of turbines, which would bring total project capacity to 975 MW. However, Governor Inslee asked EFSEC to reconsider this proposal and revisit the feasibility of producing the original 1150 MW of capacity while adequately protecting high-priority cultural and historic areas before August 21, 2024.[358] The project is currently slated to begin construction in 2025, though this is subject to change.

Horse Heaven is currently planned to occupy about 74,900 acres and overlap 235 land parcels in southeastern Benton County. The solar siting area is located within this larger project area and takes up approximately 10,700 acres. The project area and nearby land has been used primarily for agricultural purposes, particularly winter wheat production and pasture, with scattered areas of developed land and scrubland.[359]

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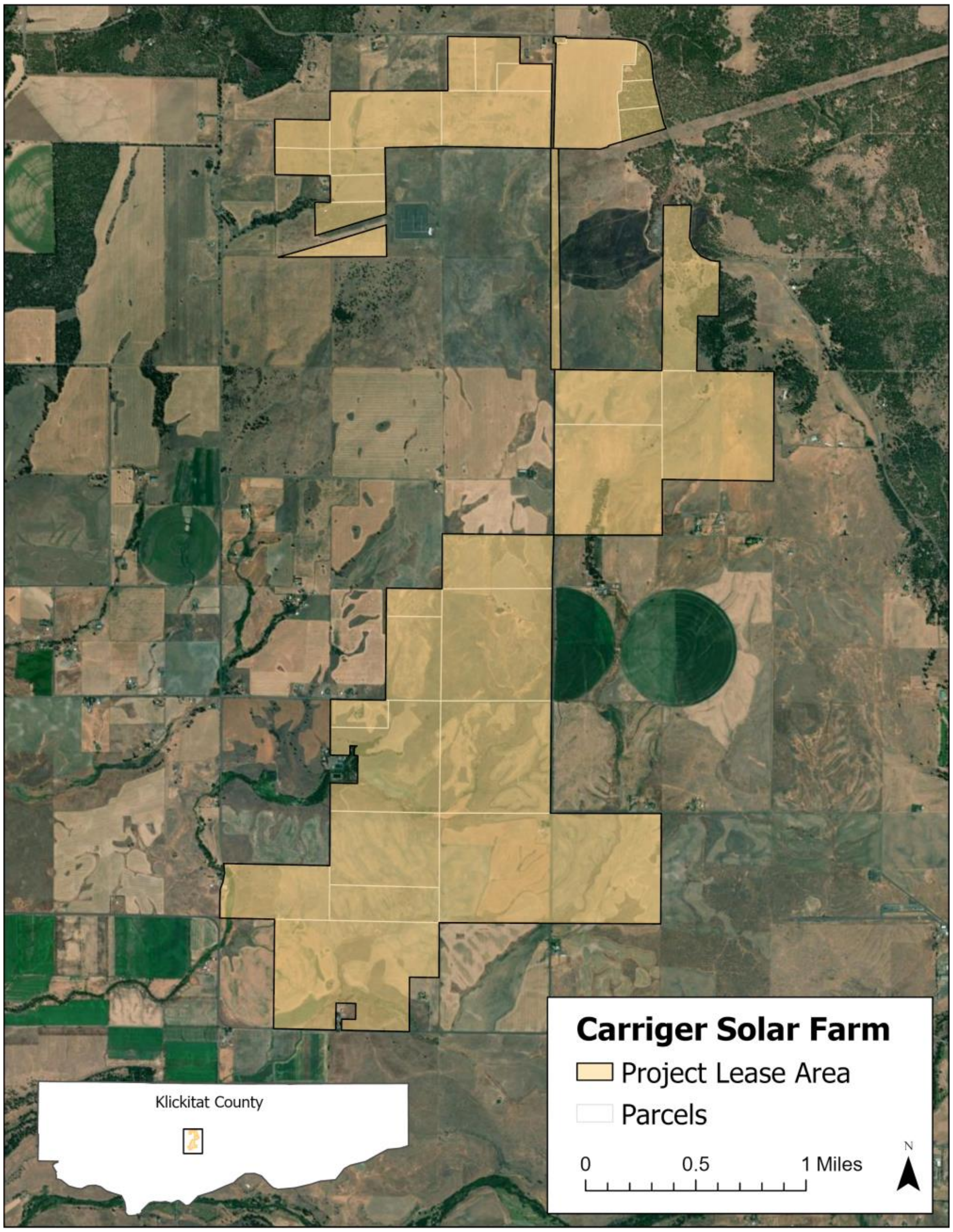
352 "Solar project bypasses Klickitat County approval process", Columbia Gorge News. Feb 22, 2023. Accessed on June 6, 2024 at https://www.columbiagorgenews.com/news/solar-project-bypasses-klickitat-county-approval-process/article_585d187c-b241-11ed-9788-7ffe5fd60239.html.
353 "Carriger Solar", EFSEC. Accessed on June 6, 2024 at https://www.efsec.wa.gov/energy-facilities/carriger-solar.
354 "Klickitat County's Energy Overlay Zone Streamlines Future Siting of Energy Projects", Institute for Local Self-Reliance. July 6, 2005. Accessed on May 21, 2024 at https://ilsr.org/klickitat-countys-energy-overlay-zone-streamlines-future-siting-energy-projects/.
355 "Carriger Solar", EFSEC. Accessed on June 6, 2024 at https://www.efsec.wa.gov/energy-facilities/carriger-solar.
356 "Solar project gets warning on soil, pushes back", The Goldendale Sentinel. Feb 21, 2024. Accessed on June 6, 2024 at https://www.goldendalesentinel.com/news/solar-project-gets-warning-on-soil-pushes-back/article_2b126834-d0d8-11ee-95fc-335d3c71aab3.html.
357 "Horse Heaven Wind Project", EFSEC. Accessed on June 6, 2024 at https://www.efsec.wa.gov/energy-facilities/horse-heaven-wind-project.
358 "Inslee rejects recommendation to shrink footprint of massive wind farm", Washington State Standard. May 23, 2024. Accessed June 6, 2024 at https://washingtonstatestandard.com/2024/05/23/inslee-rejects-recommendation-to-shrink-footprint-of-massive-wind-farm/.
359 2023 Cropland Data Layer. United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). Accessed June 22, 2023 at https://datagateway.nrcs.usda.gov/.

