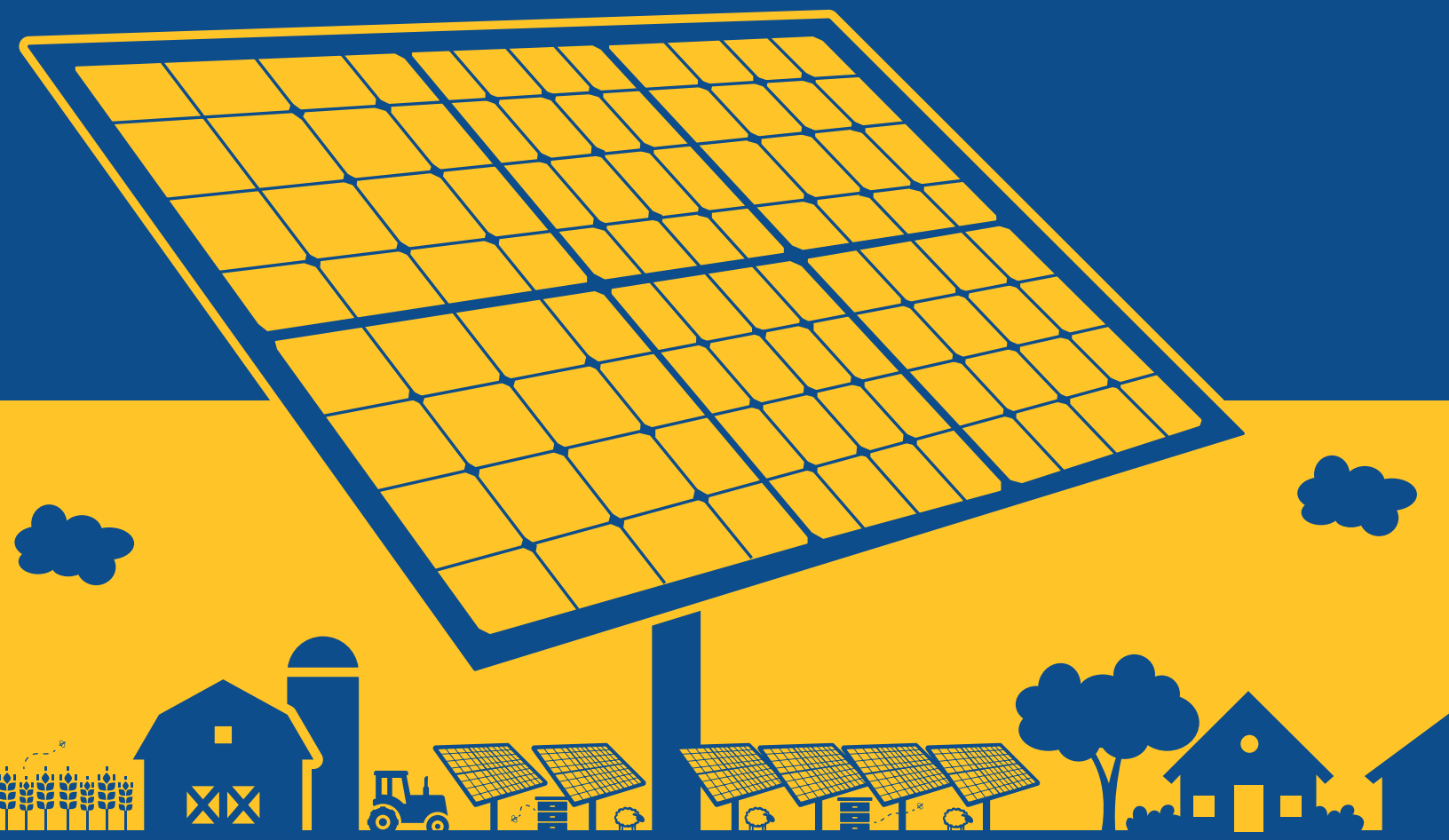

Strengthening Small Farms and Their Communities Through Solar Farming

Ridge View 350 MW Solar PV Project Social and Economic Impact Assessment

Craig A. Hart | April 2022

Pace Energy and Climate Center
ELISABETH HAUB SCHOOL OF LAW

PACE ENERGY AND CLIMATE CENTER

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ABSTRACT

This study assesses the social and economic impacts of a 350 MW solar PV project to be installed on approximately 40 farms in the Town of Hartland, Niagara County, New York area by EDF Renewables.

In total, this study identifies between $177 million to $229 million in revenues and other benefits delivered by the project to the Niagara region and the Hartland community. The study demonstrates that the project will increase and diversify participating farm revenues, support community investment, create jobs for construction and maintenance, and increase spending in the local community, helping create opportunities for diversifying the local economy.

The study recommends careful project siting practices, including setbacks and visual buffers, mitigate potential aesthetic and environmental impacts, thereby ensuring the preservation of community welfare and land values.

ACKNOWLEDGEMENTS

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Pace Energy and Climate Center is grateful to the residents of the Hartland community who made themselves available for interviews.

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1 Ridge View Solar Project Overview

EDF Renewables proposes to develop the 350 MW Ridge View Solar Project in the Town of Hartland in Niagara County, New York. EDF Renewables initially proposed the project in Spring 2019 to be completed by late 2025.[1]

1.1 THE PROJECT

The Hartland area was selected as the project site because high voltage electricity transmission lines with capacity to accommodate additional generation run through the community. The lines were originally constructed to serve the coal-fired AES Somerset Power Plant, which shut down in March 2020, and the transmission lines are now underutilized.

A 350 MW project will deploy between 750,000 to 1 million solar panels rated at 500 to 600 watts. The project is expected to contain 90 to 100 4.2 MW inverters, roughly one every 15 acres of solar panel area.

At 350 MW, the project will power approximately 88,500 homes, roughly the number of households in Niagara County.[2]

EDF Renewables will set aside financial security in favor of the Town of Hartland for decommissioning the system pursuant to the requirements specified by New York State regulations. Per these regulations, the security will be equal to the gross decommissioning and site restoration estimate, plus a 15 percent contingency cost, less the total projected salvage value of facility components.[3] Additionally, Niagara County requires the project developer to establish a plan for funding the cost of collection, management and recycling of solar panels when retired from service.[4]

1.2 LOCAL ECONOMIC BENEFITS

The solar PV installations will be located on roughly 40 locally-owned properties, many of them family farms, some of which have been handed down since the mid-1800s.[5]

Many of the farms are non-contiguous, distributed throughout the area. The minimum threshold for a property to host solar panels in the Project is approximately 20 acres, excluding setbacks, however smaller properties may participate where they are adjacent to other participating farms and panels can be installed across common property boundaries.[6] Solar arrays are expected to be about 3 feet above grade, with rows 10 feet apart, and solar tracking east to west, enabling co-locating certain agricultural activities, like sheep grazing and apiary agricultural activities.

1 EDF Renewables, Ridge View Solar Landowner Meeting PowerPoint, March 16, 2021.

2 The calculation of homes served is based on 350 MW electricity at a conservative net capacity factor of 20%. Ridge View will produce 613,200,000 kwh per year (350 MW * 8,760 hours/year * 20% * 1,000 kW/MW). Utilizing U.S. Energy Information Administration data for 2018 average monthly residential electricity consumption in New York State, average power consumption per home is 6,924 kWh/home/year. See U.S. Energy Information Administration, Residential Average Monthly Electricity Bill, Consumption, and Price, by State, by Sector, October 12, 2018. Available at: https://www.eia.gov/state/search/#?1=102&3=21&6=134&a=true&2=215 (accessed September 19, 2021)

3 Regulations Implementing Section 94-C, New York State, Chapter XVIII, Title 19 of NYCRR Part 900, §900-6.6.

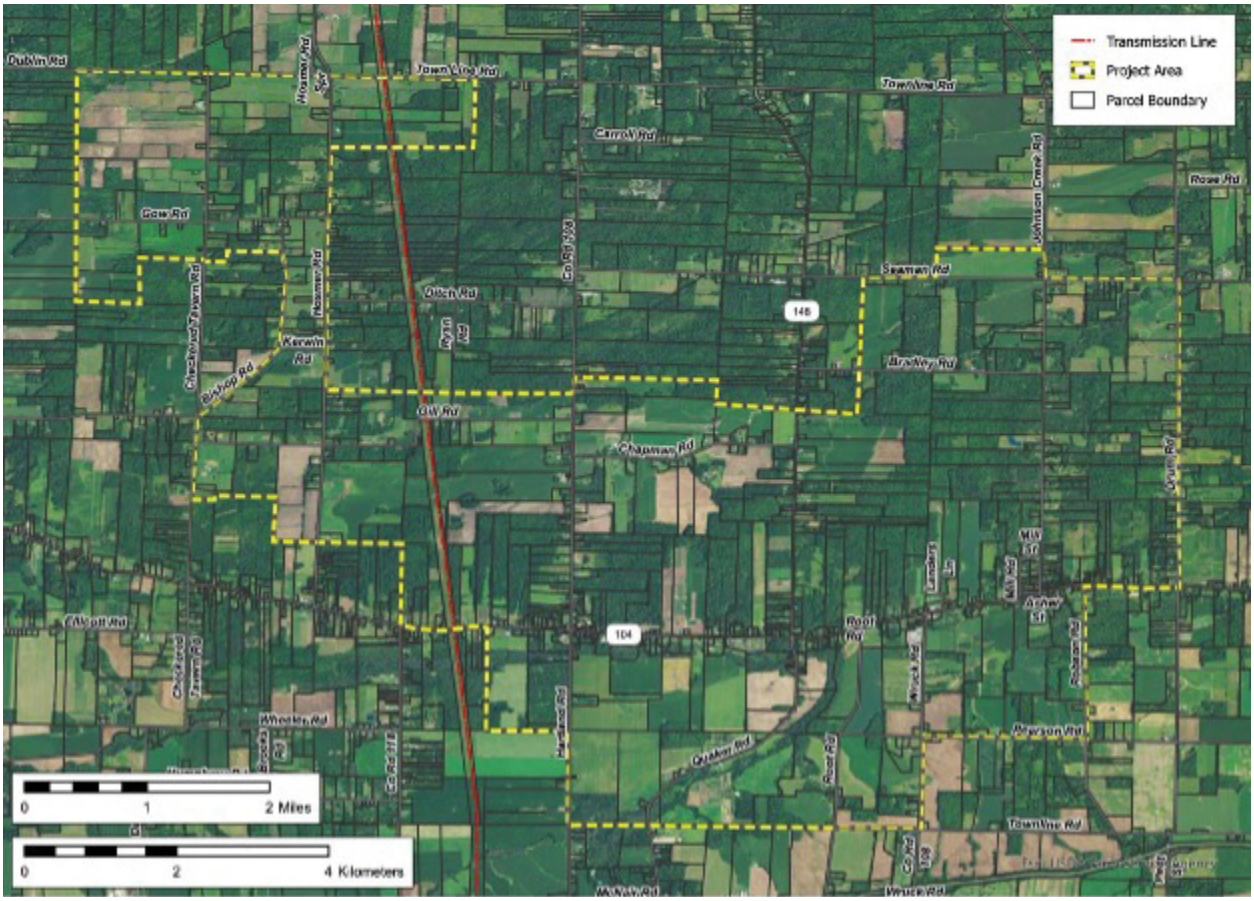
4 Niagara County Local Law Establishing Solar Panel Recycling Regulations, adopted June 15, 2021.

5 EDF Renewables (2021), *supra* note 1.

6 EDF Renewables adopted the 20-acre threshold based on the present state of inverter technology. Personal communications, EDF Renewables, May 15, 2021.

In total, EDF Renewables has subscribed over 3,000 acres of land, of which roughly 2,000 acres would accommodate solar panels, taking into account setbacks, physical constraints and project needs.[7]

Figure 1. **RIDGE VIEW SOLAR PROJECT AREA**



Source: EDF Renewables

Participating farms will be paid under a lease for land hosting solar panels. Annual payments will also be paid for hosting the project substation, collection lines for connecting the solar farm sites and a short transmission line to connect the project substation to the existing 345 kV transmission line.

Both land leases and easements are contracted for at least the expected duration of the project. Total land lease and easement payments are expected to be $2.25 million per year, escalating at 2 percent per year, totaling over $91 million over 30 years.

EDF Renewables proposes to invest approximately $400 million to construct the project. The project has already employed dozens of individuals from upstate New York performing site surveys, permitting, community engagement, engineering studies and other activities on a part-time or temporary basis. During the construction phase, EDF Renewables estimates that approximately 400 full-time equivalent years of employment will be created, perhaps accommodating 300 individuals at peak. Construction is expected to last for a period of two years. Once operating, EDF Renewables anticipates employing four permanent staff in maintenance and support roles and providing temporary work for contractors and farmers for periodic facility maintenance like equipment maintenance, landscaping, snow clearing and agrivoltaic activities.

In addition to permanent staff, EDF Renewables will employ third parties to maintain vegetation at the solar sites, remove snow, maintain roads, maintain site facilities and substations, maintain panels, and replace or repair

7 EDF Renewables (2021), *supra* note 1.

racking and electrical components. Over 30-years, local third-party maintenance services inject an additional $11.3 million to the local economy.

Beyond payments to property owners and salaries, EDF Renewables proposes to negotiate a Payment In Lieu of Taxes (PILOT) agreement with the Niagara County Industrial Development Agency for the benefit of the local tax authorities under which EDF Renewables will make payments in lieu of the additional real property taxes that would otherwise have been collected as a result of increases in assessed value due to improvements resulting from the solar project but for the clean energy systems exemption. New York State law exempts any increase in the property value attributable to the addition of a solar panel system from local property taxes. The municipality can opt-out of making the exemption available, however the exemption provides an important economic incentive for property owners to adopt solar and enhances the economics of solar energy projects.

The Town of Hartland, Niagara County, Barker Central School District and Royalton-Hartland Central School District will continue to collect local property tax revenues from participating farms at the pre-solar project rates. Additional contributions to the taxing jurisdictions are expected to be negotiated through the Payment In Lieu of Taxes (PILOT) agreement to be negotiated with Niagara County Industrial Development Agency and Host Community Benefit (HCA) agreement to be negotiated with the Town of Hartland. The contributions negotiated for both agreements will be paid by EDF Renewables. As a result, any additional property tax that would have been assessed due to increases in assessed value in respect of the solar project improvements will be partially compensated under the PILOT agreement and paid by EDF Renewables. The property owner will thus be exempt from increases in property taxes due to the solar project.

During the operation phase of the Ridge View project, EDF Renewables proposes to make combined PILOT and Host Community Agreement payments of $1 million annually, escalating 2 percent per year, investing $40 million in total into the community over 30 years. The Town of Hartland, Niagara County, Barker Central School District and Royalton Hartland Central School District can use these funds on a discretionary basis, freezing or reducing taxes and/or investing in infrastructure upgrades, education or services.