Desert Claim Wind Farm

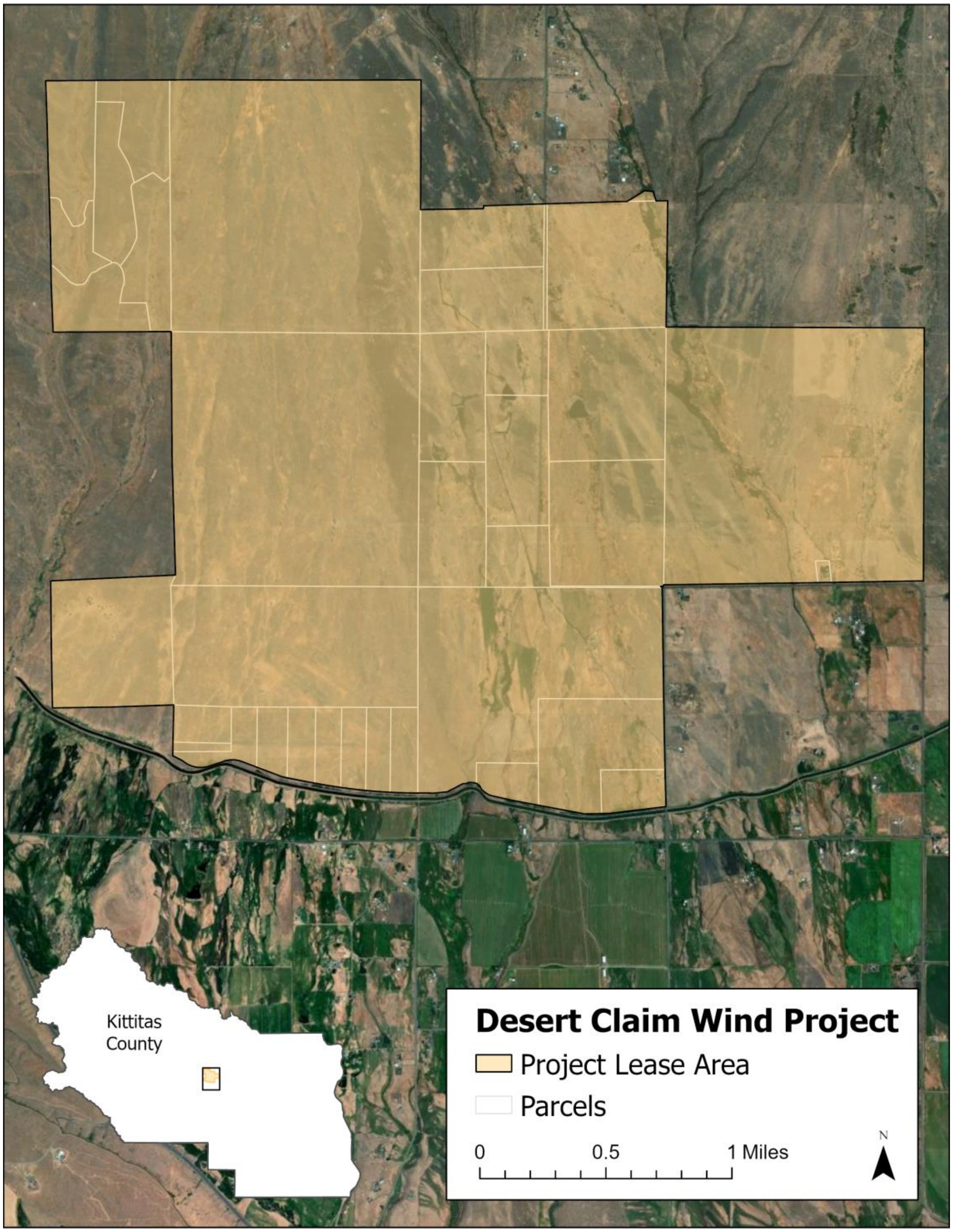
Desert Claim Wind Farm is a proposed 100-MW wind facility located in Kittitas County, Washington. The project owner is Desert Claim Wind Power LLC, a subsidiary of enXco. The project application was originally submitted in 2006, with a revised version approved in February 2010. The Site Certification Agreement was revised in October 2023 with an extended deadline for completion of November 2028. Currently, the project plan consists of at most 31 turbines on 4,400 acres of land.[360] The area overlaps 36 land parcels. Most of the project area is grassland, some of which is used for pasture, and shrubland.[361]

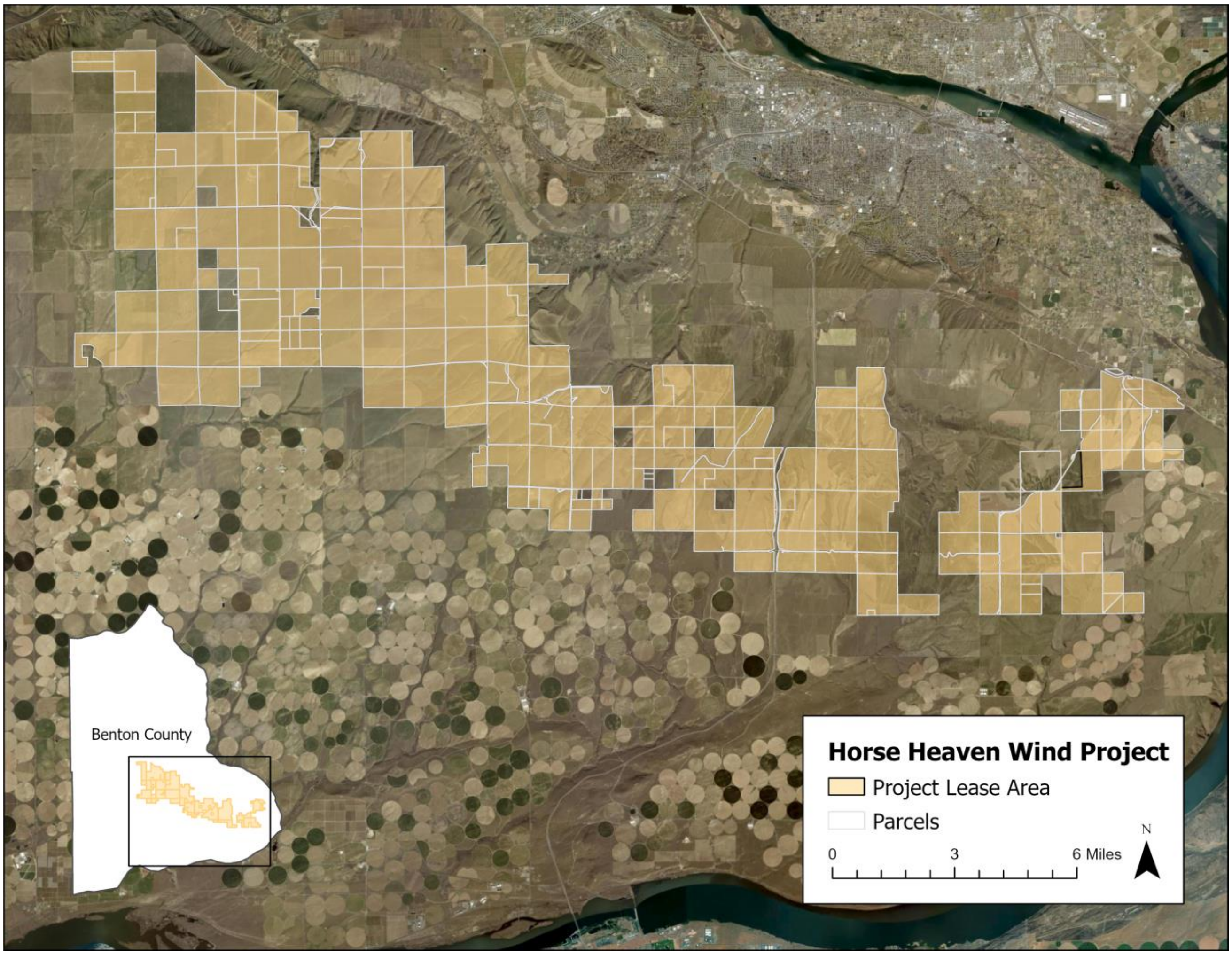
360 "Desert Claim", EFSEC. Accessed on June 6, 2024 at https://www.efsec.wa.gov/energy-facilities/desert-claim.
361 2023 Cropland Data Layer. United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). Accessed June 22, 2023 at https://datagateway.nrcs.usda.gov/.

Figure B26. Washington Planned Energy Projects (Washington State Geospatial Portal[362], U.S. Wind Turbine Database[363])



[362] Washington State Geospatial Portal, Property Parcel data, Updated February 7, 2024. Accessed at https://geo.wa.gov/datasets/wa-geoservices::current-parcels/about on February 12, 2024.
[363] Hoen, B.D., Diffendorfer, J.E., Rand, J.T., Kramer, L.A., Garrity, C.P., and Hunt, H.E., 2018, United States Wind Turbine Database (ver. 6.1, November 2023): U.S. Geological Survey, American Clean Power Association, and Lawrence Berkeley National Laboratory data release, https://doi.org/10.5066/F7TX3DN0. Accessed on February 12, 2024.


Desert Claim Wind Project
Project Lease Area
Parcels
0
0.5
1 Miles
N
Kittitas
County



Geographic Location/Community Context

Carriger Solar
Carriger Solar Project is in Klickitat County. Klickitat County is a rural county, located along the border between Washington and Oregon, with a population of 23,271 in 2022. [364] The project is located about 3.5 miles west/northwest of Goldendale, the county seat, which has a population of 3,453. The county government employs 229 full-time and 24 part-time employees and has an annual budget of $59.5 million as of 2023.[365],[366]

Table B36 summarizes community population statistics for the project area. As shown, the population in Klickitat County has a lower median income, higher population without a high school diploma, higher population living below the poverty level, higher population over 65, and higher energy burden than the state population overall.

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[364] 2022 ACS 5-Year Survey, U.S. Census Bureau.
[365] 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
[366] 2023 Annual Budget. Klickitat County.

Carriger will be the newest of several utility-scale clean energy projects in Klickitat County. Existing wind projects include Lund Hill Solar, Linden Ranch Wind Farm, Big Horn Wind Farm, Hoctor Ridge Wind Farm, Windy Flats, Windy Point I and II, Harvest Wind, and Juniper Canyon. Juniper Canyon is one of the largest of these projects at 128 turbines with a combined capacity of 250 megawatts.[367] Big Horn Wind Farm, with a capacity of 249.5 MW and 133 turbines, is also located in the county. Bluebird Solar Project, which has not yet begun construction, has a planned capacity of 100 megawatts.[368]

Horse Heaven Clean Energy Center

Horse Heaven Clean Energy Center is in Benton County, a county with a population of 212,791 as of 2022, making it the 10th most populous county in Washington. Benton County is located at the confluence of the Yakima, Snake, and Columbia rivers. The project wraps around the southern border of Richland, Washington, and is nearby other cities such as Benton City, Kennewick, and Badger. Richland has a population of 62,821 as of 2022 and is the second most populous city in the county, second only to the 84,750-person city of nearby Kennewick.[369] The County government employs 594 full time and 20 part-time individuals and has a biennial budget of $497.6 million as of the 2023-2024 term.[370],[371]

Table B36 summarizes community population statistics for the project area. As shown, the population in Benton County has a higher population without health insurance (12.7 percent) and a somewhat higher population with less than a high school diploma or equivalent (9.9 percent) relative to the state population overall (9.2 percent and 7.9 percent, respectively).

Horse Heaven Clean Energy Center would be one of the largest clean energy projects in Benton County and the State of Washington. The two other utility-scale projects in Benton County are Horn Rapids Solar, Storage, & Training and Columbia Generating Station. The second project, Columbia Generating Station, is a 1,207-MW nuclear power plant constructed in 1984.[372] Multiple other utility-scale clean energy projects, including Wautoma Solar Energy Project and Hop Hill Solar, have been proposed to be built in Benton County and are at various stages of permitting and development.[373]

Desert Claim Wind Farm

Desert Claim Wind occupies land in the rural area of Kittitas County, which has a population of 45,189 as of 2022. [374] The project is located about four miles northeast of Thorp and about eight miles northwest of Ellensburg. Ellensburg is the county seat and has a population of 18,703 as of 2022.[375] The county's largest

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[367] "Juniper Canyon Wind Farm", Renewable Technology. Accessed on May 21, 2024 at https://www.renewable-technology.com/projects/juniper-canyon-wind-farm/.
[368] "EIS Comment Period Ends for Planned Avangrid Solar Project in Klickitat County", NewsData, February 11, 2022. Accessed on May 21, 2024 at https://www.newsdata.com/clearing_up/briefs/eis-comment-period-ends-for-planned-avangrid-solar-project-in-klickitat-county/article_5bb4892a-8b68-11ec-b7d1-aba443f902f6.html.
[369] 2022 ACS 5-Year Survey, U.S. Census Bureau.
[370] 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
[371] "2023-2024 Final Budget", Benton County. November 29, 2022.
[372] "Columbia Generating Station produces record amount of energy in 2022", Energy Northwest. February 9, 2023. Accessed on April 29, 2024 at https://www.energy-northwest.com/whoweare/news-and-info/Pages/Tri-Cities-nuclear-power-plant-produces-record-amount-of-energy-for-Northwest.aspx.
[373] "Energy Facilities", Energy Facility Site Evaluation Council. Accessed on April 29, 2024 at https://www.efsec.wa.gov/energy-facilities.
[374] 2022 ACS 5-Year Survey, U.S. Census Bureau.
[375] 2022 ACS 5-Year Survey, U.S. Census Bureau.

city, Yakima, is about 25 miles south of the three projects. The County government employs 331 full time and 27 part-time individuals and has an annual budget of $141.3 million as of 2022.[376],[377]

Table B36 summarizes community population statistics for the project area. As shown in **Table B36**, the population in Kittitas County has a lower population identifying as other than white and non-Hispanic and lower population with low English proficiency than the state population overall.

There are two operating utility-scale clean energy projects in Kittitas County. Columbia Solar, which is composed of three separate solar sites, was constructed in 2022 and has a nameplate capacity of 15 MW. Wild Horse is a wind farm constructed in 2006 with a total capacity of 274 MW.[378] There are also other several planned projects that have not yet begun construction.

Table B36. Community population statistics for planned Project Areas (2018 - 2022).