Additionally, the conversion of land from agricultural use to hosting solar panels could potentially result in loss of the agricultural tax exemption for that land. The loss of the agricultural exemption will result in increases in property taxes to be paid by the developer directly to the tax authorities under the lease agreement, and not borne by the participating farms, thereby representing additional income for local tax authorities. EDF Renewables will make additional tax payments to taxing authorities pursuant to the land lease agreements for tax liabilities that result from loss of agricultural exemption tax on properties used by the solar project.

Finally, EDF Renewables will make special district tax payments for fire, water and refuse with respect to solar project improvements, as exemptions are not available for special district taxes.

The amounts proposed under the PILOT Agreement, Host Community Agreement and the additional taxes collected due to the rollback of the agricultural exemption will provide the taxing jurisdictions with over eight times more revenue than the current taxes generated from farming.[8]

EDF Renewables has also pledged to establish a Host Community Fund of $40,000 per year for the community during construction and the first 10 years of operation. The fund will be distributed to local initiatives, such as youth sports and clubs, American Legion, volunteer fire companies, and the historical society. These funds would be administered by a local committee established for this purpose. These payments will total at least $480,000.

Under the New York Public Service Commission Host Community Benefit Program, $500 per MW installed for the first ten years of operation will be devoted to providing rebates for Hartland residents residential electricity bills. The rebate is worth $175,000 annually to be shared among residents against their utility bills. Based on 1,526 households in the Town of Hartland, this would result in approximately $100 per year rebate per household.

The project would also generate additional business opportunities. Among these, EDF Renewables is investigating co-locating agriculture such as hosting pollinators and grazing sheep within the solar facility. EDF Renewables

8 Taxes on participating farm parcels are approximately $122,00 per year as of 2021 based on tax records for participating farms (analysis on file with author).

already hosts these activities at their 200-acre Arnprior Solar facility.[9] If such initiatives are implemented and managed by landowners or community members, they could earn additional income.

Table 1. **SUMMARY OF BENEFITS**

Type	Frequency	Amount	Total Over Project
PILOT and Host Community Agreement Payments	Annual over 30 years	$1 million per year, escalating 2% annually	$40.5 million
Additional Taxes due to Loss of Agricultural Exemption	Annual over 30 years	$34,600 per year, plus a one-time rollback tax penalty with interest of $210,000, escalating 2% annually	$1.6 million
Community Benefit Fund	Annual over 10 years + 2 years construction	$40,000	$480,000
NY PSC Host Community Benefit Program	$500 per MW capacity for 10 years ($500 x 350 MW)	$175,000 annually for 10 years	$1,750,000
Solar Lease/Easement Payments	Annual over 30 years	$2.25 million per year, escalating 2% annually	$91 million
Additional Local Spending	Annual over 30 years	$437,000 per year in additional consumption, at least half spent locally, escalating 2% annually	$8.8 million, assuming 50% of additional consumer spending spent locally
Business Investment in the Local Community	Annual over 30 years	$190,000 per year, escalating 2% annually	$7.7 million
Additional Hiring	Annual over 30 years	$45,000, escalating 2% annually	$1.8 million
Preconstruction Jobs	3-year period	Not Estimated	
Construction Jobs	3-year period	Up to $52.5 million	
Operational Jobs	30-year period	$400,000 per year assuming four positions at average $100,000 per year	$12 million, excluding benefits and escalation
Third Party Local Operations Support	30-year period	Variable annual costs, escalating for inflation	$11.3 million
New Business Opportunities	30-year period	Not Estimated: depends on individual initiative; see discussion in section 5.5 of this paper	
Total Payments – Nominal Value (depending on construction jobs): $177.0 to 229.4 million			
Total payments, $/acre/yr (assuming 30 years of operation): $177.0 to $229.4 million/2,000 acres/30 years = $2,949 to $3,824			

Source: Author's calculations.

9 EDF Renewables (undated) Corporate Social Responsibility Case Study: Arnprior Solar Project. Available at: https://www.edf-re.com/flipbook/670 (accessed December 7, 2021).

Over a 30-year period, the project is expected to generate revenue to local landowners and businesses averaging $2,949/acre to $3,824/acre each year over the expected period of operation from 2026 to 2055, the range depending upon the extent to which construction jobs are sourced in the immediate community. Compared to average gross farm income in Niagara County of $1,080 per acre, the Ridge View Solar Project will generate up to three and a half times the revenue of agricultural production.[10]

1.3 PERMITTING

The Ridge View Solar Project has commenced the approval process under New York State's Public Service Law, Article 10, by filing its Public Involvement Program Plan in 2019. Article 10 governs siting of electric generating facilities with 25 MW generating capacity or more. The plan explains the project to the community and how EDF Renewables proposes to engage stakeholders throughout the project permitting process. As part of this process, EDF Renewables consults with the Town of Hartland authorities on applicable procedural and substantive local laws.

In 2020, New York State enacted the Accelerated Renewable Energy Growth and Community Benefit Act, which established a new process for siting renewable energy projects over 25 MW under Section 94-c of New York State's Executive Law. Section 94-c also created the Office of Renewable Energy Siting (ORES) to make determinations for renewable permits, removing jurisdiction under Article 10 proceedings for renewables siting from the New York State Board on Electric Generation Siting and the Environment, a multi-agency siting board within the Department of Public Service. Projects that have filed permit applications under Article 10, such as Ridge View, may opt-in to the more streamlined Section 94-c siting process, which is based in part on Article 10 practice. All future renewable projects of 25 MW or larger must file under Section 94-c.

Under Article 10 and Section 94-c, the siting agency has 60 days to review an application and determine whether it complies with applicable requirements.

Section 94-c streamlines the process by establishing a 60-day period by which the application is deemed complete unless the agency affirmatively finds it incomplete, followed by a subsequent 60-day public comment period. To find an application complete, the record must contain proof the applicant consulted with the host municipalities and communities. Applicants are required to work with host municipalities in which the proposed facility is to be located, conduct a variety of studies, consult with regulators, obtain environmental approvals from ORES prior to applying, and file an application including exhibits addressing areas of impacts on land use, public health, safety and security, noise and vibration, cultural resources, endangered and threatened species, visual impacts, water quality, and wetlands.

During the Section 94-c comment period, the host municipality is to file a statement "indicating whether the proposed facility is designed to be sited, constructed and operated in compliance with applicable local laws and regulations, if any, concerning the environment, or public health and safety."[11] Following the public comment period, the agency may set the matter for an adjudicatory hearing to hear arguments or to rule on the application.

Under Section 94-c, ORES is required to issue a permit within 12 months of the application being deemed complete, similar to the requirements for the State Siting Board under Article 10. Like Article 10, ORES may issue a permit only if it finds that any significant adverse environmental impacts have been avoided or minimized, that a review of applicable local zoning laws has been completed, and that the application complies with applicable

10 USDA (2017) Census of Agriculture County Profile: Niagara County, New York. Average gross farm income calculated as the sum of per farm average market value of products sold, government payments and farm-related income, divided by average farm size in acres.

11 New York Consolidated Executive Laws, Executive Law Section 94-C(5)(c)(ii).

laws and regulations. Under Section 94-c, in making its determination of compliance, ORES may elect to not apply local law and ordinances in favor of a uniform set of standards and conditions set out in the Regulations Implementing Section 94-c:

> A final siting permit may only be issued if the office makes a finding that the proposed project, together with any applicable uniform and site-specific standards and conditions would comply with applicable laws and regulations. In making this determination, the office may elect not to apply, in whole or in part, any local law or ordinance which would otherwise be applicable if it makes a finding that, as applied to the proposed major renewable energy facility, it is unreasonably burdensome in view of the CLCPA targets and the environmental benefits of the proposed major renewable energy facility.[12]

Under Section 94-c, ORES must issue a final decision on the siting permit within one year of the date on which the application is deemed complete.

Article 10 and Section 94-c both require that project applicants establish an intervenor fund of $1,000/megawatt to support participation in the permit application review process by the host community.

While pursuing approval through Article 10, or potentially opting into the Section 94-c procedures, EDF Renewables has committed to actively engage with the Town of Hartland in designing the project. Pursuant to Section 94-c, ORES established uniform standards and conditions set out in the Regulations Implementing Section 94-c,[13] which specify that solar panel arrays shall not exceed 20 feet in height from grade, and specifies setbacks from non-participating properties, reproduced in the table below.

Table 2. **SETBACK REQUIREMENTS FOR SOLAR FACILITY COMPONENTS**

Setback Type	Setback
Non-participating residential property lines	100 feet
Centerline of public roads	50 feet
Non-participating property lines (non- residential)	50 feet
Non-participating occupied residences	250 feet

Source: Regulations Implementing Section 94-c, New York State, Chapter XVIII, Title 19 of NYCRR Part 900, §900-2.6(d).

12 New York Consolidated Executive Laws, Executive Law Section 94-C(5)(e).

13 New York State, Chapter XVIII, Title 19 of NYCRR Part 900, §900-2.6(e).

1.4 CONTRIBUTION TO NEW YORK STATE CLEAN ENERGY GOALS

The project will contribute 350 MW of renewable electricity generation to the State of New York, which would power roughly 88,500 homes,[14] roughly the number of households in Niagara County.[15]

The project is an incremental but important step towards meeting New York State's clean energy goals under the Climate Leadership and Community Protection Act (CLCPA), which mandates ambitious state-wide greenhouse gas emissions reductions of 40 percent from 1990 levels by 2030, and 85 percent reductions by 2050.[16] The CLCPA further requires that 70 percent of electricity generation must be derived from renewable energy by 2030,[17] and 100 percent of the state's electricity must be emission free by 2040.[18]

1.5 TRANSMISSION LINE CAPACITY

In New York State and nationwide, limited transmission line capacity has constrained the expansion of solar and wind resources, making communities along transmission lines strong candidates for solar development.

The Ridge View Solar Project will connect to one of the two Kintigh (Somerset) 345 kV transmission lines that serviced the now shuttered AES Somerset Power Plant, each rated at 1,900 MW capacity. Several renewable projects have been proposed to connect to this line One of these projects competing for transmission capacity is a 140 MW to 175 MW solar PV facility proposed at the former AES Somerset Power Plant.[19] Additional projects are expected to be proposed for Niagara and Erie counties.

Further, New York State and the Federal Government recognize the expansion of transmission lines are a priority for both their economic benefits and achieving decarbonization goals.[20] The expansion of transmission lines may also affect the unique opportunity presented to the Hartland community. Further south of Hartland, the 345-kilovolt Empire State Line will run from the Town of Royalton at the southern edge of Niagara County deep into Erie County, creating opportunities for renewable energy development along its path.[21] Hydro-Québec proposes to supply up to 1,250 MW of power from hydro and possibly renewable energy generation sited in New York State via the proposed Champlain Hudson Power Express line.[22]

The Ridge View Solar Project provides the Town of Hartland community with the opportunity to participate in the new energy economy, and a path to build further opportunities upon this initial project while preserving its agricultural heritage. As such, the Town of Hartland community should carefully evaluate the project in light of the long-term development of the region and the direction New York State is taking towards clean energy.

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14 The calculation of homes served is based on 350 MW electricity at a conservative net capacity factor of 20%. Ridge View will produce 613,200,000 kwh per year (350 MW * 8,760 hours/year * 20% * 1,000 kW/MW). Utilizing U.S. Energy Information Administration data for 2018 average monthly residential electricity consumption in New York State, average power consumption per home is 6,924 kWh/home/ year. See U.S. Energy Information Administration, Residential Average Monthly Electricity Bill, Consumption, and Price, by State, by Sector, October 12, 2018. Available at: https://www.eia.gov/state/search/#?1=102&3=21&6=134&a=true&2=215 (accessed September 19, 2021).

15 U.S. Census Bureau, QuickFacts, Niagara County, New York. Available at: https://www.census.gov/quickfacts/fact/table/niagaracountynewyork/PST045219 (cccessed December 7, 2021).

16 Climate Leadership and Community Protection Act, S. 6599, A. 8429, 2019-20 Reg. Sess. (N.Y. 2019), §1(12)(a).

17 Climate Leadership and Community Protection Act, S. 6599, §1(12)(d).

18 Ibid.

19 Thomas J. Prohaska, "Solar energy project proposed at former coal-burning plant," *The Buffalo News*, April 21, 2021. Available at: https://buffalonews.com/news/local/solar-energy-project-proposed-at-former-coal-burning-power-plant/article_baf8cf10-a20f-11eb-8ee4-234b9cc39257.html (accessed May 7, 2021).

20 Patrick R. Brown and Audun Botterud (2021) The Value of Inter-Regional Coordination and Transmission in Decarbonizing the US Electricity System. Joule, 5(1), 115-134; Aaron Bloom, Josh Novacheck, Greg Brinkman, James McCalley, Armando L. Figueroa-Acevedo, Ali Jahanbani-Ardakani, Hussam Nosair, Abhinav Venkatraman, Jay Caspary, Dale Osborn and Jessica Lau (2021) The value of increased HVDC capacity between eastern and western U.S. grids: the interconnections seam study, NREL/JA-6A20-76580. See, also, New York State Press Release: Governor Cuomo Announces New York State Public Service Commission Approval of Major Transmission Line Project From Rensselaer County to Dutchess County, February 11, 2021, Available at: https://www.governor.ny.gov/news/governor-cuomo-announces-new-york-state-public-service-commission-approval-major-transmission (accessed August 21, 2021).

21 "Transmission Line Construction Begins In Niagara And Erie Counties," *Fast Aurora Advertiser,* May 25, 2021. Available at: https://www.eastaurorany.com/articles/transmission-line-construction-begins-in-niagara-and-erie-counties/ (accessed May 7, 2021).

22 Investable Universe, Hydro-Québec and Transmission Developers In Pitch to Decarbonize New York City, May 14, 2021. Available at: https://investableuniverse.com/2021/05/14/hydro-quebec-blackstone-transmission-developers-to-develop-champlain-hudson-power-express-hydropower-new-york/ (accessed May 27, 2021).

2 The Town of Hartland Community

The Town of Hartland is located in the Northeast of Niagara County, roughly three miles north of the Erie Canal. The Town is 52.4 square miles.

Since 1970, the Town's population has remained at roughly 4,000 residents fluctuating within a range of several hundred residents.

2.1 GOVERNMENT

Hartland is governed by the Hartland Town Board, comprised of the Town Supervisor and four board members who are elected for four-year terms. Hartland's Planning Board and Zoning Board are both appointed by the Town Board. The Town Zoning Board administers the Town's zoning laws.