Metric	Census tracts intersected by Carriger[a]	Klickitat County	Census tracts intersected by Horse Heaven[a]	Benton County	Census tracts intersected by Desert Claim[a]	Kittitas County	State of Washington
Population (2022)	3,406	22,798	2,270	207,560	5,699	44,424	7,688,549
10-Year Population Change (2012 – 2022)	n/a	+11.6%	+13.3%	+18.3%	+21.0%	+8.5%	+14.1%
Median Household Income	$74,470	$66,581	$93,821	$83,778	$102,220	$66,800	$90,325
Population identifying as other than white and non-Hispanic	13.1%	19.8%	47.3%	32.6%	12.8%	19.4%	34.5%
Population with income below federal poverty level	20.1%	13.8%	8.4%	10.5%	11.8%	14.5%	9.9%
Population with less than high school diploma or equivalent	6.9%	10.6%	20.9%	9.9%	5.1%	6.9%	7.9%
Population that is unemployed	3.9%	3.7%	4.1%	3.0%	1.4%	3.7%	3.2%
Population without health insurance	6.8%	12.2%	18.6%	12.7%	2.6%	7.5%	9.2%
Population over 65 years old	27.1%	24.4%	11.2%	15.4%	16.0%	16.8%	16.0%
Population with low English proficiency	0.0%	4.9%	19.9%	8.2%	2.4%	1.2%	7.7%

[376] 2022 Census of Governments, Survey of Public Employment & Payroll Methodology, U.S. Census Bureau. Accessed on March 22, 2024 at https://www.census.gov/data/datasets/2022/econ/apes/2022.html.
[377] 2022 Annual Budget, Kittitas County.
[378] "Wild Horse Wind Power Project", Energy Facility Site Evaluation Council. Accessed on April 25, 2024 at https://www.efsec.wa.gov/energy-facilities/wild-horse-wind-power-project.

Metric	Census tracts intersected by Carriger[a]	Klickitat County	Census tracts intersected by Horse Heaven[a]	Benton County	Census tracts intersected by Desert Claim[a]	Kittitas County	State of Washington
Energy burden [b]	2.7%	2.6%	1.7%	1.7%	2.0%	2.4%	1.5%

[a] Carriger intersects Census Tract 9501.02 and Desert Claim intersects Census Tract 9753. Horse Heaven intersects six Census Tracts: 108.07, 108.14, 115.01, 115.06, 116, 118.01. The above values for Horse Heaven are a weighted average by project acreage overlap.

[b] Energy burden is defined as the percentage of gross household income spent on energy cost.

Sources: 2022 ACS 5-Year Survey, 2012 ACS 5-Year Survey; U.S Department of Energy LEAD Tool.[379]

As shown in **Figure B27**, approximately 70.3 percent of Klickitat County is privately owned; 12.9 percent of the county is owned by the Yakama Nation, with the remaining lands including federal lands (18.9 percent), state lands (10.1 percent), and county or locally owned lands (less than one percent).[380] The primary commodities produced in Klickitat County vary across the county: in the west, unmanned aerial vehicles, wood products, and fruit crops; in center, windsurfing and kite boarding beaches; in the east, vegetable crops and the regional landfill. Agriculture is present across the county, with fruits, tree nuts, berries, and wine grapes being the most profitable crops. Agriculture and forestry industries are major employers in the county.[381]

Approximately 42.9 percent of Benton County is publicly owned, including approximately 74.8 percent federal, 9.7 percent state, and about one percent county or locally owned lands.[382] Agriculture is historically and currently important to the local economy, particularly with the growth of the wine industry. Benton County is also home to the Hanford Project, which brought many skilled engineers and scientists to the area and contributed to a strong economic basis in energy production and medical equipment manufacturing. Recreational and tourism industries are also developing in the county. [383]

Approximately 93.0 percent of Kittitas County is publicly owned, including approximately 63.8 percent federal, 28.8 percent state, and less than one percent county or locally owned lands.[384] Agriculture is an important economic activity in this county; in particular, timothy hay is a major cash crop and is grown primarily for export to Japan and other Pacific Rim countries. Central Washington University, located in Ellensburg, is the county's largest employer.[385]

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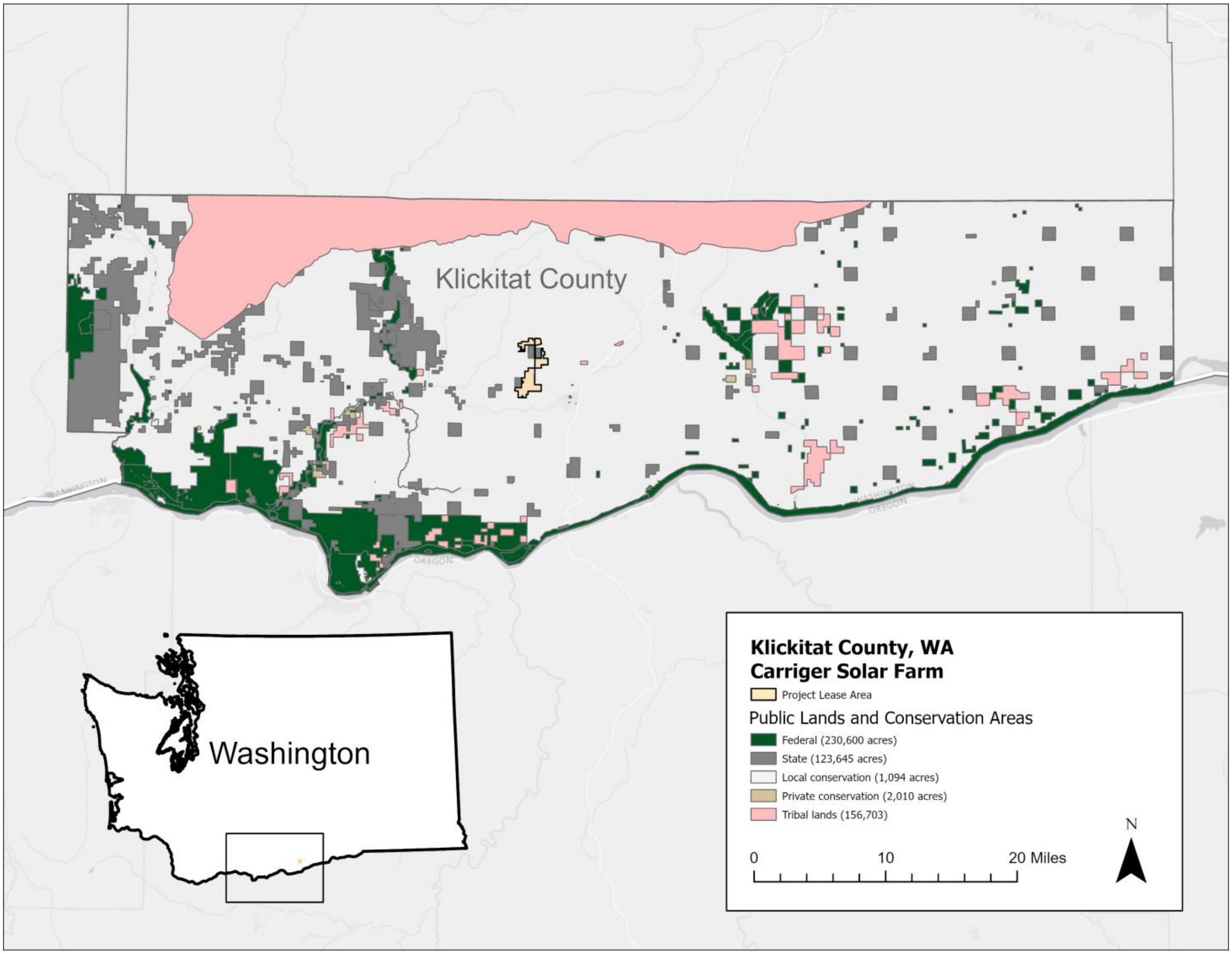
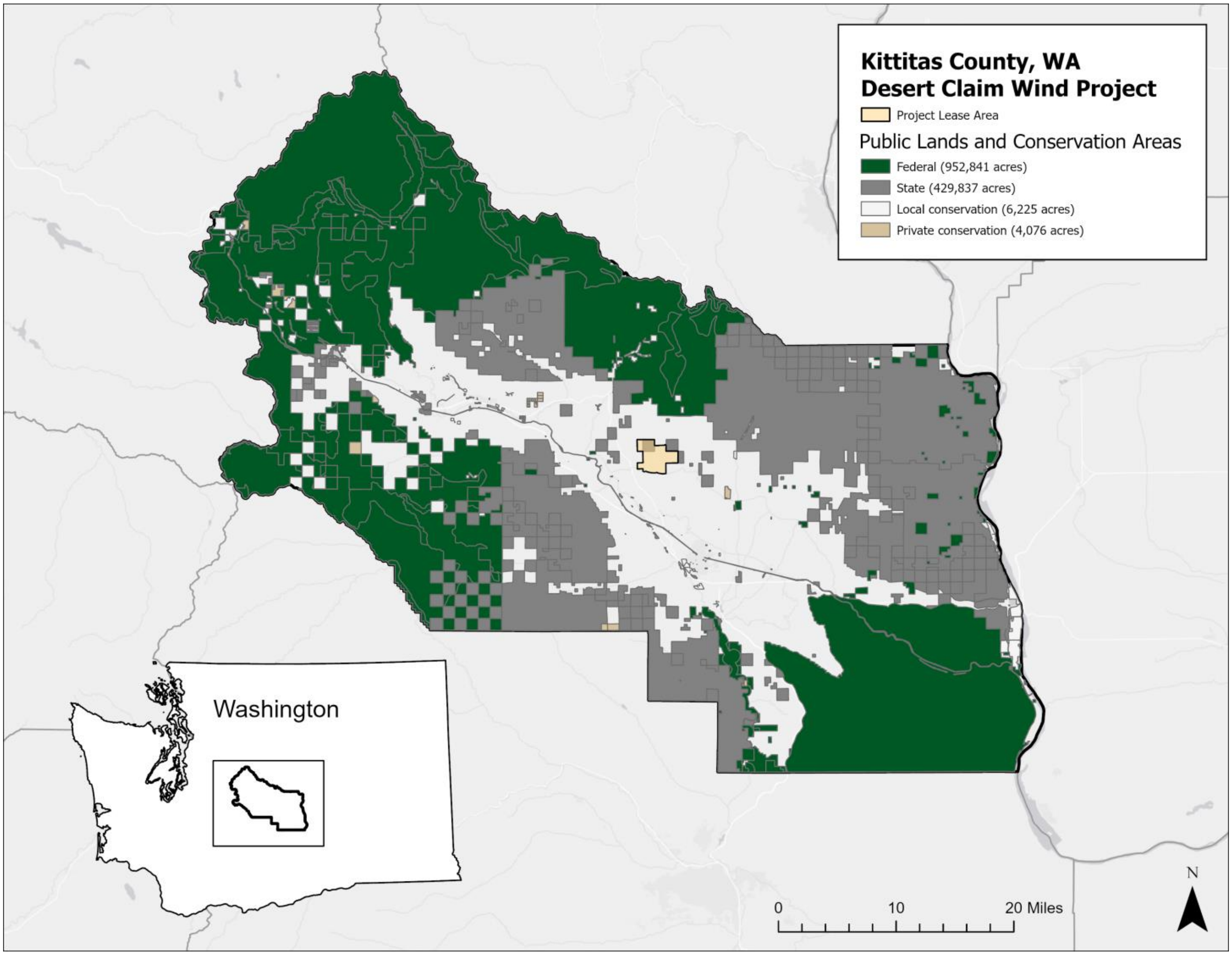
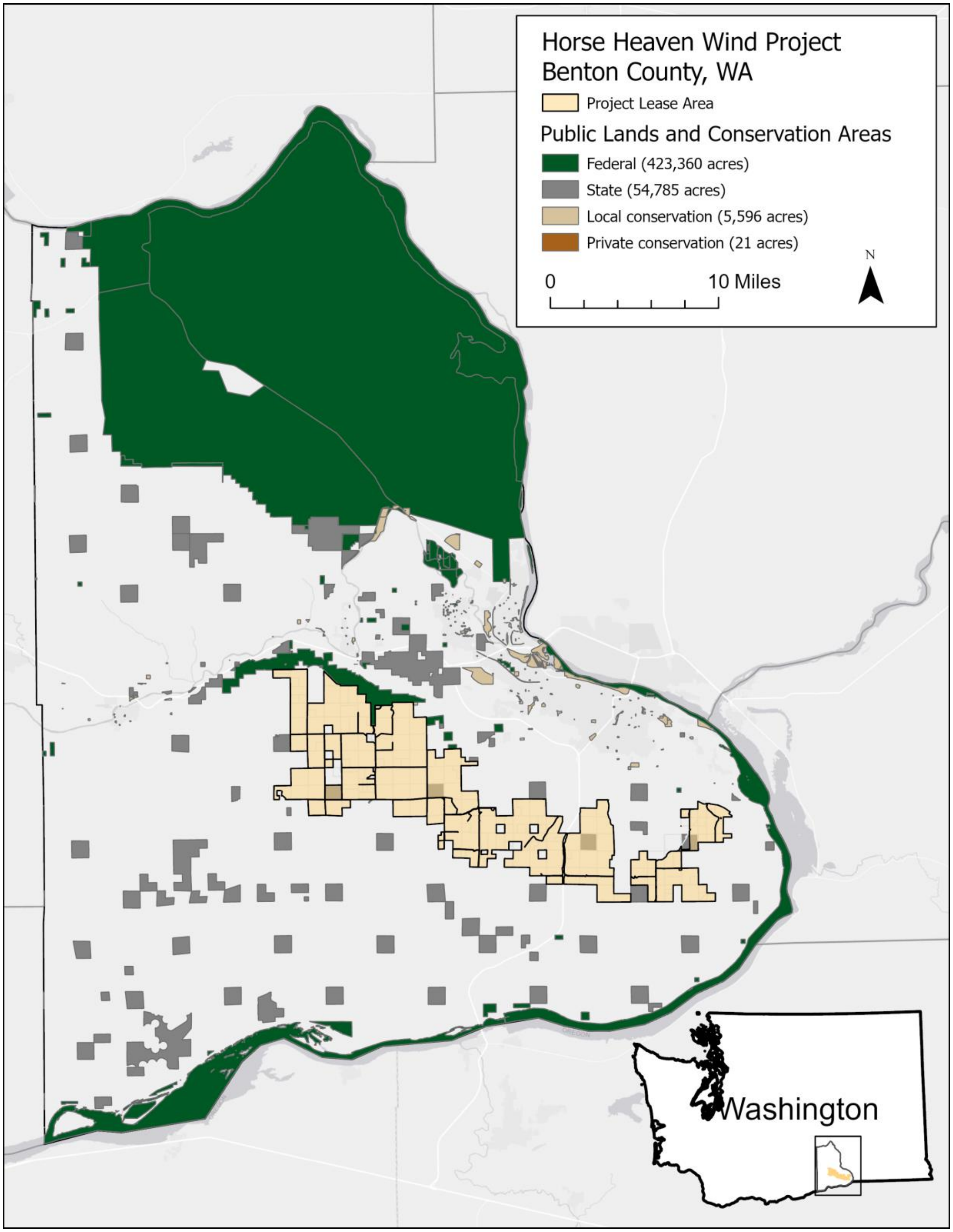
379 Low-income Energy Affordability Data Tool, Office of State and Community Energy Programs, 2022. Accessed on March 27, 2024 at https://www.energy.gov/scep/slsc/lead-tool.
380 U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
381 "Klickitat County Profile", Employment Security Department of Washington State, updated July 2022. Accessed on May 21, 2024 at https://esd.wa.gov/labormarketinfo/county-profiles/klickitat.
382 U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
383 "Benton County Profile", Employment Security Department of Washington State. March 2022. Accessed on April 29, 2024 at https://esd.wa.gov/labormarketinfo/county-profiles/Benton.
384 U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2022, Protected Areas Database of the United States (PAD-US), Version 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B. State data accessed on March 14, 2024 at https://www.sciencebase.gov/catalog/item/622262ded34ee0c6b38b6bd3.
385 "Kittitas County Profile", Washington State Employment Security Department. July 2022. Accessed on April 25, 2024 at https://esd.wa.gov/labormarketinfo/county-profiles/kittitas.