2.2 DEMOGRAPHICS

According to the 2019 American Community Survey, median household income was $49,826. Only 15.2 percent of the population is between 20 to 40 years of age. Almost 91 percent of the Town's population owns their residence. For Niagara County, 13.5 percent of the population lives below the federal poverty line.[23]

2.3 FARMING ECONOMY

Since the area was settled in 1803, farming has remained central to its economy and culture. Hartland contains approximately just under 12 thousand acres of active agricultural land.[24] By some estimates, farming accounts for roughly 1 in 5 jobs in Hartland.[25] Given the importance of farming to the local economy, a larger portion of Hartland's residents are indirectly dependent upon farming.

In Niagara County, 95 percent of farms remained family owned in 2017.[26] Nevertheless, over the past 50 years, small family farms that once were commonplace have consolidated into larger operations, and have trended towards monocropping.[27] Large dairy farming and corn crops have increased during that period.

The village of Medina, roughly 10 miles from Hartland, is host to an ethanol production facility, which uses corn as feedstock, a substantial amount of which is sourced locally.[28]

23 2019 American Community Survey, Available at: https://data.rgj.com/american-community-survey/block-group-1-census-tract-24101-niagara-county-new-york/labor-statistics/unemployed-civilians/num/15000US360630241011/area/ (accessed July 12, 2021).

24 Town of Hartland, History, available at: http://www.townofhartland.org/how_do_i_(faq)/history.php (accessed May 8, 2021). Personal communications, Ross Annable, June 11, 2021.

25 Personal communications, Ross Annable, June 11, 2021

26 USDA (2017), *supra* note 10.

27 Ibid.

28 Personal communications, Verratti Farms, August 24, 2021.

2.4 EMPLOYMENT OPPORTUNITIES

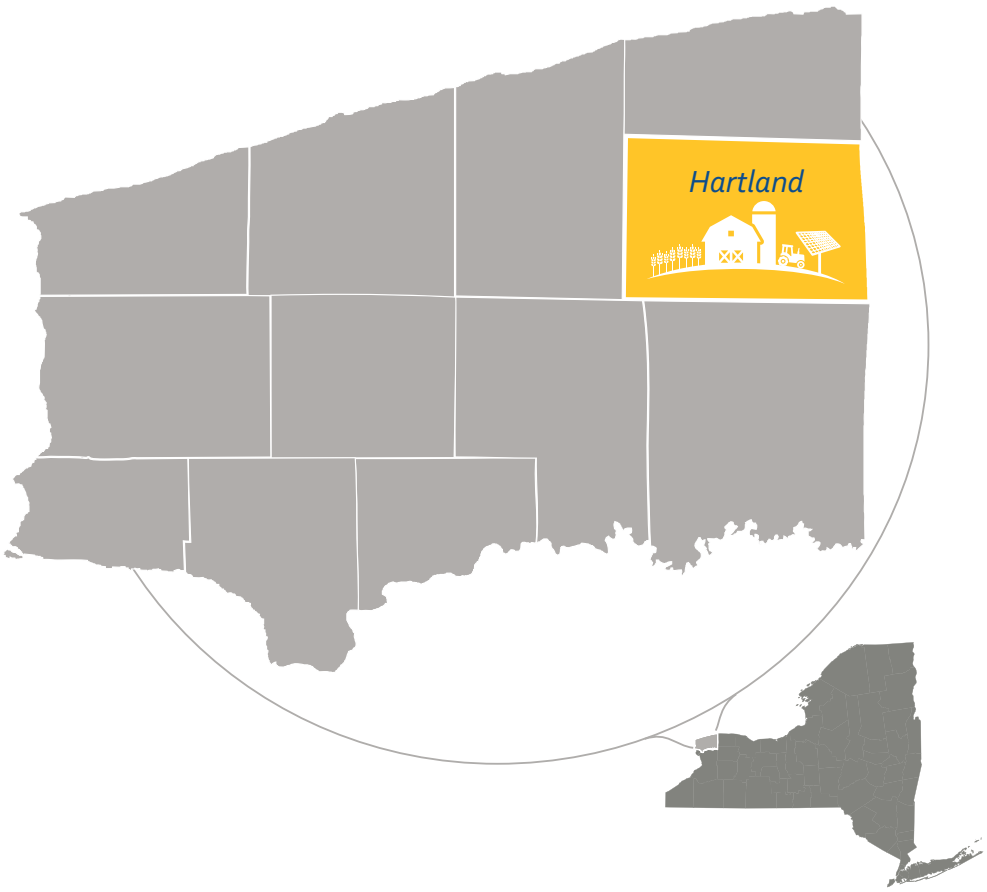
As of 2019, the Town's unemployment rate was only 3.4 percent, and 37.5 percent of working age population was not in the labor force.[29]

The farming sector is the largest employer in Hartland.[30]

Niagara County generally has suffered declining employment levels, worsened by COVID. According to Niagara County's 2020 comprehensive economic development strategy:

> The last several years have been difficult for Niagara County's economy. Figures released by the U.S. Bureau of Labor Statistics indicate that Niagara county has suffered the third-worst employment decline of any major metropolitan area in the U.S., with the region losing 23.3% of its private-sector jobs between April 2019 and April 2020. COVID-19 further exacerbated the situation and contributed to a loss of nearly 10,000 jobs due to other business shutdowns, layoffs and other impacts from the pandemic.

The area has steadily lost jobs since the 1950s, including the closures of Fisher Price (closed in the 2010s), the AES Somerset Power Plant (2020), OxyChem (2021), as well as significant reductions in workforce by General Motors suppliers like Harrison Radiator (2000s), FMC (2000s), Olin (2016), and Southland Frozen Foods (1990s).



29 2019 American Community Survey, *supra* note 23.

30 Personal communications, Ross Annable, June 11, 2021

3 Stabilizing Local Farms

This chapter discusses the challenges facing small family farms that have defined the landscape and culture of Niagara County, and how the Ridge View Solar Project impacts local family farms.

The chapter first discusses how global competition in agricultural markets has transformed farming into a complex, capital-intensive commodity business, putting pressure on small family farms to consolidate in order to achieve economies of scale.

The chapter then discusses how solar PV revenues increase the value of farmland and diversify farm revenues, thereby stabilizing family farms.

3.1 GLOBALIZED AGRICULTURAL MARKETS TRANSFORM FARMING

Since the 1980's, trade liberalization has globalized agricultural markets, permanently transforming small family -run farms. Starting under the General Agreement on Tariffs and Trade in the mid-1980s, and then the World Trade Organization Agricultural Agreement initiated in the 1990s and further expanded in subsequent decades, international trade rules committed countries to expanding market access by eliminating quota restrictions, reducing or eliminating tariffs, and discouraging subsidies that distort markets.[31] The North American Free Trade Agreement further liberalized trade among the United States, Canada and Mexico in the 1990s, particularly between the US and Mexico concerning agriculture.

Through these agreements, and with the aid of technology, American farmers expanded their exports to international markets. This globalization of agricultural markets has required the traditional family farm serving local markets to compete on the basis of price in national and international commodities markets, making farmers increasingly dependent on export revenues, and subject to price volatility in international markets.

Whereas competing on cost was always an important feature of traditional farming, in the past a cost-competitive farmer that was careful not to expand too rapidly, beyond the sector's sustainable growth rate, generally survived and prospered.[32] Traditionally, farmers selected plant varieties based on local conditions and diversified crops to reduce the risks of crop failure and market conditions; and protected soil quality through crop rotation and other natural methods.[33]

With the global commoditization of agricultural markets, prudent farm management was no longer enough to survive. The consolidation of agricultural supply chains transformed farming into an industrial enterprise. Now, international price competition aided by technological advances demands that American farms continually drive down the costs of production, focus on specific commodity crops, increase short-term productivity through extensive use of chemical fertilizers, pesticides and genetically modified crops,[34] and scale up land under production

31 World Trade Organization (undated) Agriculture: fairer markets for farmers. Available at: https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm3_e.htm (accessed August 21, 2021).

32 Michael Boehlje (undated) Globalization and Agriculture: New Realities. Purdue University: Center for Food and Agricultural Business. Available at: https://ag.purdue.edu/agecon/ExtensionPrograms/programs/eicp/seminar_resources/globalization%20and%20agriculture.pdf (accessed May 10, 2021).

33 Gail Feenstra, Chuck Ingels and David Campbell (2014) What is Sustainable Agriculture. University of California Sustainable Agriculture Research and Education Program. Available at: https://sarep.ucdavis.edu/sustainable-ag (accessed March 30, 2022).

34 H. Leo, R.S. Lawrence, and P. Walker (2002) How Sustainable Agriculture Can Address the Environmental and Human Health Harms of Industrial Agriculture. Environmental Health Perspectives, 110 (5), 445-456.

in order to maintain economies of scale.[35] The dairy sector is similarly consolidating due to cost and market drivers.[36] Those that cannot compete face being consolidated into larger farming operations.

Agricultural market dynamics supported by technological advances have resulted in unprecedented increases in productivity. U.S. farmers produced an average of 12 times more farm yield per hour worked in 2000 than their predecessors in 1950.[37]

The phenomenal gains in productivity achieved through economies of scale and technological advances have largely benefitted agricultural processors and consumers by reducing real prices of agricultural products.[38] Yet, the resulting increased productivity and lower agricultural output prices have forced small farmers from the industry, and eroded profit margins for surviving farms.[39]

Liberalization of trade has not only broadened access to agricultural markets, but has also expanded access to capital and advanced technologies, increasing the competitiveness of farmers in competing countries, whereas technology transfer and research and development activity was in the past primarily exploited by U.S. and Western Europe farmers.[40]

Further, the industrialization of farming in the United States that began with fruits, vegetables, cereals and grain has expanded to and been virtually completed in the areas of livestock, poultry, and dairy.[41] These sectors in developing countries with lower costs of labor are increasingly industrializing their agricultural production.

The emergence of integrated marketing and distribution supply chains, in which farm producers supply raw materials to manufacturers and food processors, enable buyers like Costco and Walmart to exert extraordinary market power on farmers. To compete, farmers must be "better, faster, and cheaper" to remain competitive.[42]

Marketing and distribution chains earn the vast majority of farming profits, creating further pressure for small farms to consolidate into large, vertically integrated agribusinesses that control all aspects of the value chain. For each dollar spent by consumers on food, farms earned 14.3 cents (14.3%) while processing, marketing and distribution earned 85.7 cents (85.7%). Of the farmer's 14.3 percent, half of that amount or 6.7 cents covers the cost of production purchased from other U.S. agribusiness, leaving 7.6 cents for the farmer representing their portion of the value added for each dollar spent by a consumer.[43] From that amount, farmers must pay salaries and benefits, property costs, and purchase any non-U.S. inputs for their operation.[44] After all these expenses are deducted, the net farm income amounts to approximately 2.6 percent or 2.6 cents of the retail dollar spent by consumers.[45]

As a result of these market dynamics, to compete, modern farmers not only must manage the traditional risks associated with price, weather, and disease, but also face new risks as farms become increasingly capital and technology intensive, and subject to factors affecting global agricultural supply chains, including trade relations between major economies, foreign exchange, and other risks. Rising labor, seed, fertilizer and other input costs

35 J. MacDonald (2013) *Cropland Consolidation and the Future of Family Farms.* Economic Research Service. US Dept. of Agriculture.

36 J. MacDonald, J. Law, and R. Mosheim (2020) *Consolidation in U.S. Dairy Farming.* Economic Research Service. US Dept. of Agriculture.

37 K.O. Fuglie, J. MacDonald, and E. Ball (2007) *Productivity Growth in US Agriculture.* Economic Research Service. US Dept of Agriculture.

38 Ibid; E.J. O'Donoghue, J. MacDonald, U. Vasavada, and P. Sullivan (2011) Changing Farming Practices Accompany Major Shifts in Farm Structure. Economic Research Service. Washington: US Dept of Agriculture.

39 Ibid.

40 Boehlje, *supra* note 32.

41 Ibid.

42 Ibid.

43 U.S. Department of Agriculture, Economic Research Service, Food Dollar Series, updated March 2021. Available at: https://www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx#marketing (accessed May 22, 2021).

44 Patrick Canning (2013) ERS Food Dollar Series Allows an Indepth Look at Farm Level Components of the U.S. Food Dollar, Amber Waves, U.S Department of Agriculture. Available at: https://www.ers.usda.gov/amber-waves/2013/july/ers-food-dollar-series-allows-an-indepth-look-at-farm-level-components-of-the-us-food-dollar/ (accessed May 22, 2021).

45 In 2020, farmers are expected to receive net farm income amounting to roughly 17.8% of gross farm income, derived by net cash income of 76.9 billion over gross cash income of 430.9 billion. John Newton (2020), A Tale of Two Farm Incomes: Reviewing USDA's February 2020 Farm Income Forecast, Market Intel, February 11, 2020. Available at: https://www.fb.org/market-intel/a-tale-of-two-farm-incomes (accessed May 22, 2021). Calculating 17.8% of 14.3% farm value of production, net farm income received by farmers is only 2.6% of retail value.

are eroding profit margins.[46] Worse, soils are degrading due to intensive farming techniques and farming is increasingly reliant on groundwater which in turn is increasingly at risk of depletion and salinization.[47]

Access to capital and technology, the consolidation of agricultural marketing chains, and government policies subsidizing larger farms all advantage large farms to the detriment of small farmers.[48] While farm productivity is increasing for all farm sizes, total factor productivity has consistently increased based on farm size over the past several decades, and productivity growth has been smallest among smaller farms.[49] As a result, larger farms on average earn greater profits, forcing smaller farms to consolidate into larger operations.[50]

As a corollary to consolidation, competitive pressures are also driving farmers to adopt automation and artificial intelligence (AI) technologies on their farms. Automation and AI represent a further substitution of human labor with capital, further reinforcing the trend towards capital-intensive farming, and away from traditional farming practices and culture. Automation and AI are now being deployed at every stage of farming activities: forecasting and crop planning, seeding, monitoring, watering, fertilization, and application of pesticides, harvesting, packaging, and equipment and building maintenance.[51] The imperatives of meeting increasing demand and raising efficiency to drive profits, and shortages of labor make automation indispensable to remaining competitive.

The competitive trends that have shaped farms for the past several decades will only intensify. According to the Purdue Center for Food and Agricultural Business:

> Twenty-first century agriculture is likely to be characterized by: more global competition; expansion of industrialized agriculture; production of differentiated products; precision (information intensive) production; emergence of ecological agriculture; formation of food supply chains; increasing risk; and more diversity.[52]

46 Tony Dreibus, "Ag Census: Input Costs Rise, Farm Income Declines Amid Low Commodity Prices," *Successful Farming*, April 18, 2019. Available at: https://www.agriculture.com/news/business/ag-census-input-costs-rise-farm-income-declines-amid-low-commodity-prices (accessed May 21, 2021).

47 The State of the World's Land and Water Resources for Food and Agriculture: Managing systems at risk, Food and Agriculture Organization of the United Nations and Earthscan, 2011. .