Figure B277. Land ownership in Klickitat, Benton, and Kittitas Counties, Washington.




Kittitas County, WA
Desert Claim Wind Project
Project Lease Area
Public Lands and Conservation Areas
Federal (952,841 acres)
State (429,837 acres)
Local conservation (6,225 acres)
Private conservation (4,076 acres)
Washington
0
10
20 Miles
N



Land Use

THE ISSUES // Some community members and other representative interests have expressed concerns that renewable energy projects may adversely affect local communities, both in terms of losses to productive lands for agriculture, as well as potentially resulting in reductions in the attractiveness of the area to tourism, recreation, or other development activities. In this section, we evaluate the potential impacts of each of the

three planned clean energy projects on land uses within the project lease area and discuss the likelihood of other potential effects on nearby land uses.

Like other areas in this part of the county, NASS data from 2023 suggests that most of the crops grown in the lease area are winter & spring wheat, hay, potatoes, and small areas of other crops. As shown in **Table B37**, across all three projects, over two thirds of the project area is used for agricultural purposes as of 2023. About two or three percent of the area is already developed, and the remaining land is occupied by grass or shrubland.

- At Carriger, 74.4 percent of the project area is used for crop production, with alfalfa, winter wheat, and barley being the most common crops. At average 2023 crop values, the value of the crops in the Carriger project area (1,791 crop acres) is approximately $1.3 million annually, or an average of $703 per acre in revenues.
- Around 81.0 percent of the Horse Heaven project area is used to produce crops such as winter and spring wheat. The total value of the 60,717 crop acres in the Horse Heaven project area is about $10.1 million annually at an average of $165.60 per acre in revenue.
- Though less than one percent of the Desert Claim project area is used for crop production, a large part of the “other” uses is likely used as pasture. Based on the project’s final EIS and IEc analysis of satellite imagery, we estimate this pasture area to be approximately 4,064 acres.[386] In 2023, average rent for pasture in Washington was $9 per acre, per year.[387] To the extent that the entire 4,064 acres are currently used as a rangeland, this suggests an annual revenue to landowners of $36,576. Finally, in the Desert Claim project area (15 crop acres), crop revenues totaled around $9,000 annually ($610/acre) in annual revenue.

Although the projects aren’t yet constructed, based on similar projects, we can estimate the percentage loss of land for each project. Wind projects typically lose approximately two percent of the total project area to project operations; the rest is usually able to retain its original use. Solar projects, however, tend to lose more land to project operations. Whereas wind turbines don’t physically occupy a large percentage of the ground in the project area, the installation of solar panels tends to prevent the land from being used as it was before.

- Given this information, we would expect 100 percent of the land within the Carriger Solar MPE to be lost to the project, resulting in an overall project area loss of 62.8 percent.
- Similarly, the maximum of 10,700 acres of land in the Horse Heaven project area sited for solar development will be completely lost to project operations, plus about two percent of the remaining land. In total, this implies that a maximum of 11,984 acres, or 16 percent of the total project area, will no longer be able to continue pre-project activity once construction begins.
- Desert Claim is expected to lose only two percent of its land to project-only use.

These estimates provide a sense of the general scale of changes in land use after these projects would be installed, but projects may change significantly a throughout the permitting, design, and approval process.388

[386] Desert Claim Wind Power Project: Final Environmental Impact Statement. August 2004.
[387] 2023 Cash Rent Per Acre, Pasture in Washington State. United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). Updated August 2023. Accessed on May 31, 2024 at https://quickstats.nass.usda.gov/.
[388] 2023 Washington State Agriculture Overview, United States Department of Agriculture (USDA) and National Agricultural Statistics Service (NASS). Accessed on March 6, 2024 at https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=WASHINGTON.

Table B37. Cropland acres within project area (2023)

Area	Carriger (Acres, percent of total)	Horse Heaven (Acres, percent of total)	Desert Claim (Acres, percent of total)
Crops	1,791 (74.4%)	60,717 (81.0%)	15 (0.3%)
Developed	82 (3.4%)	1,493 (2.0%)	77 (1.8%)
Other	536 (22.3%)	12,738 (17.0%)	4,260 (97.9%)
Total	**2,409 (100%)**	**74,948 (100%)**	**4,352 (100%)**

Source: 2023 Cropland Data

Financial Returns to Property Owners

THE ISSUES // Community members and lawmakers have inquired as to whether and to what extent the leasing of lands for renewable energy projects is beneficial or harmful to landowners. Primary concerns include both the short- and long-term community impacts, as well as whether adjacent landowners could be affected by these projects. Answering this question is made somewhat challenging due to the confidential nature of the agreements made between landowners and project developers and is further complicated by the variety of characteristics that affect neighboring property values. This section evaluates the potential effects of each of the three planned clean energy projects on landowners in within the project County.

As is common practice with clean energy project development in rural areas, land parcels in the project area are usually leased to the project owner and most retain their original land ownership status. Property owners within the leased areas typically enter into lease agreements with the project owners for a pre-development period (typically ranging from two to five years in duration). After the design of the project is established, landowners for which physical infrastructure is developed are further compensated on a per acre basis at an established fee. While these agreements are generally confidential to the parties engaged, some agreements made with public entities are made public that provide insights into these payments. All three planned projects overlap with at least one parcel of state-owned land; any public lease agreements between the developer and the state may help estimate lease terms for private landowners.

Table B38 summarizes hypothetical leasing payments for the three planned projects using publicly available leasing rates.[389] These are illustrative and intended to provide an example of potential payments to

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[389] While it is difficult to directly compare leases given the variety of factors likely considered in individual agreements, several publicly available estimates provided similar annual values. Wind Exchange from the DOE estimated $7,800 per MW in the west (https://windexchange.energy.gov/economic-development-guide), Windustry estimates $4,000 to $8,000 per turbine or $3,000 to $4,000 per MW (https://www.windustry.org/how_much_do_farmers_get_paid_to_host_wind_turbines) and a recent presentation at a USDA forum presented $10,000 as an example (https://www.usda.gov/sites/default/files/documents/2023aof-Sherrick.pdf). Based on these rates and the uncertainty of these projects, we use a range of $3,000 to $7,800 for the estimate of returns for landowners in the Desert Claim and Horse Heaven Wind project areas.
Solar payments tend to be lower dollar amounts but on a per acre basis. BLM rents range from $18.61 per acre up to $62,000 per acre depending on the zone with a median of $400 per acre in zone 8 (https://www.blm.gov/sites/default/files/policies/IM2021-005_att5.pdf, https://www.blm.gov/sites/default/files/policies/IM2021-005_att1_0.pdf). Kittitas County is in Zone 4 ($108/acre) and Benton County is in zone 6 ($216/acre). The Strategic Solar Group lists a broad range of $300 to $2,000 per acre as a standard range, noting that a variety of factors, including proximity to a substation influence the leasing rate (https://strategicsolargroup.com/what-is-the-average-solar-farm-lease-rate/). They note that in California's Central Valley leases are typically around $1,000 per acre. Based on these rates and the uncertainty of these projects, we use a range of $216 to $1,000 per acre for the estimate of returns for landowners in the Horse Heaven Solar project area and $108 to $1,000 per acre for landowners in the Carriger Solar area.

landowners. This example does not include any payments during pre-development or additional payments such as bonus payments and access payments (e.g., for roads).

Table B38. Estimated leasing rates and payments to landowners.

Project	Wind MWs	Turbines Rent Per MW	Turbine Annual Payments	Solar Acres Leased	Solar Rent per Acre	Solar Annual Payments	Total Annual Payments
Carriger Solar	--	--	--	2,409	$108 to $1,000	$260,000 to $2.4 million	$260,000 to $2.4 million
Horse Heaven	175 to 350	$3,000 to $7,800	$525,000 to $2.7 million	10,700	$216 to $1,000	$2.3 million to $11 million	$2.8 million to $13 million
Desert Claim	100	$3,000 to $7,800	$300,000 to $780,000	--	--	--	$300,000 to $780,000

This table is an illustrative example of potential lease payments using publicly available leasing estimates. It is not indicative of actual lease agreements made for these proposed projects. Leasing rates vary considerably and any change to project plans would affect these estimates.

Taxes

THE ISSUES // Projects bring tax revenues to counties. However, there have been questions raised about whether the impacts are sustained over time and how the changes to tax payments over time affect the counties in which they are located, particularly as projects depreciate over time.

Since these projects have not yet been constructed, they have not paid at taxes (real, personal or sales). **Table B39** presents an estimated effect of the projects on taxes. This is a hypothetical example using prevailing tax rates as of 2023. All three projects, if constructed as currently planned would represent over 1 percent of their county's tax base as of 2023.

Table B39. Planned project estimated personal property and sales tax payments.

Project	County	Assessed Value (2023 dollars)[a]	2023 County Levy	Personal Property Taxes (2023 dollars)[b]	Sales Taxes (2023 dollars)	Total County Taxes Collected (2023 dollars)	Personal Property % of County Tax Roll
Carriger Solar	Klickitat	$205 million	0.656%	$1 million	$11 million	$105 million	1.3%
Horse Heaven	Benton	$1.5 to $1.8 billion	0.874%	$13 million to $16 million	$99 million to $118 million	$252 million	5.2% - 6.2%
Desert Claim	Kittitas	$153 million	0.801%	$1 million	$8 million	$106 million	1.2%

This table is intended to be illustrative and hypothetical. Should levy rates, assessment approaches, or project details change, the amount of taxes collected would change. In addition, real property taxes are excluded from this table given uncertainty on how those taxes may change once a project is developed.

[a] We assume assessed values are approximately equivalent to estimated construction costs applied in our job impacts analysis.
[b] Personal Property tax payments were estimated using the 2023 levy rate for each Project County and the estimated assessed values.

Jobs

THE ISSUES // Community members and representative interests have inquired about how much effect renewable energy projects have on local employment. This section describes information that we have

gathered about the extent of potential impacts that project construction and operations may have on local employment.

Direct Investments

For each planned project, we calculate direct investments using an input-output model for each involved technology. for solar photovoltaic and on-shore wind components of a system, we estimate total project costs using the Jobs and Economic Development Impact (JEDI) input-output model built by NREL for either solar photovoltaic or on-shore wind energy development.

For solar photovoltaic system components, we use the model assumption that solar photovoltaic project installation and capital expenditure costs are $1,030 per kW in the State of Washington (2023 USD). Similarly, we assume that project operation and maintenance (O&M) costs are $20 per kW (2023 USD).

For onshore wind system components, we use the model assumption that wind energy project installation and capital expenditure costs are $1,531 per kW in the State of Washington (2023 USD). Similarly, we assume that project O&M costs are $38 per kW (2023 USD).

For the battery energy storage system (BESS) components, our methodology varies by project. For the Carriger Solar Project, we estimate costs using BESS cost estimates from Magnum Economics (2022).[390] For the Horse Heaven Clean Energy Center, we estimate costs using an average BESS capital cost of $1,353 per kW (2023 USD) for the Northwest (NWPP) region of the United States of America from U.S. EIA's Annual Energy Outlook (AEO).[391] We then use the input-output model IMPLAN to evaluate the impacts of this component on the Washington State economy.[392],[393]

- Using these assumptions, we estimate total Carriger Solar Project construction and installation costs to be approximately $205 million (2023 USD), and O&M to cost $3.2 million (2023 USD).
- Horse Heave Clean Energy Center is estimated to cost between $1.5 and $1.8 billion (2023 USD) for construction and installation, and between $23 and $30 million (2023 USD) for O&M.
- We estimate total Desert Claim Wind Farm construction and installation costs to be approximately $153 million (2023 USD), and O&M to cost $4 million (2023 USD).

Employment

Table B40 presents occupations of residents within each planned project's lease area census tract, project County, and the State of Washington, as broadly grouped by the American Community Survey.

- For the Carriger Solar Project, occupations that include natural resources and construction are high in the relevant census tracts (13 percent) as well as Adams County (29 percent) when compared with the Washington State average (9.4 percent). For the Carriger Solar Project, occupations that include natural resources and construction are high in the relevant census tracts (13 percent) as well as Klickitat County (15.5 percent) when compared with the Washington State average (9.4 percent).

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390 Mangum Economics. (2022). Carriger Solar Economic & Fiscal Contribution to Klickitat County and the State of Washington. Prepared for Cypress Creek Renewables. Available at https://www.efsec.wa.gov/sites/default/files/230001/001/Attachment_J_Carriger_Socioeconomic_Report.pdf.

391 U.S. Energy Information Administration. 2023. Cost of Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2023. Available at https://www.eia.gov/outlooks/aeo/assumptions/pdf/elec_cost_perf.pdf.