48 O'Donoghue, MacDonald, Vasavada, and Sullivan (2011) *supra* note 38.

49 Nigel Key, Productivity Increases With Farm Size in the Heartland Region, Amber Waves, December 3, 2018. Available at: https://www.ers.usda.gov/amber-waves/2018/december/productivity-increases-with-farm-size-in-the-heartland-region/ (accessed May 21, 2021).

50 James M. MacDonald, Robert A. Hoppe, and Doris Newton (2018), Three Decades of Consolidation in U.S. Agriculture. Washington, D.C.: U.S. Department of Agriculture.

51 See Lutz Goedde, Joshua Katz, Alexandre Menard, and Julien Revellat (2020) *Agriculture's connected future: How technology can yield new growth*. McKinsey & Company; Plug and Play (2020) Agtrends in 2020: How 6 trends are transforming the future of agriculture. Pnptc.com.

52 Boehlje, *supra* note 32.

Competitive factors have markedly impacted American farmers, painting an uncertain future for small farmer and their communities:

- Farm debt is at the highest levels in three decades.[53]
- Over half of farms have been losing money every year since 2013.[54]
- Farm bankruptcies hit an 8-year high in 2019,[55] with many farmers forgoing reorganization because long term trends make it pointless.[56]
- Vertically integrated agrobusiness earn the vast majority of consumer food expenditures, leaving less than 3 percent of the consumer dollar spent for net farm income.[57]
- About 40 percent of farmland in the United States is operated by renters.[58]
- Contracted production accounts for approximately 35 percent of the total value of agricultural production.[59]
- By 2030, over 75 percent of farmland owners will be women over the age of 60,[60] and the children of farmers are often not pursuing farming given its challenges and low returns.
- Large agribusinesses, not small farmers, capture the vast majority of government farm subsidies.[61]
- The number of farms steadily declined from 1987 to 2012, dropping by 16 percent.[62]
- The midpoint for cropland acreage, at which half of all cropland is on larger farms and half is on smaller farms, nearly doubled in acreage from 650 acres in 1987 to 1,201 acres in 2012, as farmers sought to achieve economies of scale to remain competitive.[63]
- Less than one-fifth of rural counties are farming dependent.[64]
- Workforce employed in agriculture declined from 16 percent in 1945 to less than 2 percent in 2002.[65]
- 93 percent of farming households depend on off-farm income in 2002.[66]

53 U.S. Department of Agriculture, Economic Research Service, Assets, Debt, and Wealth, updated February 2021. Available at: https://www.ers.usda.gov/topics/farm-economy/farm-sector-income-finances/assets-debt-and-wealth/ (accessed May 22, 2021).

54 A. Semuels (2019) 'They're Trying to Wipe Us Off the Map.' Small American Farmers Are Nearing Extinction. *Time*. Available at: https://time.com/5736789/small-american-farmers-debt-crisis-extinction/ (accessed March 29, 2021).

55 Niall McCarthy (2020) U.S. Farm Bankruptcies Reach Eight-Year High, Statistica, February 11. Available at: https://www.statista.com/chart/20779/chapter-12-bankruptcies-filed-in-the-us/ (accessed May 21, 2021).

56 Semuels (2019), *supra* note 54.

57 See *supra* notes 43-45 and accompanying text.

58 R. Amundson and L. Biardeau (2018) Opinion: Soil carbon sequestration is an elusive climate mitigation tool. Proceedings of the National Academy of Sciences of the United States of America. Available at: https://www.pnas.org/content/115/46/11652 (accessed May 21, 2021).

59 James MacDonald and Christopher Burns (2019) Marketing and Production Contracts Are Widely Used in U.S. Agriculture. Washington: US Dept of Agriculture.

60 P. Petrzelka and A. Sorenson (2014) Women Non-Operating Landowners: Overcoming Barriers to Increasing Conservation on Leased Farmland Preliminary Report. American Farmland Trust.

61 Between 1995 and 2020, the top 10% of recipients received 78% of the over $240 billion in commodity subsidies. EWG Farm Subsidy Database. Available at: https://www.thebalance.com/farm-subsidies-4173885 (accessed May 21, 2021).

62 MacDonald, Hoppe, and Newton (2018) , *supra* note 50.

63 Ibid.

64 N. Conklin, C. Dimitri, and A. Effland (2005)*The 20th Century Transformation of US Agriculture and Farm Policy.* Economic Research Service. US Dept of Agriculture.

65 Ibid.

66 Ibid.

3.2 IMPACT ON NIAGARA COUNTY FARMING

Hartland and Niagara County farms have experienced the same pressures exerted by commoditization and globalized markets driving down farm profits.[67] In response, Niagara County farms have consolidated, increasing in size and reducing in overall number.[68]

Local farmers face other potential risks. Transition towards electric vehicles[69] could impact Niagara County farmers who devote a portion of their acreage to corn used in ethanol production. In particular, demand for local corn could decline if the local ethanol plant in Medina reduces production or its economics change.

If corn demand reduces nationwide for ethanol, solar PV would counter the impact on farm revenues. As demonstrated in the sections that follow, a modest portion of farm acreage devoted to solar are adequate to protect farms from market risks.

Importantly, solar does not need to compete with farming. Acres devoted to solar remain compatible with agricultural activities, such as sheep grazing and beekeeping, further described in this paper. With agriculture-compatible solar arrays, farmers will enjoy stable revenues, and, as our experience expands possible solar-agricultural combinations, will be incented to co-locate agriculture with solar to further increase profits.

3.3 SOLAR LEASE IMPACTS ON SMALL FAMILY FARMS

Solar PV can provide additional significant and stable revenues to farmers. Importantly, solar PV revenues are independent of the traditional risks of farming — weather, disease and commodity prices — thus diversifying both farm revenues and risks.

Also, highly significantly, unlike farming, solar PV arrays can be deployed on land of poor productive quality. Solar PV thus can help farmers better manage their best land, and still make use of sub-optimal lands.

Finally, solar PV revenues for participating farms are independent of agricultural subsidies, thus further insulating farmers from the risks associated with government policy.

Solar PV revenues enhance the value of farmland. In the Niagara County area, farmland owners who rent their land to larger farms typically receive annual rents of between $30 to $100 per acre. Nationwide, solar lease arrangements range between $300 to $2,000 per acre per year.[70] EDF Renewables will make annual payments for the land to host the solar panels and to host the project substation, collection lines for connecting the solar farm sites and a short transmission line to connect the project substation to the existing 345 kV transmission line. Payments for hosting the panels, substation, transmission and collection lines are expected to total about $2.25 million per year, escalating at 2 percent annually. As farmland is valued based on its productivity or revenue potential, the substantial increase in revenue potential enhances the value of these farms.

The significant additional revenues provided by solar PV offer aging farmers who would like to partially retire the ability to hire additional labor and invest in labor saving technologies. For farmers who want to retire altogether, the additional revenues provided by solar PV may be the difference between keeping the farm within the family or selling to a larger operation.

The next section presents a case study demonstrating how solar PV revenues help stabilize small farms by diversifying revenues and risks.

67 Personal communications, various Hartland farmers, March and June, 2021.

68 USDA (2017), *supra* note 10.

69 By 2041, 4.5 million total electric vehicle purchases are expected to occur in New York State. New York ISO (2021) Power Trends 2021: New York's Clean Energy Grid of the Future. This is roughly equal to the number of registered vehicles in New York State as of 2019. Statista (2019) U.S. automobile registrations in 2019, by state. Available at: https://www.statista.com/statistics/196010/total-number-of-registered-automobiles-in-the-us-by-state/ (accessed December 7, 2021).

70 Strategic Solar Group, What is the average farm lease rate? Available at: https://strategicsolargroup.com/what-is-the-average-solar-farm-lease-rate/ (accessed October 7, 2021).

3.4 FARM COMMUNITY REVENUE DIVERSIFICATION AND STABILIZATION

This section evaluates how solar PV helps diversify revenue, manage risk and stabilize small family farms by presenting three case studies of hypothetical 100-acre, 500-acre and 1,000-acre farms in Niagara County.

The 100-acre farm leases its tillable land to larger local farm, reflecting common practice in the Hartland region for small farms of this size.

The 500-acre farm is operated by the owner. The 500-acre farm produces soybeans, corn and wheat. Farm revenues are evaluated assuming input and commodity prices during the 2021 period, which are varied within a range reflecting changes in input and commodity prices over the past 5 years.

Both hypothetical farms are evaluated under two scenarios. The first compares the revenues and risks of a hypothetical farm dedicating all of its acres to farming without solar PV, and a second scenario in which the farm dedicates all or a portion of its acres to solar PV while farming its regular crops on the remaining land. Although land dedicated to solar arrays can also be used for solar-compatible agriculture, such as beekeeping and sheep grazing, these case studies do not consider these possible additional revenue sources in the interests of conservative estimates.

In both the 100-acre the 500-acre farm examples, combining solar power generation with farming operations increases revenues and reduces farming operation risks, thereby stabilizing local farms. Importantly, the additional revenues to farms also increases wealth generation within the Hartland community by resulting in increased household savings, increased consumer and business spending, and increased hiring. Accordingly, following evaluation of the direct increase in farm revenues, this chapter further evaluates the indirect impacts on the Hartland community.

3.4.1 100-acre Farm

Since the 100-acre farm does not directly farm the land, calculation of the impact of solar is the difference between what the farmer would receive by leasing all or a portion of their land for solar power generation and the amount the farmer would receive by leasing the land to a larger farm.

Based on interviews conducted within the Hartland region, the annual per-acre cost of leasing farmland ranges from $30 to $100 per acre. Data is unavailable to calculate median or average leasehold costs. In the absence of published data, this study assumes that landowners receive $70 per acre per year when leased for farming.

Assuming $70 per acre for farm leases, the 100-acre farm landowner will receive an additional $18,600 to $93,000 per year in pre-tax income if its places 20 to all 100 acres under solar lease.

Assuming a combined federal and state marginal income tax rate of 30 percent, a solar lease contributes between $13,020 to $65,100 in after-tax household income to the owner of the 100-acre farm.

3.4.2 500-acre Farm

The 500-acre farm devotes 200 acres to soybeans, 200 acres to corn, and 100 acres to wheat.

Various factors impact production and revenues. These include weather, international trade relationships, particularly tariffs and trade agreement in relation to China, and most recently, the disruption of commodities markets and supply chains due to COVID-19.

Assumptions

For purposes of this study, the following ranges are used in this scenario analysis based on production, revenues and cost volatility over a 5-year period:

- Production variation of +/-10%.
- Commodity prices fluctuate within a +/- 50% range.
- Farm input prices fluctuate within a +/- 10% range.

Production yields are estimated for commercial farming operations in Niagara County based on interviews with local farmers and reference to United States Department of Agriculture (USDA) national production data.[71] Local estimates are higher than USDA national average production figures.[72] The higher yields are based on interviews with Hartland area farms, predicated on the commercial farms in Niagara County being large enough to achieve economies of scale, yet smaller than the national average, enabling both greater efficiency and yields.

Revenues per bushel are based on the spot prices for soybeans, corn and wheat as of July 8, 2021, and their five-year history, as reported on the Internet.[73] Agricultural commodities prices for soybeans, corn and wheat started climbing in 2020, and at the time of study, were close to five-year highs. Accordingly, this paper also reports a 5-year range for each commodity to put revenue figures into perspective based on averaging of five average closing prices for the years 2017 through 2021, with the 2021 year representing only half the year at the time of study.[74]

Costs for fertilizer, seed and chemicals are estimated for Niagara County based on review by a local commercial farm.[75]

Table 3. **STUDY ASSUMPTIONS AND HISTORICAL DATA**

Production Bushels per Acre				
	Study Estimate	**2015-2019 Low**		**2015-2019 High**
Soybeans	60	47.4		51.9
Corn	175	167.5		176.6
Wheat	70	47.9		53.6
Revenues per Bushel				
	Average 2021 Closing Price as of July 8, 2021	**52-Week Low**	**52-Week High**	**5-Year Average**
Soybeans	$14.40	$8.70	$16.77	$10.40
Corn	$5.94	$3.07	$7.75	$4.15
Wheat	$6.63	$4.91	$7.62	$5.29
Costs				
Fertilizer, Seed and Chemicals / Acre		**Soybeans**		$175
		Corn		$350
		Wheat		$225
Labor, Machinery and Fuel / Acre				$140
Land Lease /Acre – for Farming				$70
Land Lease /Acre – for Solar				$1000

Sources: See Notes 71 to 77 and accompanying text for sources.

71 Personal communications, Verratti Farms, July 2021. Five-year yield data is based on USDA data for winter wheat, available at https://www.nass.usda.gov/Charts_and_Maps/Field_Crops/wwyld.php (accessed July 8, 2021), corn available at https://www.nass.usda.gov/Charts_and_Maps/Field_Crops/cornyld.php (accessed July 8, 2021), and soybeans available at https://www.nass.usda.gov/Charts_and_Maps/Field_Crops/soyyld.php (accessed July 8, 2021).

72 USDA soybean estimated average yields were 50.2 per acre and corn yields 172 per acre for 2020. USDA News Release, January 12, 2021. USDA wheat estimated average yields were 52 per acre for 2019. USDA Crop Production, July 10, 2020, available at: http://www.nass.usda.gov/Publications/Todays_Reports/reports/crop0720.pdf (accessed July 8, 2021)

73 Data was obtained from Markets Insider, https://markets.businessinsider.com/commodities (accessed July 8, 2021) and Macrotrends, available at: https://www.macrotrends.net (accessed July 8, 2021).

74 Averages were based on data provided by Macrotrends, available at: https://www.macrotrends.net (accessed July 8, 2021).

75 Personal communications, Verratti Farms, July 2021.

Costs for labor, machinery and fuel are estimated for Niagara County based on recent survey data published by Ohio State University and Iowa State University. Specifically, Iowa State University data for various field operations were aggregated to achieve a figure of $131.90/acre,[76] which is roughly consistent with the Ohio State University data of $103/acre for soybeans, $108 for wheat, and $118/acre for corn.[77] An additional increment beyond harvesting for drying, storing and transporting harvest was added to achieve a $140/acre figure, based on review from local farmers. As these data were collected for other regions of the country, the final estimates were reviewed by a Niagara County farmer to confirm they are representative of local conditions.

Agricultural land lease costs are estimated averages for commercial farming operations in Niagara County based on interviews with local farmers. Farm lease prices vary and there is no published data available for Niagara County.

Results

The base case scenario using the study assumptions is set out in the table below.