392 For this estimate, we classify our input expenditures as a Commodity Input to the "Storage Batteries" category (IMPLAN Industry 3333) within the State of Washington. This IMPLAN Industry assumes 48.3 percent of expenditures are spent in the State of Washington per IMPLAN's Social Accounting Matrix (SAM).

393 We were unable to identify expenditures associated with the O&M costs of the BESS component.

- For the Horse Heaven Clean Energy Center, occupations that include natural resources and construction are high in the relevant census tracts (27.9 percent) as well as Benton County (12.2 percent) when compared with the Washington State average.
- For the Desert Claim Wind Project, occupations that include natural resources and construction are high in the relevant census tracts (13.3 percent) as well as Kittitas County (9.7 percent) when compared with the Washington State average.

Table B40. Occupation of residents on and nearby Planned Clean Energy Projects, 2018 - 2022.

Metric	Census tracts intersected by Carriger Solar[a]	Klickitat County	Census tracts intersected by Horse Heaven*	Benton County	Census tracts intersected by Desert Claim*	Kittitas County	State of Washington
Management/Business/ Science/Arts	357 (31.2%)	4,211 (44.1%)	347 (33.7%)	39,271 (41.6%)	1,239 (47.1%)	8,300 (37.6%)	1,664,322 (44.4%)
Sales/Office	281 (24.6%)	1,392 (14.6%)	150 (14.5%)	16,937 (17.9%)	522 (19.8%)	4,416 (20.0%)	697,384 (18.6%)
Service	297 (26.0%)	1,370 (14.4%)	125 (12.1%)	15,241 (16.1%)	271 (10.3%)	5,013 (22.7%)	595,994 (15.9%)
Production/Transportation/ Material Moving	60 (5.2%)	1,094 (11.5%)	121 (11.7%)	11,422 (12.1%)	252 (9.6%)	2,214 (10.0%)	443,300 (11.8%)
Natural Resources/ Construction/Maintenance	149 (13.0%)	1,480 (15.5%)	288 (27.9%)	11,553 (12.2%)	349 (13.3%)	2,146 (9.7%)	351,076 (9.4%)
Total	**1,144 (100%)**	**9,547 (100%)**	**1,031 (100%)**	**94,424 (100%)**	**2,633 (100%)**	**22,089 (100%)**	**3,752,076 (100%)**

[a] Carriger intersects Census Tract 9501.02 and Desert Claim intersects Census Tract 9753. Horse Heaven intersects six Census Tracts: 108.07, 108.14, 115.01, 115.06, 116, 118.01. The above values for Horse Heaven are a weighted average by project acreage overlap.
Source: 2022 ACS 5-Year Survey.

We developed a modeled estimate of job effects of the project using JEDI to evaluate the potential impacts of the planned clean energy projects on the Washington State economy (**Tables B41** and **B42**). The JEDI model estimates the direct, as well as the indirect (supplier) and induced (consumer spending) effects associated with planned project expenditures.

Table B41 presents estimates for the planned clean energy projects for the construction phase. These results are highly uncertain given the potential for changes in proposals and plans for these three projects. However, they each support hundreds of jobs during the construction phase as well as millions in contributions to the regional economy of Washington.

Table B41. Regional economic impacts of Planned Clean Energy Projects in Washington, Construction Phase

Project Name	Estimated Project Costs (2023 USD)	Projected Jobs (Full-time equivalents)	Projected Earnings (2023 USD)	Projected Output (2023 USD)
Carriger Solar	$205 million	890	$60 million	$140 million
Horse Heaven Clean Energy Center	$1.5 billion to $1.8 billion	5,600 – 6,000	$410 million to $440 million	$0.94 to $1.0 billion
Desert Claim Wind	$153 million	360	$27 million	$62 million

Source: IEC analysis. For Carriger Solar and Horse Heaven, project costs for the solar photovoltaic component of the system are estimated by taking the product of the project's rated capacity and the solar photovoltaic JEDI model's default average cost value of $1,030 per kW (including sales tax) for the state of Washington. Job impacts associated with the battery energy storage component are estimated by inputting costs from Magnum Economics (2022) into the input-output model IMPLAN, assuming 48.34% of expenditures are spent in the state of Washington per IMPLAN's Social Accounting Matrix (SAM). For Horse Heaven and Desert Claim, project costs are estimated by taking the product of the project's rated capacity and the onshore wind JEDI model's default average cost value of $1,531 per kW (including sales tax) for the State of Washington.

Note – Impacts include direct, indirect, and induced effects of construction spending, which are assumed to include spending on labor, materials, equipment, permitting, and taxes. Some materials and equipment costs are assumed not to be spent locally. Estimated project costs include both in-state and out-of-state expenditures. Both JEDI and IMPLAN are run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality). FTEs have a duration of one year.

Table B42. Regional economic impacts of Planned Clean Energy Projects in Washington, O&M Phase, Annual

Project Name	Estimated Operation and Maintenance Costs (2023 USD)	Projected Jobs (Full-time equivalents)	Projected Earnings (2023 USD)	Projected Output (2023 USD)
Carriger Solar	$3 million	39	$3 million	$4 million
Horse Heaven Clean Energy Center	$23 million to $30 million	230 - 260	$15 million to $18 million	$28 million to $33 million
Desert Claim Wind	$4 million	15	$1 million	$3 million

Source: IEC analysis. For Carriger and Horse Heaven, O&M costs for the solar photovoltaic component of the system are estimated by taking the product of the project's rated capacity and the solar photovoltaic JEDI model's default average cost value of $20 per kW for the State of Washington. For Horse Heaven and Desert Claim, O&M costs are estimated by taking the product of the project's rated capacity and the onshore wind JEDI model's default average cost value of $38 per kW for the State of Washington. Due to data limitations, estimates reflect annual job impacts associated with operation and maintenance of only the solar and/or wind component of the system, but do not include impacts associated with the O&M of the battery storage facility. FTEs have a duration of one year.

Note - Impacts include direct, indirect, and induced effects of O&M spending, which are assumed to include spending on labor, materials, equipment, and other services. O&M expenditures are assumed to be spent in the State of Washington. The JEDI model is run at the state-level, meaning any local expenditures and job estimates are associated with in-state impacts and not impacts at finer spatial scales (e.g., county, municipality).

Mitigation Impact Payments/Economic Development Assistance

THE ISSUES // Communities and representative interests have inquired whether and to what extent renewable energy projects provide investments to communities in which they are located. As discussed above, the projects typically provide payments to landowners in lease areas. In addition, the projects pay

personal property taxes that are collected by the counties in which they are located. This section discusses some additional payments that the projects could provide to communities.

Clean energy development in rural areas is sometimes accompanied by local economic development. Developers may choose to provide additional economic benefits to the local communities impacted by the incoming project. Across similar utility-scale developments in Washington, developers have donated to local charities or organizations, established scholarships, agreed to a Project Labor Agreement, or directed a portion of project revenue to fund local development costs. Though none of the three planned projects have explicitly stated intentions to provide economic development assistance to nearby communities, it is likely that any actions taken would be like those seen previously by other nearby developers.