Table 4. **500-ACRE FARMING ONLY BASE CASE SCENARIO**

	Soy	Corn	Wheat
Acres	200	200	100
Production (bushels)	60	175	70
Price/Bushel	$14.40	$5.94	$6.63
Cost — Inputs/Acre	$175	$350	$225
Cost — Labor/Acre	$140	$140	$140
Cost — Land	$0	$0	$0
Farming Only			
Revenues	$172,800	$207,900	$46,410
Costs	$63,000	$98,000	$36,500
Profit	$109,800	$109,900	$9,910
Profit/Acre	**$549**		
Total Profit	**$229,610**		

Source: Author's calculations.

The base case farming-only scenario produces total annual profits of $229,610. Profit per acre range from $99 for wheat to $549 for soy and corn.

In the combined farming and solar operation, 100 acres are devoted to solar panels, the remaining 400 acres remaining in agriculture. Although the 100 acres devoted to solar could also support solar-compatible farming to produce additional revenues, such as sheep grazing and beekeeping, this scenario assumes the no farming occurs on solar acres.

All crops abate proportionately to stagger planting and harvesting cycles and because low-margin wheat has value for crop rotation purposes.

76 Iowa State University, 2021 Iowa Farm Custom Rate Survey, Ag Decision Maker, File A3-10, March 2021. Available at: https://www.extension.iastate.edu/agdm/crops/html/a3-10.html (accessed July 8, 2021). The $131.90 comprises the following elements: chisel plowing/acre $17.50, disking/tandem/acre $15.00, field cultivating/acre $15.05, planting/acre $22.90, spraying/acre $7.50 x 2 times, dry bulk fertilizer application/acre $5.55, corn combining/acre $35.10, and hauling grain $5.80.

77 The Ohio State University, Ohio Farm Custom Rates 2020, September 2020. Available at: https://farmoffice.osu.edu/farm-mgt-tools/custom-rates-and-machinery-costs (accessed July 8, 2021).

As shown in the table below, the combination of solar with farming in this scenario produces total annual profits of $283,688, an increase of almost 24 percent. The increase in solar lease revenues producing higher profits than the profits per acre of $99 for wheat and $549 for soy and corn.

Table 5. **500-ACRE COMBINED SOLAR FARMING SCENARIO**

	Soy	Corn	Wheat
Acres	160	160	80
Production (bushels)	60	175	70
Price/Bushel	$14.40	$5.94	$6.63
Cost — Inputs/Acre	$175	$350	$225
Cost — Labor/Acre	$140	$140	$140
Cost — Land	$0	$0	$0
Solar and Farming			
Farm Revenues	$138,240	$166,320	$37,128
Farm Costs	$50,400	$78,400	$29,200
Farm Profit	$87,840	$87,920	$7,928
Solar Revenues	**$100,000**		
Total Profit	**$283,688**		

Source: Author's calculations.

Introducing variations in farm production, commodity prices, and farm input and labor prices result in significant changes in farm profitability. Of these variables, commodity prices are especially volatile. The table below assumes the following variations:

- Production variation of +/-10%.
- Commodity prices fluctuate within a +/- 50% range.
- Farm input prices fluctuate within a +/- 10% range.

Downside stress scenarios can significantly reduce the profitability of farming operations, especially reductions in commodity prices. Combining solar with farming under these stress conditions significantly stabilizes farm profitability.

Table 6. **500-ACRE FARM SENSITIVITY ANALYSIS**

	Farming Only	Solar and Farming
Production		
+10%	$272,321	$317,857
-10%	$186,899	$249,519
Commodity Price		
+50%	$443,165	$454,532
-50%	$16,055	$112,844
Farm Input and Labor Prices		
+10%	$209,860	$267,888
-10%	$249,360	$299,488

Source: Author's calculations.

The most significant financial risks are downturn in commodity prices. A reduction of 50 percent in commodity prices would reduce farm profits to just over $16,000, inadequate to support a family of four.

Significantly, at these commodity prices, the marginal revenues of farming are lower than the marginal costs. Farmers may adjust to the situation by attempting to lower input costs, such as by using less fertilizer, delaying machinery improvements, holding down labor costs, and cutting costs where possible. In these circumstances, conserving cash becomes the overriding priority. However, foregoing investment in the farm will eventually have adverse consequences and this situation is not financially sustainable indefinitely.

In contrast, if the farm devoted 100 acres of the farmland to solar, profits are stabilized at $112,000, which is adequate for the farm to support a family of four. The solar revenues lower the farm's risks by diversifying farm revenues with a revenue stream independent of the variables affecting agriculture, from a creditworthy counter-party, supported by the sale of electricity, and backed by a regulatory regime.

Importantly, reductions of commodity prices by 50 percent are a very real possibility; prices almost dipped to these levels over the 52-week range. Thus, solar provides a robust and consequential revenue floor to farms.

3.4.3 1000-acre Farm

The final scenario is a 1,000-acre farm that owns 500 acres and leases 500 acres.

Presented with the opportunity to install solar, the 1,000-acre farm and the land owners from whom it leases farmland are presented with a choice whether to devote a portion of farmland into solar production.

This scenario assumes that of the 500 leased acres, 200 acres will be devoted to solar, reducing the size of the 1,000-acre farm to 800 acres, and thereby reducing its overall profitability.

The now 800-acre farm now has a choice: whether to place some portion of its own acreage into solar or to remain a farm-only operation. As already demonstrated above, combining solar with farming improves and stabilizes profits when production or commodity prices decline, and when costs increase.

The results below show that when the now 800-acre farm commits to place 20 percent of its acreage into solar, it stabilizes its profits at the same level as the original 1,000 acres devoted to farming without any solar.

Importantly, under all solar scenarios, even when the 800-acre farm declines to devote a portion of its acreage to solar, revenues to the community increase overall, because solar revenues are always greater than the diminution in profits from farming. Thus, solar delivers a net gain to the community, quantified in the 800-acre farm examples below as the "Net Community Gain," which measures the net additional revenues earned by all participating farms from solar land leases over what they would have earned from farming leases, less the lost farming revenue of the 1,000-acre farm that has been reduced to 800 acres by losing 200 acres of leased farm land due to land owners leasing their land to the solar project. Importantly, the 800-acre farm only loses revenue if it declines to participate in the solar program. In the second 800-acres farm example below, it can offset lost farm revenues by leasing some of its own land for solar, resulting in it sharing in the gains to the community.

Table 7. **1,000-ACRE FARM**

	Soy	Corn	Wheat
Owned Acres	200	200	100
Leased Acres	200	200	100
Production (bushels)	60	175	70
Price/Bushel	$14.40	$5.94	$6.63
Cost — Inputs/Acre	$175	$350	$225
Cost — Labor/Acre	$140	$140	$140
Cost — Land/Acre	$70	$70	$70
Farming 1,000 Acres			
Farm Revenues	$345,600	$415,800	$92,820
Farm Costs	$140,000	$210,000	$80,000
Farm Profit	$205,600	$205,800	$12,820
Solar Revenues	**$0**		
Total Profit	**$424,220**		

Source: Author's calculations

Table 8. **NOW 800-ACRE FARM THAT DECLINES TO DEVOTE ANY LAND TO SOLAR**

	Soy	Corn	Wheat
Owned Acres	200	200	100
Leased Acres	120	120	60
Farm Revenues	$276,480	$332,640	$74,256
Farm Costs	$112,000	$168,000	$64,000
Farm Profit	$164,480	$164,640	$10,256
Solar Revenues	**$0**		
Total Profit	**$339,376**		
Net Community Gain	**$101,156 ($339,376 - $424,220 + 200 acres x ($1,000 - $70))**		

Source: Author's calculations

Table 9. **NOW 800-ACRE FARM THAT DEVOTES 20% OF OWNED LAND TO SOLAR**

	Soy	Corn	Wheat
Owned Acres — Farming	136	136	68
Leased Acres — Farming	120	120	60
Owned Acres — Solar	160		
Farm Revenues	$285,184	$330,112	$91,405
Farm Costs	$91,840	$136,640	$52,320
Farm Profit	$193,344	$193,472	$39,085
Solar Revenues	**$160,000**		
Total Profit	**$425,901**		
Net Community Gain	**$187,681 ($425,901 - $424,220 + 200 acres x ($1,000 - $70))**		

Source: Author's calculations

3.4.4 Resulting Spending, Investment and Hiring in the Community

The additional post-tax income to participating farms will be spent on consumer goods and services, reinvested in the farm business, saved, or used to hire additional workers.

Savings and investment in the business strengthen the household and by extension the community. Spending on local goods and services also strengthens the community. The additional household income can be significant, sufficient to finance home and farm improvements, a portion of which will be spent with local businesses and support local jobs. Like spending on local goods and services, investment in the business, and hiring additional workers share the wealth generated by the solar project more broadly within the community.

In total, the solar farm project will generate $2.25 million per year in pre-tax land lease payments. Assuming a combined federal and state marginal income tax rate of 30 percent, participating households will earn $1.575 million per year in after-tax income.

In order to evaluate how additional income may be more broadly shared with the community, participating farms were surveyed in August 2021 concerning planned use of additional farm income. Of 27 farms owned by different families or entities that had signed leases and easements or confirmed their intention to do so at the time of survey, 22 completed surveys.

Spending priorities vary with stage of life and income levels. Of those 22 farms, 12 farms were owned by individuals 60 years or older, and 19 farms were owned by individuals 50 years or older.

Of the 22 farms surveyed, 16 responded to the survey question concerning household income. For those 16 farms, all household income categories were represented, 12 of the 16 respondents falling in the over $50,000 family income per year categories.

Respondents represented a total of 1,948 acres of land which they intend to lease to the solar project. Over 22 respondents, this represented an average of 89 acres of land per respondent. Additionally, respondents representing 7,640 feet of easement rights of way, or about 10 percent of the expected 70,000 feet in easements to be procured, also participated in the survey.

When asked to rank planned uses for solar lease revenues, the most commonly identified priorities were increasing savings, making home improvements, increasing spending, and paying off debt. Among those priorities, paying off debt was ranked number one more than any other priority, ranked first by seven respondents.

The survey asked respondents to estimate their use of solar lease revenues for the first five years, estimating as a percentage how they will spend the additional after-tax household income toward: paying down debt/paying bills, savings, investing in their own business, hiring someone for home or business, purchasing real property and spending money on goods and services. Twenty-one of those surveyed responded to these questions.

Survey respondents were further asked to estimate, for the amounts expected to be spent on consumer goods and services, how much they would spend on various categories of expenses, described further below. Twenty-one of those surveyed responded to these questions.

This data enabled us to calculate marginal propensity statistics, specifically for every dollar of additional after-tax income, what percentage will be spent on goods and services, saved, invested in a business, or used to hire someone to assist around the house or business. The degree to which additional household income increases consumption, saving, or hiring is measured by the marginal propensity to consume, save, or hire, which expresses spending behavior for each additional dollar of household income between the amounts zero to one.

The marginal propensity to consume is perhaps the most commonly researched of these statistics. Empirical estimates of the marginal propensity to consume in the United States range widely, typically between 0.2 and 0.6 in economics literature and can vary based on household income levels, economic conditions, and the study population.[78] A Federal Reserve Bank of Boston study using time series data from 1999 to 2013 estimates the marginal propensity to consume based on wealth quintile: 0.218 for the first quintile, and 0.166, 0.002, 0.002,

78 C. Carroll, J. Slacalek, K. Tokuoka and M.N. White (2017) The distribution of wealth and the marginal propensity to consume. Quantitative Economics, 8: 977-1020.

0.015, for the subsequent wealth quintiles.[79] A study of marginal propensity to consume under COVID shows significant increases of at least two times the previously cited Federal Reserve Bank of Boston study for each quintile.[80] None of these studies involved farming communities.

Instead of relying on generic data, this study calculates marginal propensity statistics for this particular population of farming households leasing land or granting easements to the Ridge View Solar Project. Based on survey responses from 21 farm respondents, the following relationships are estimated:

- Marginal propensity to consume: 0.28
- Marginal propensity to save: 0.57
- Marginal propensity to invest in their own business: 0.12
- Marginal propensity to hire additional workers: 0.03

Thus, for example, for each additional dollar of household income, 28 cents are expected to be spent on consumption of goods and services.

Notably, the survey data produced a marginal propensity to consume statistic that is within the range commonly used in economics literature and roughly consistent with the Federal Reserve Bank of Boston figures cited above for the first wealth quintile.

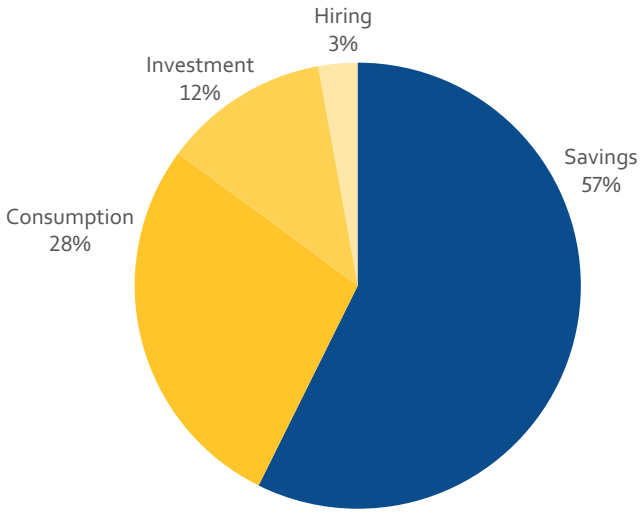
In deriving the marginal propensity to consume statistic, this study further defined categories as local-spending versus non-local spending. Local spending included: food, home renovation, vehicle expenses, fuel, local recreation, and medical expenses. Non-local spending is travel. The categories "consumer goods" and "other" are unknown and are not counted towards local spending. Based on responses, at least 49 percent or half of consumer spending is expected to be local spending. Non-local travel accounts for 10 percent of expected consumer spending. The remaining 41 percent is mixed or unknown.

The marginal propensity to save statistic includes both savings and paying down debt. Both components were roughly of equal magnitude. Paying down debt can also be a form of investment for a home business. Savings and debt repayment both strengthen and increase the resilience of farming households, as down years can be both pervasive and severe.

79 Jonathan Fisher, David Johnson, Timothy Smeeding and Jeffrey P. Thompson (2019) Estimating the Marginal Propensity to Consume Using the Distributions of Income, Consumption, and Wealth. Federal Reserve Bank of Boston Research Department Working Papers No. 19-4.

80 M. Dinerstein, Z. He and X. Sun (2021) Background: Marginal Propensity to Consume in the 2021 Economy. Available at: https://budgetmodel.wharton.upenn.edu/issues/2021/2/3/background-mpc-in-2021-economy (accessed May 24, 2021).

Figure 2. **EXPECTED PRIORITIES FOR AFTER-TAX HOUSEHOLD INCOME**



Source: Author based on survey results.

Based on surveyed priorities, the $1.575 million in annual after-tax revenues to participating households would generate:

- $437,000 in annual additional consumption, at least half being spent locally
- $903,000 in annual savings and debt reduction
- $190,000 in annual investment in farm and local businesses
- $45,000 in additional hiring

All of these strengthen the local community. Savings and debt reduction makes households and businesses more resilient, especially in a downturn. The additional consumption, investment and hiring, in particular, will have multiplier effects as these generate revenues for other members of the community.

4 Farmland and Residential Values

This chapter addresses the impact of how solar PV arrays located on farmland could affect property values. In evaluating this issue, we analyze property values for farms installing solar arrays under the proposed Ridge View Solar Project, for farms not participating in the project, and for residential properties that do not have adequate land for farming or to participate in the solar project.

4.1 REAL ESTATE VALUES

4.1.1 Value Impacts on Participating Farms

Land valuation is complex, involving many factors like location and proximity to markets, soil quality, climate, topography, water availability and drainage, length of the growing season, and productivity.[81] These factors can vary between neighboring plots of land. Notwithstanding these variables, valuation of a farm or any other commercial property will heavily weigh the critical variables of the business's revenue potential, considering operating risks.

As background, in the Niagara County area, farmland owners who rent their land to larger farms typically receive annual rents of between $30 to $100 per acre. EDF Renewables is offering leases that pay considerably more per acre per year, commensurate with market rates for solar land leases. Solar lease arrangements typically range between $300 to $2,000 per acre per year nationwide.[82] Annual payments will also be paid for hosting the project substation, collection lines for connecting the solar farm sites and a short transmission line to connect the project substation to the existing 345 kV transmission line.

As farmland is valued based on its productivity or revenue potential, the significant increase in revenue potential for leased land will unquestionably enhance the value of participating farms. The below illustration of the impact of solar on land value assumes that 20 acres of a hypothetical 100-acre farm are devoted to solar arrays. The farm may also use that same land for grazing sheep, beekeeping or other compatible purposes, however we have assumed those other activities to be non-revenue producing for purposes of conservative estimates.

Under these assumptions, the 100-acre farm will generate an additional $18,500 each year with a solar lease on 20 percent of its total acreage.

Over 30 years, assuming a discount rate of 3 percent, the net present value of $18,500 received annually is equal to just over $362,600.

The farm, sold as residential real estate, would therefore be worth up to an additional $362,600 over the value it would ordinarily sell for without the solar installation. In practice, buyers and sellers would likely negotiate a sales price that splits the additional benefit between them.[83]

81 See, e.g., CIBO (undated) Solving the Tricky Riddle of Land Valuation. Available at: https://www.cibotechnologies.com/ (accessed August 21, 2021).

82 Strategic Solar Group, *supra* note 70.

83 The author has observed New York unimproved farmland advertised for sale in 2021 with existing or planned solar leases being priced by seller to split the future value of revenues between buyer and seller, taking into consideration both the land value component and the solar lease component.

A larger farm, sold as a business, would typically be priced both on land value and taking its productivity into account. The additional revenue stream from solar, independent of traditional risk factors, would enhance the value of the business, both by increasing its revenues and reducing the risk of operating a farm with solar revenues.

4.1.2 Value Impacts on Non-Participating Farms

Non-participating farms may also experience an increase in the value of their farmland for several reasons.

First, solar leases establish greater price transparency and a higher benchmark in valuing farmland. As previously described, Niagara County farmland owners typically receive annual rents of between $30 to $100 per acre. In contrast, nationwide, solar lease arrangements range between $300 to $2,000 per acre per year.[84]

Second, solar PV will increase the demand for farmland in the Niagara County area. The greater demand will increase land values, even for non-participating farms.

The only group of farms that will not benefit from the solar PV will be those that rent property from other farms and do not participate in the solar PV project. They may pay higher annual rents, and if they wish to consolidate these smaller farms by acquisition, they likely will pay higher prices to acquire them.

Increasing market prices for farmland leases could pose challenges for large non-participating dairy farms in particular. New York State requires dairy farms to maintain an approved plan to manage sewage under its Concentrated Animal Feeding Operations (CAFO) permitting regime. CAFO compliance depends in part upon maintaining an adequate ratio of acreage to livestock to keep animal concentrations at levels that sewage can be managed. Importantly, the provision of subsidized agricultural loans is conditioned upon compliance with state licensing requirements.[85] With farm land potentially exiting agricultural leases in favor of solar leases, larger commercial farms dependent upon land leases can be expected to pay more for leases, and if they are unable to obtain additional acreage, may be required to reduce their herd or take other measures to maintain compliance with CAFO and other permitting requirements.

4.1.3 Value Impacts on Residential Properties

Residential property values are based on the desirability of a property, typically based on past sales of comparable properties. Desirability is a function of various factors, including size and quality of home and land, its features and condition, its location, neighborhood aesthetics, tax levels, the quality of schools, and proximity to shopping and other services.

Two other factors that influence property values generally are demographics and economic growth.[86] Demographics – a growing working age population and income levels – strongly influence demand for real property. Economic growth influences overall wealth and drives the ability to pay higher prices for property. The relationship between economic growth and housing prices is well established. However, quantification of the relationship is complicated by the various factors that influence housing values and economic growth; this paper does not attempt to quantify the relationship with precision, other than to rely on the commonsense relationship that housing prices, demographics (working age population and per capita income) and economic growth move together.[87]

In turn, real estate prices also have a salutary effect on the economy. Housing prices effect the economy through "wealth effects" as increased home values increase home equity, increase confidence in the economy, and encourage homeowners to spend more money in the economy generally. Because consumer spending accounts for roughly 70 percent of the U.S. economy, housing market prices can have a large impact on economic growth.[88]

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84 Strategic Solar Group, *supra* note 70.

85 Personal communications, Jim McNeil, Farm Service Agency, Lockport, New York, September 15, 2021.

86 G. Donald Jud and Daniel T. Winkler (2002) The dynamics of metropolitan housing prices. Journal of Real Estate Research 23 (1–2), 29–45.

87 See, e.g., Ghislain Nono Gueye (2021) Pitfalls in the cointegration analysis of housing prices with the macroeconomy: Evidence from OECD countries, Journal of Housing Economics 51 (2021) 101748; Charles Leung (2004) Macroeconomics and housing: a review of the literature, Journal of Housing Economics 13 (2004) 249–267.

88 Congressional Research Services (2021) Introduction to U.S. Economy: Housing Market, May 3. Washington, D.C.: Congressional Research Services.

For purposes of this analysis, local population growth and economic growth that stabilize jobs, attract homebuyers to the Hartland region, and increase household incomes are the most relevant factors that influence housing values in the Hartland region.

Other factors that influence property values, such as interest rates, government policies and general inflation levels, act independently of the introduction of solar arrays into the Hartland community. These factors are thus assumed to be neutral factors and not part of the analysis below, which is restricted to the impact of the solar panels on residential property values for residential properties.

Based on the foregoing factors, the introduction of solar arrays could have the following effects on property values in the Hartland community:

Negative Impacts

- For adjacent properties, potentially aesthetics depending on the extent to which mandatory setbacks and buffers effectively mitigate these impacts

Positive Impacts

- More financially stable local farm community and businesses from the solar lease and easement revenues paid to landowners
- Stabilized taxes due to the proposed PILOT agreement and potential enhancement of public services, such as schools, due to increased revenues earned by the Town of Hartland, Niagara County, Barker Central School District and Royalton Hartland Central School District

Based on these factors, for un-adjacent properties, the impact on property value could be positive. By extension, for the Hartland community overall, the impact will be positive due to the higher overall property values.

For immediately adjacent properties, the direction of the impact is unclear, and the overall impact depends on whether mitigation measures are taken for these properties. The number of potentially affected properties are relatively few – those adjacent to the roughly 40 participating farms – relative to a total of 1,526 households in the community. This suggests that the overall effect on community values will exert a positive influence on adjacent properties.

At the same time, for adjacent properties, mitigation strategies that preserve aesthetics will be important to minimize any potential negative influence being located next to a solar farm may have.

The next section addresses potential mitigation strategies to maintain adjacent residential home values.

4.2 MITIGATION STRATEGIES TO MAINTAIN RESIDENTIAL VALUES

EDF Renewables will be required to observe setbacks and install and maintain visual buffering like planting hedge rows and trees as a condition of the permit. These measures will mitigate potential negative impacts on neighboring residential properties adjacent to or within view of neighboring farms hosting solar arrays.

Project Approval and Setbacks

Hartland's zoning rules require that properties hosting solar arrays must be at least 15 acres, and that the maximum solar array coverage area no greater than 50 acres. The rules establish standard setbacks of a minimum 100 feet from any property lot line, and minimum 200 feet from lot lines bordering a zoning district boundary. Further, solar arrays must be a minimum of 250 feet from buildings or structures and 500 feet from dwellings not located on the lot hosting the solar array. Solar arrays must also be a minimum of 200 feet from any public road and 500 feet from property lot lines bordering a school or public park. Solar arrays may not exceed 20 feet in height when oriented at maximum tilt.[89]

89 Town of Hartland, Zoning Code, Section 144-17(G).

As described in the previous section, the Ridge View Solar Project may be permitted under either of two alternative permitting regimes under New York State law.

The project applied for review under Article 10 of the Public Service Law, authorizing electrical generation facilities of 25 MW capacity or greater to be reviewed by the New York State Board on Electric Generation Siting and the Environment within the New York Department of Public Service. In reviewing proposals, the Board may preempt substantive local land use restrictions if it determines them to be "unreasonably burdensome in view of the existing technology or the needs of or cost to ratepayers whether located inside or outside of such municipality."[90]

In 2020, New York State amended the Executive Law to adopt Section 94-c adopting procedures specific to approve renewable energy facilities equal to or greater than 25 MW planned capacity and transferring jurisdiction for permitting to a newly created Office of Renewable Energy Siting (ORES).[91] The Ridge View Solar Project may opt-in to the Section 94-c review process.

Pursuant to Section 94-c, ORES issued implementing regulations that adopt standards and conditions based on Article 10 practices relating to renewable generating facilities. Section 94-c authorizes ORES to provide specific guidelines for solar generating facilities, which supersede local zoning requirements. Under Section 94-c, solar arrays must maintain minimum setbacks of 100 feet from non-participating residential property lines and 250 feet from non-participating occupied residences. Further, solar arrays must be at least 50 feet from non-participating non-residential property lines and from the centerline of public roads. Solar arrays may not exceed 20 feet in height when oriented at maximum tilt.[92]

EDF Renewables can exceed Section 94-c standards and conditions by voluntarily negotiating greater setbacks from non-participating residential homes on a case-by-case basis.

Hedgerows and Trees

Planting hedgerows and trees within the setback areas will buffer the view from adjacent non-participating residences. Hedgerows and trees can be a highly effective screen. The type and amount of hedgerows and trees can be selected in consultation with neighboring non-participating property owners to help address their concerns.

Hedgerows and trees will also help solar farmland continue to host flora and fauna, and can be selected based on types that protects the region's biodiversity.

The clear-cutting of healthy, mature stands of trees should be avoided in siting solar arrays in order to protect community aesthetics and biodiversity. EDF Renewables has procured commitments for enough previously cleared land to site solar panels to avoid the widescale clearcutting of trees. Cutting trees may still be required on a limited basis, particularly for installation of collector lines.

Tree replanting proposed by the project may also be an opportunity to replenish Niagara County's ash tree population. Throughout New York State, including Niagara County, the emerald ash borer beetle (*Argulus planipennis*) has been attacking native North American ash species (*Fraxinus* sp.), resulting in loss of these trees. Tree replanting at the perimeter of properties as a screen can help maintain this native tree species.

90 New York Public Service Law, Article 10, § 160.

91 Pursuant to the Accelerated Renewable Energy Growth & Community Benefit Act, S. 7508-B, A. 9508, 2020-21 Reg. Sess. (N.Y. 2020), the Office of Renewable Energy Siting is responsible for siting and permitting new major renewable energy facilities in New York State, which are defined as "any renewable energy system, as such term is defined in section sixty-six-p of the public service law... with a nameplate generating capacity of twenty-five thousand kilowatts or more". Section 66-p of the Public Service Law defines renewable energy systems as "systems that generate electricity or thermal energy through use of the following technologies: solar thermal, photovoltaics, on land and offshore wind, hydroelectric, geothermal electric, geothermal ground source heat, tidal energy, wave energy, ocean thermal, and fuel cells which do not utilize a fossil fuel resource in the process of generating electricity."

92 New York State, Chapter XVIII, Title 19 of NYCRR Part 900, §900-2.6(d)-(e).

5 Community Investment and Jobs

This chapter evaluates the contribution the Ridge View Solar Project will make to the Hartland community through host community agreements, taxes, household electricity savings and jobs development.

5.1 TAX REVENUES

In New York, counties, cities, towns, villages, school districts, and special districts use property taxes to fund schools, police and fire protection, road maintenance, and other municipal services. Schools account for over 60 percent of local taxes levied in New York State outside of New York City.[93]

Niagara County, the Town of Hartland, on behalf of itself and special districts such as fire, water and sewage, and local school districts impose real property taxes used to fund their operations.

The Ridge View Solar Project will provide four types of payments to municipal governments and school districts related to real property taxes.

First, EDF Renewables intends to enter into a Payment In Lieu of Taxes (PILOT) agreement with the Niagara County Industrial Development Agency for the benefit of the local tax authorities that would collect additional real property taxes due to increases in assessed value due to improvements resulting from the solar project, but for the New York State exemption for clean energy systems under the Real Property Tax Law[94] or exemption under Industrial Development Agency authority.[95]

Second, EDF Renewables will also enter into a Host Community Agreement with the Town of Hartland to direct additional revenues to the town.

Third, EDF Renewables will make additional payments to landowners pursuant to the land lease agreements for tax liabilities that result from the loss of agricultural tax exemption on properties used by the solar project.

Finally, EDF Renewables will make any special district tax payments with respect to solar project improvements. Special district taxes are not subject to exemption under the clean energy systems provision of the Real Propert Tax Law[96] or exemption under Industrial Development Agency authority.[97] Special district taxes for fire, water and refuse are assessed within the project area.

Combined, the amounts proposed under the PILOT agreement, Host Community Agreement and the additional taxes collected due to the rollback of the agricultural exemption will provide the taxing jurisdictions with over eight times more revenue than the current taxes generated from farming.[98]

93 New York State, Property Taxes. Available at: https://www.tax.ny.gov/pit/property/learn/proptax.htm (accessed May 24, 2021)

94 New York State Real Property Tax Law § 487.

95 General Municipal Law § 874 and New York State Real Property Tax Law § 412-a.

96 The clean energy systems exemption of Section 487 of the Real Property Tax Law does not apply to special district taxes.

97 The industrial development agency exemption provided by section 412-a of the Real Property Tax Law and section 874 of the General Municipal Law applies only to general taxes and not to special assessments and special ad valorem levies. Volume 1: Opinions of Counsel SBEA 23. Available at: https://www.tax.ny.gov/pubs_and_bulls/orpts/legal_opinions/v1/23.htm (accessed February 25, 2022).

98 Taxes on participating farm parcels are approximately $122,00 per year as of 2021 based on tax records for participating farms (analysis on file with the author).

5.1.1 PILOT Agreement

A PILOT agreement ensures taxing jurisdictions are compensated for the taxes they would have collected for the increased value of participating real property parcels as a result of the installation of a solar panel system. EDF Renewables proposes to enter into a PILOT agreement with the Niagara County Industrial Development Agency for the benefit of the taxing authorities.

New York State law exempts any increase in property value attributable to the addition of certain renewable or clean energy systems from municipal and school district property taxes for a period of up to 15 years.[99] Special districts established to collect taxes, such as are common for fire, library, sewage or other special purposes, are not covered by the law and thus these special district taxes would be assessed at full value and payable by the taxpayer without the benefit of the exemption. The exemption provides an important economic incentive for property owners to adopt solar and other renewable energy improvements.

To protect municipalities and school districts that rely on real property taxes for a majority of their revenue, the law allows taxing jurisdictions to opt-out of the tax exemption by adopting a local law or resolution making the added value of a solar panel system fully taxable,[100] or alternatively, to require a solar developer to make PILOT payments to partially replace the taxes it would have otherwise collected. PILOT agreement amounts cannot exceed what the tax amount would have been without the exemption. NYSERDA estimates that PILOT payments should be negotiable between 1 and 3 percent of the compensation solar developers receive for the electricity their projects generate.[101]

The Town of Hartland, Niagara County, Barker Central School District and Royalton Hartland Central School District will continue to collect local property tax revenues from participating farms at the pre-solar project rates. Additional contributions to the taxing jurisdictions are expected to be negotiated through the PILOT agreement to be negotiated with Niagara County Industrial Development Agency and Host Community Benefit agreement to be negotiated with the Town of Hartland. As a result, any additional property tax that would have been assessed due to increases in assessed value in respect of the solar project improvements will be partially compensated under the PILOT agreement and paid by EDF Renewables. The property owner will thus be exempt from increases in property taxes due to the solar project.

In the absence of a PILOT agreement, increases in property taxes would be assessed using standardized valuation methods specified by the State of New York.

Without a PILOT arrangement, if taxes were assessed at full value, the cost of solar electricity produced would increase by approximately ¢2.3 per kWh.[102]

5.1.2 Host Community Agreement

The Town of Hartland receives about 7 to almost 10 percent of all real property tax revenues assessed on Hartland properties.[103] EDF Renewables proposes to enter into a Host Community Agreement with the Town of Hartland to supplement revenues to the town. Since the Town of Hartland only collects 7 to 10 percent of all real property tax revenues assessed on Hartland properties and the project will have the greatest impact within the town, the Host Community Agreement seeks to increase its overall share of revenues. The Host Community Agreement also satisfies the New York State Executive Law Section 94-c requirement that a project provide a host community benefit acceptable to the host community.[104]

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99 New York State Real Property Tax Law § 487.

100 See jurisdictions opting out of New York State Real Property Tax Law § 487's clean energy systems exemption: https://www.tax.ny.gov/research/property/legal/localop/487opt.htm (accessed February 25, 2022).

101 NYSERDA (undated) Solar Payment-In-Lieu-Of-Taxes (PILOT), Albany, New York: NSYERDA.

102 This figure assumes $400 million in capital investment and application of an 81% equalization rate, resulting in property tax increase of almost $14 million per year based on 2021 Hartland village tax rate of $11.704685 per $1,000 of assessed value, Niagara County tax of $8.090107 per $1,000 of assessed value, Niagara County refuse rate of $0.060713 per $1,000 of assessed value, Hartland Town Tax of $2.610724 per $1,000 of assessed value, and school taxes of $16.782392 for Barker CSD or $24.225992 for Roy Hart CSD per $1,000 of assessed value. Assuming production of 613,200,000 kwh per year (see note 2 for calculations), an increase of $14 million in tax per year increases the price of electricity by about $0.0226/kWh. Niagara County Real Property Tax Services. Available at: https://www.niagaracounty.com/realproperty/Resources/Tax-Rates (accessed January 24, 2022).

103 Calculation based on town and village taxes collected by Town of Hartland over all real property taxes. See preceding note for details.

104 New York Consolidated Executive Laws, Executive Law Section 94-C(f).

During the operation phase of the Ridge View project, EDF Renewables proposes to make combined PILOT and Host Community Agreement payments of $1 million annually, escalating 2 percent per year, thereby investing 40 million in total into the community over 30 years. The Town of Hartland, Niagara County, Barker Central School District and Royalton Hartland Central School District can use these funds on a discretionary basis, freezing or reducing taxes and/or investing in infrastructure upgrades, education or services.

5.1.3 Additional Tax Revenues Resulting from Loss of Agricultural Exemption

For farms participating in the Ridge View solar project, conversion of part of their land from agricultural use to hosting solar panels could potentially result in the loss of the agricultural tax exemption for that land.

The loss of the agricultural exemption for property used by the solar project will result in increases in property taxes to be paid to local tax authorities, including the Town of Hartland. EDF Renewables will pay these taxes directly to the local tax authorities under the terms of the land lease agreements or will reimburse landowners for increased amounts paid by them, and therefore these taxes will not be borne by the participating farms. Such amounts contribute additional income to the community.

For all farms anticipated to participate in the project, the loss of the agricultural exemption will result in increases in property taxes of approximately $34,600 per year, plus a one-time rollback tax penalty with interest of approximately $218,000, totaling $1.6 million over 30 years assuming 2 percent escalation.[105]

5.2 HOST COMMUNITY FUND

EDF Renewables has also pledged to establish a Host Community Fund of $40,000 per year for the community during construction and the first 10 years of operation. The fund will be distributed to local initiatives, such as youth sports and clubs, American Legion, volunteer fire companies, and the historical society. These funds would be administered by a local committee established for this purpose. These payments will total at least $480,000.

5.3 HOUSEHOLD ELECTRICITY SAVINGS

Under the New York Public Service Commission Community Benefit Program, $500 per MW installed for the first 10 years of operation will be devoted to providing rebates for Hartland residents residential electricity bills. The rebate is worth $175,000 total, and approximately $100 per year rebate per household based on 1,526 households in the Town of Hartland.

5.4 JOBS CREATION

5.4.1 Project Construction Jobs

EDF Renewables proposes to invest approximately $400 million in order to construct the project, approximately $52 million of which will be spent on labor during construction. During the predevelopment phase, the project has employed dozens of individuals from upstate New York on a part-time or temporary basis to conduct environmental reviews, interconnection studies, field surveys, community engagement activities, and other preparatory work.

During the construction phase, EDF Renewables estimates that approximately 300 individuals will be employed for two seasons or approximately 18 months.

105 Estimated increase in property taxes due to loss of agricultural exemption based on percentage of each participating farm's acreage expected to be devoted to solar panels (analysis on file with the author).

Table 10. **RIDGE VIEW SOLAR PROJECT CONSTRUCTION JOBS**

Position	Jobs	Duration Weeks	Weekly Compensation including benefits	Annual Compensation including benefits	Total Payroll (salary + benefits)
Construction Management	42	74	$2,615	$135,980	$8,127,420
Foundations Installation	15	49	$2,320	$120,640	$1,705,200
Electrical Installation	200	49	$2,713	$141,076	$26,587,400
Module Installation	56	49	$2,615	$135,980	$7,175,560
Racking Installation	70	49	$2,615	$135,980	$8,969,450
Total	**383**				**$52,565,030**

Source: EDF Renewables

In total, construction jobs are estimated to equal 383 annualized full time employee positions. These are well paying prevailing wage or union jobs, considerably higher than current compensation for construction, installation and maintenance positions in the Buffalo-Cheektowaga-Niagara Falls area. For example, according to May 2020 Bureau of Labor Statistics data for the region, electricians earned a mean annual wage of almost $67,000. The Ridge View Solar Project will pay $141,000 per year in compensation including benefits for electrical installation positions, which comprise almost half the positions created. Similarly, the other positions are compensated higher than non-solar local trade positions.[106]

5.4.2 Project Operation Jobs

Once operating, EDF Renewables proposes to employ four permanent staff in maintenance and support roles and provide temporary work for contractors and farmers for periodic facility maintenance, landscaping, snow clearing and agrivoltaic activities. Compensation for solar maintenance positions in New York is approximately $44,000 to $64,000 per year.[107] As with the construction phase, EDF Renewables expects to compensate the permanent operations phase positions at higher levels, including benefits, in the range of $80,000 to $120,000 annually.[108]

In addition to permanent staff, EDF Renewables will employ third parties to maintain vegetation at the solar sites, remove snow, maintain roads, maintain site facilities and substations, maintain panels, and replace or repair racking and electrical components. The costs of these services escalate annually at a rate of 2% to 3%, with some expenses being periodic as equipment ages and warranties expire. Based on EDF Renewables estimates of the extent to which these expenses are provided by local labor, these costs start at over $270,000 per year in the initial years and grow to almost $900,000 in year thirty. Over 30-years, local third-party maintenance services inject an additional $11.3 million to the local economy.[109]

5.4.3 Farm Household Jobs

Hartland participating farms will receive an estimated $2.25 million per year in pre-tax income due to the project. A portion of this income will likely be deployed by farm households to hire additional labor to support farming operations on farmland devoted to agriculture and potential complementary agricultural activities compatible with solar arrays, such as beekeeping and sheep grazing.

106 See Bureau of Labor Statistics, May 2020 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates, Buffalo-Cheektowaga-Niagara Falls, NY. Available at: https://www.bls.gov/oes/current/oes_15380.htm#49-0000 (accessed September 19, 2021).

107 Estimates based on advertised solar maintenance positions in New York advertised on Indeed.com on October 2, 2021, offering hourly compensation of $22 to $32 per hour depending on experience and training. Annualized estimated range based on these hourly figures for a 40-hour work week at 50 weeks per year. The resulting range is consistent with maintenance position compensation reported in the Bureau of Labor Statistics, May 2020 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates, Buffalo-Cheektowaga-Niagara Falls, NY.

108 Personal communications, November 2021.

109 EDF Renewables data provided January 31, 2022 (on file with Author).

Based on the study survey results showing a marginal propensity to hire of .03, based on $1.575 million of post-tax solar lease revenues annually, $45,000 of additional post-tax household income is expected to be devoted to hiring new employees, resulting in one full-time position or two part-time positions being created in the Town of Hartland.

These estimates do not account for additional hiring that may result from increased local consumption of goods and services or increases in investment in farm household businesses.

5.5 NEW BUSINESS OPPORTUNITIES

Solar farming is compatible with other business opportunities. Some of these business opportunities accrue directly to participating farms, with solar farming providing start-up capital for the new venture. Other opportunities accrue to the community more broadly.

New business opportunities in farming include solar array-compatible agriculture like beekeeping and sheep grazing, and potential new business activities such as the establishment of a local abattoir to process sheep, as well as tourism and hospitality business generated by interest in the project.

Although potentially significant, the development of new business opportunities depends on the initiative of community members, and thus are speculative.

Beekeeping

Beekeeping presents several potential revenue streams for solar farms that wish to use the land under solar panels to generate additional income. These revenue streams include sales of honey, wax, products made from honey or wax, and providing pollination services.

The number of beehives appropriate to a site depend on various factors, including the abundance of flora for nectar within a one-mile or greater radius, weather conditions, density of bees in the area, solar panel array configuration, and proximity to neighbors.

A recent study of beekeeping on solar project lands for Genesee County, New York supported by EDF Renewables suggests that the profitability of these operations is highly sensitive to honey production, honey prices, and management of costs as well as other variables. Depending upon these variables and the size of the operation, the beekeeper could incur losses or generate modest profits.[110]

Labor is a major consideration in the scale and management of a beekeeping operation. A beekeeping operation can be serviced by the land owner, or scaled to the size they wish to manage. Larger operations approaching 400 to 500 beehives could support one or more seasonal positions or consistent contract work, depending on the services provided.[111]

Also, pairing honey and wax production with pollination services and bee sales can improve the profitability of operations. Due to declining bee populations in the United States over the past decade,[112] demand for bee pollination services is likely to remain strong.

Small beekeeping operations can earn roughly $250 to $500 per beehive per year after expenses if they are providing pollination services and selling bees, and managing the operation well to avoid high loss rates.[113] However, the provision of pollination services and bee sales requires significant additional effort by the beekeeper.

110 Mary Kate MacKenzie (2021) Morris Ridge Solar Beekeeping Report, Mount Morris Agrivoltaic Study.

111 Personal Communications, Joe Maresh and John Jacob, Oregon State Beekeeping Association, August 20, 2021.

112 See Environmental Protection Agency (2021) Colony Collapse Disorder, Available at: https://www.epa.gov/pollinator-protection/colony-collapse-disorder (accessed August 19, 2021); Johanne Brunet (2019) Pollinator Decline: Implications for Food Security & Environment, Scientia, Available at: https://www.scientia.global/pollinator-decline-implications-for-food-security-environment/ (accessed August 19, 2021).

113 Personal Communications, Joe Maresh and John Jacob, Oregon State Beekeeping Association, August 20, 2021.

Beyond potential revenues generated by beekeeping, solar farms that host bees enhance the biodiversity of their region and safeguard pollinators essential to agriculture.[114] Pollinators benefit the broader farming community, resulting in higher agricultural yields, the value of which to the local ecosystem can be significant.[115]

Due to the inherent uncertainty in the financial performance of beekeeping operations and because the pursuit of beekeeping operations depends on the initiative of individual farmers, this study does not quantify their potential revenue contribution to the community.

Sheep Grazing

Sheep grazing presents a potentially significant revenue source for local grazing operations if used to service the solar installations as an alternative to mechanical landscaping and for local farms that install solar PV and wish to continue to utilize the same land for agricultural activities.

The farm to table movement is growing and opens up opportunities for local sheep grazing on solar farms to market high-end specialty meats to local restaurants as consumers are increasingly concerned about the sustainability and quality of food.[116] Muslim and other ethnic communities in nearby Buffalo, Niagara Falls and Syracuse generate additional demand for lamb as well as specialty meat preparation.[117] A recent survey of restaurants, distributors, retailers and processors in Western New York confirm robust consumer demand for local, grass-fed, solar grazed lamb if it became available.[118] As over half of lamb consumed in the United States is imported from Australia and New Zealand,[119] local suppliers should be competitive in displacing imports as well as expanding consumption.

Sheep grazing provides at least two potential streams of revenues: grazing revenues as an alternative to landscaping services, and the sale of sheep for food. Farmers, whether participating landowners or not, may acquire sheep and operate their own grazing and animal sale business, scaling these activities based on their own preferences.

EDF Renewables is responsible for maintaining Ridge View leased land and would pay sheep farmers to graze the property during the spring, summer and fall months. EDF Renewables would therefore provide a stable source of business income for one or more local grazing operations, which may expand to service additional clients beyond the Ridge View Solar Project.

This study assumes a simple grazing operation that purchases lambs seasonally, grazes them from May through October, and then sells the lambs to slaughterhouses at the end of the season. Assuming an operation servicing 25 acres, grazing two lamb per acre, a small-sized operation earning $250 per acre per season to remain competitive with landscaping services,[120] animal losses of 4 percent due to predation and other causes, and selling lambs at market prices, can earn a modest profit. This study makes the following assumptions:[121]

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114 Leroy J. Walston, Shruti K. Mishra, Heidi M. Hartmann, Ihor Hlohowskyj, James McCall and Jordan Macknick (2018) Examining the Potential for Agricultural Benefits from Pollinator Habitat at Solar Facilities in the United States, Environmental Science & Technology 52: 7566-7576.

115 See Katie Siegner, Scott Wentzell, Maria Urrutia, Whitney Mann and Hallie Kennan (2019) Maximizing Land Use Benefits from Utility-Scale Solar: A Cost-Benefit Analysis of Pollinator-Friendly Solar in Minnesota, New Haven: Yale University; John Jacob and Rob Davis (2019) Flowering Solar Farms, *American Bee Journal*, April.

116 International Food Information Council Foundation (2018) 2018 Food & Health Survey. Available at: Foodinsight.org (accessed August 20, 2021).

117 Gary Williams, Oral Capps, Victoria Salin, Senarath Dharmasena, Lindsey Higgins, William Thompson and David Anderson (2011) Ethnic Lamb Buying and Preparation Behavior and Preferences. AFCERC Commodity Market Research Report No. CM-01-11.

118 Letchworth Gateway Villages, Juniper Economic Consulting and Agrivoltaic Solutions, LLC ,Morris Ridge Lamb Demand Survey, draft dated August 5, 2021 (on file with author).

119 USDA Economic Research Service, Sheep, Lamp & Mutton. Available at: https://www.ers.usda.gov/topics/animal-products/sheep-lamb-mutton/sector-at-a-glance/ (accessed September 7, 2021).

120 Solar grazing compensation range from $250 for sub-contracted services to $500 for directly contracted. Nikola Kochendoerfer, Lexie Hain and Michael L. Thonney (2018) The agricultural, economic and environmental potential of co-locating utility scale solar with grazing sheep. Ithaca, New York: Cornell University, David R. Atkinson Center for a Sustainable Future. A budget of $250 per acre for grazing on utility-scale solar farms, which is generally at the lower end of the range, was also used in Julie Stepanek Shiflett (2021) Morris Ridge Solar Energy Grazing Budget, Mount Morris Agrivoltaic Study.

121 Assumptions based on information provide by Dr. Judy St. Leger, board member of the American Solar Grazing Association, personal communications, August 25, 2021; Julie Stepanek Shiflett (2021) Morris Ridge Solar Energy Grazing Budget, Mount Morris Agrivoltaic Study.

Costs	
Cost of lambs	50 lambs at $85 per head
Medicine, salt and minerals	$7/lamb
Labor	10 hours per week for 24 weeks at $25/hour
Moveable fencing	25 acres at $25/acre
Revenues	
Grazing	25 acres at $250 per acre
Lamb sales	48 lambs at $135 per head after losses[122]

At this small scale, in the first year, the business would generate a modest profit and pay for its investment in fencing. At a grazing price of $250 per acre, the business generates approximately $1,500 in profit, after paying off the investment in fencing. At this scale, the business will require about 10 hours a week of labor for six months of the year.

Sheep grazing and sales can generate significant additional revenue to solar farming or scaled as its own business. As a rough estimate, if scaled to 1,000 acres based on these assumptions and a grazing price of $250 per acre, the business generates roughly $60,000 dollars in profits annually, with a payroll of roughly $240,000 employing approximately four full-time employees.

The scale and profitability of operations vary based on factors such as sheep per acre, local conditions, range of services offered, and year-round operations. A variety of business models and budgets have been developed and made publicly available by the American Solar Grazing Association.[123]

Significantly, the availability of several business models and relatively low barriers to entry offer farmers interested in pursuing sheep grazing options in scaling this opportunity.

Hospitality

During the construction phase, approximately 300 construction workers will come to the Town of Hartland region, increasing spending on local hospitality, food and supplies.

Once operating, the Ridge View Solar Project offers educational and eco-tourism opportunities that could draw tourists to visit. If the solar farm increases visits to Hartland, a certain percentage will extend their stay, using local hotels or creating opportunities for private accommodations rental businesses, such as Airbnb, and eating at local restaurants. For each 100 family trips generated, assuming 50 percent of those visitors stay locally, accommodations revenues would be approximately $5,000 at a price of $100 per night. If 75 percent of visiting families purchase a meal in the Hartland area, this would further increase local revenues by $3,375, assuming on average a family of three persons at $15 per person. Under these assumptions, 100 family day visits would generate $8,375 in additional revenues for the Hartland area.

The number of visitor days to Hartland to see the solar farm cannot be predicted with precision, however additional visits to the Hartland area are likely to occur due to promotion of the solar farm development. The Becker Farms and local chamber of commerce will actively promote tourism. Travel websites like Tripadvsor.com will advertise the solar farm as a local attraction. The project developer will invite business guests to view the development for proof of concept. Schools will visit the site to learn more about solar.

122 Nikola Kochendoerfer and Michael L. Thonney (2021) Grazing Sheep on Solar Sites in New York State: Opportunities and Challenges, Ithaca, New York: Cornell University.

123 See American Solar Grazing Association at https://solargrazing.org/resources/solar-grazing-budgets/ (accessed on August 31, 2021).

Abattoir

Solar sheep grazing will generate additional demand for meat processing services. The local Hartland Abattoir in Gasport, New York has limited capacity, typically has a reservation backlog, and prioritizes existing customers.[124] Thus, there appears to be adequate demand to support additional abattoir services and, conversely, the lack of these services may be a significant barrier to expanding sheep grazing in the local area.

Establishing an abattoir would create both temporary construction jobs and permanent jobs. Abattoirs are complex facilities, requiring animal intake and lairage areas, slaughter area, processing, refrigeration, and shipping areas and equipment.[125] Construction of a modern abattoir costs well upwards of $1 million.[126] Alternatively, mobile abattoirs, built on a truck platform, are also an option.

A small abattoir can employ between five to ten employees. Required positions include operations manager, accountant, harvest manager, and cutting and processing staff.[127] Cutting and processing staff earned a mean annual wage of $31,210 or mean hourly wage of $15.00 in 2020, according to the Bureau of Labor Statistics.[128] Assuming 90 percentile salaries of $40,000 per annum for managers and clerical staff, a small abattoir with a staff of three cutting and processing and three managers/clerical staff would have a total payroll of over $213,000 per year, creating six new jobs, with potential for growth.

5.6 ADDITIONAL HOUSEHOLD SPENDING AND SAVINGS

In total, the solar farm project will generate payments of $2.25 million per year in pre-tax farm income, escalating at 2 percent per year, for land leases and easements. Assuming a combined federal and state marginal income tax rate of 30 percent, participating households will earn $1.575 million per year in after-tax income.

Based on surveyed priorities, the $1.575 million in annual after-tax revenues to participating households would generate $437,000 in annual consumption, at least half of which is expected to be spent locally.

Local spending includes food, home renovation, vehicle expenses, fuel, local recreation, and medical expenses. The study survey showed that home renovation is one of the highest priorities of participating households, suggesting that local construction companies will benefit from increased household incomes.

Income not spent is saved or invested. Additional income to participating farms will significantly increase household savings. Based on the study survey's estimated marginal propensity to save of 0.57, solar leases will result in over $900,000 in annual savings and debt reduction.

Similarly, the study survey's estimated marginal propensity to invest of 0.12, solar leases will result in almost $190,000 in annual investment in farm and local businesses. This amount may be further increased to the extent that debt reduction for farms or other businesses, reflected in the savings estimate above, can be treated as a form of investment.

Additional savings strengthens community households by making them more financially resilient. Households can invest these savings, pay down debt, or hold them as cash as precautionary savings.

In summary, the income to participating farms of $1.575 million per year, yields between roughly $215,000 to $437,000 of spending per year in the community, aggregate savings among community households of $900,000 annually, and annual investment of $190,000.

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124 Personal communications, August 2021.

125 Food and Agricultural Organization, Standard design for small-scale modular slaughterhouses. Available at: http://www.fao.org/3/t0034e/T0034E05.htm#ch4. (accessed August 20, 2021).

126 Lacey Newlin, So you want to build a slaughter plant?, High Plains Journal, June 12, 2020, Available at: https://www.hpj.com/livestock/so-you-want-to-build-a-slaughter-plant/article_a033a44e-acaf-11ea-a32d-63beecbd5f05.html (accessed August 20, 2021).

127 Lauren Gwin, Arion Thiboumery, Debra Garrison, and Nick McCann (2011) Small Meat Processors Business Planning Guidebook, Corvallis, Oregon: Niche Meat Processor Assistance Network.

128 Bureau of Labor Statistics, Occupational Employment and Wages, May 2020: 51-3023 Slaughterers and Meat Packers https://www.bls.gov/oes/current/oes513023.htm (accessed August 20, 2021).

5.7 SUMMARY OF COMMUNITY BENEFITS

Over the 30+ year period during which the project will be constructed and operating, the community of Hartland will receive direct economic benefits of at least between $175 million to $227 million, depending on how many of the construction phase jobs are filled by Hartland area residents.

Beyond the revenues received by participating farm households, spending by those households on local consumer goods, investment in local business and hiring further add to the value of the project to the local community. For example, participating farms will earn additional household income to spend, a portion of which will be spent on consumer goods, and in turn 50 percent of additional consumer expenditures are assumed to be spent locally based on surveys. These households receive goods and services for the amount spent, and the individual or business with whom they transact also earns income, both spreading and increasing the benefit to the community. Expected consumer spending, investment and hiring are described in section 3.4.4 of this paper.

The estimated benefits to the community presented in the table below do not count potential new business opportunities, which depend on individual initiatives. This paper identified business opportunities in sheep grazing and farming, and additional opportunities to establish a new abattoir with a starting payroll of over $200,000 per year, potentially adding cumulatively eight jobs to the Hartland area economy. In addition, beekeeping opportunities, which depend on availability of local forage and density of hives, could produce additional household business revenues. These opportunities are described in section 5.5 of this paper.

Over a 30-year period, the project is expected to generate revenue to local landowners and businesses averaging $2,949/acre to $3,824/acre each year over the expected period of operation from 2026 to 2055, the range depending upon the extent to which construction jobs are sourced in the immediate community. Compared to average gross farm income and in Niagara County of $1,080 per acre, the Ridge View Solar Project will generate up to three and a half times the revenue of agricultural production.[129]

129 USDA (2017), *supra* note 10.

Table 11. **SUMMARY OF BENEFITS**

Type	Frequency	Amount	Total Over Project
PILOT and Host Community Agreement Payments	Annual over 30 years	$1 million per year, escalating 2% annually	$40.5 million
Additional Taxes due to Loss of Agricultural Exemption	Annual over 30 years	$34,600 per year, plus a one-time rollback tax penalty with interest of $210,000, escalating 2% annually	$1.6 million
Community Benefit Fund	Annual over 10 years + 2 years construction	$40,000	$480,000
NY PSC Host Community Benefit Program	$500 per MW capacity for 10 years ($500 x 350 MW)	$175,000 annually for 10 years	$1,750,000
Solar Lease/Easement Payments	Annual over 30 years	$2.25 million per year, escalating 2% annually	$91 million
Additional Local Spending	Annual over 30 years	$437,000 per year in additional consumption, at least half spent locally, escalating 2% annually	$8.8 million, assuming 50% of additional consumer spending spent locally
Business Investment in the Local Community	Annual over 30 years	$190,000 per year, escalating 2% annually	$7.7 million
Additional Hiring	Annual over 30 years	$45,000, escalating 2% annually	$1.8 million
Preconstruction Jobs	3-year period	Not Estimated	
Construction Jobs	3-year period	Up to $52.5 million	
Operational Jobs	30-year period	$400,000 per year assuming four positions at average $100,000 per year	$12 million, excluding benefits and escalation
Third Party Local Operations Support	30-year period	Variable annual costs, escalating for inflation	$11.3 million
New Business Opportunities	30-year period	Not Estimated: depends on individual initiative; see discussion in section 5.5 of this paper	
Total Payments – Nominal Value (depending on construction jobs): $177.0 to 229.4 million			
Total payments, $/acre/yr (assuming 30 years of operation): $177.0 to $229.4 million/2,000 acres/30 years = $2,949 to $3,824			

Source: Author's calculations.

6 Key Findings

This chapter summarizes the key findings of the assessment of the Ridge View Solar Project.

6.1 STABILIZING SMALL FARMS, COMMUNITY AND JOBS

- Devoting a modest portion of a farm's acreage to solar arrays provides a diversified revenue stream ensuring protection against farming risks of commodities prices, yields and increased costs.
- Solar revenues will significantly increase participating Hartland farm household savings and debt repayment, both strengthening and increasing the resilience of these farming households.
- Solar revenues will to a lesser but significant extent result in spending on local goods and services, particularly home and farm improvements, and will result in increasing investment in local business.
- The solar pre-construction, construction and operational periods will generate full-time and part-time jobs and temporary opportunities. The most significant jobs creation will occur during construction when 300 individuals will be employed in the construction trades. During the operational period, four full-time maintenance positions will be created.
- Solar-compatible agriculture can generate additional revenues and potentially modest seasonal jobs, depending on the initiative of the farming community to further utilize solar acreage to maximize revenues. Other opportunities facilitated by the project, such as establishment of an abattoir in conjunction with sheep grazing, would create significant jobs and could be undertaken by a member of the community

6.2 PROPERTY VALUES

- Solar PV will increase the demand for farmland in the Niagara County area. The greater demand will increase land values, even for non-participating farms.
- The only group of farms that will not benefit from the solar PV will be those that rent property from other farms and do not participate in the solar PV project. They may pay higher annual rents, and if they wish to consolidate these smaller farms by acquisition, they likely will pay higher prices to acquire them.
- The additional revenue stream from solar enhances the value of farming business, both by increasing its revenues and reducing the risk of operating a farm with solar revenues.
- Setbacks, hedgerows and trees should be generously employed to minimize potential aesthetic impacts on neighboring non-participating properties. Solar array placement should be designed to minimize tree removal.
- Higher farmland lease prices available through solar leases will establish greater price transparency and a higher benchmark in valuing farmland compared to farmland that is leased to third parties for agricultural purposes.

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