PROJECT PROFILE:

Solar Power Generation

A Sustainable, Revenue Generating Business Model for Smaller Dairies

Hunt Farm | Orange, Massachusetts

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INSIDE

OVERVIEW

Hunt Farm near Orange, Massachusetts milks 120 cows and farms 500 acres. In 2012, the farm owner/operator, George Hunt Jr. partnered with Jordan Energy to design, finance and build a series of solar power systems on marginal land and farm buildings. To date, five solar-electric projects are completed and providing $150,000 annual net revenue to the farm. Solar panels on the freestall barn produce enough electricity to power the milking parlor, milk cooling equipment and area lights nine months of the year. Two solar projects provide land lease revenue to the farm and the remaining projects sell power directly to campground and restaurant tenants. There are no dollars invested on our part in some of these projects, and it provides a positive cash flow. It's been a real help," says George Jr.

BACKGROUND

Collaboration and third-party investment can deliver profitability to small farm dairies from solar projects despite challenges.

Since 2012, farm owner/operator, George Hunt Jr. installed 5 solar projects that have brought savings and revenue to the farm. A key partner in many of these projects has been Jordan Energy who designed, financed, and built most of solar power systems on marginal land and farm buildings. Currently, the five completed solar-electric projects are providing approximately $150,000 annual net revenue to the farm. Solar panels on the freestall barn

Continued

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Although some large dairy farms have been utilizing solar systems for several years, the expertise, time, and financial requirements of designing and installing a solar-electric project can be burdensome for smaller farms. That is why Hunt Farm partnered with Jordan Energy to develop five successful solar projects of various sizes over the ten years. It all began when the free-stall barn needed a new roof at a cost of $70,000 to $80,000, said George Jr. "In 2010, a solar company offered to give us a new roof for free if we mounted solar panel on the roof." At that time, Jordan Energy, having expertise in dairy solar systems, contacted us and offered to review the proposal and provide advice. Jordan Energy recommended applying for a USDA Rural Energy for America Program (REAP) grant for renewable energy systems. A proposal was submitted, and Hunt Farm received a $20,000 grant and proceeded to commission their first solar project.

Hunt Farm recognized that farm-based solar energy projects were not economically feasible and sustainable without third-party financing options, state and federal incentives, and grants. To address this problem, Hunt Farm partnered with Jordan Energy to move the projects forward, secure financing through solar companies that claim a 30% federal tax credit, sell the power to the grid and provide the dairy cash payments.

> *"There are no dollars invested on our part in some of these projects, and it provides a positive cash flow. It's been a real help.*

George Hunt is confident that "…working with Jordan Energy, we were able to complete the five solar projects on our land and have a stable annual revenue while contributing to the sustainability of our dairy operation."

PROJECT SPECIFICS

Hunt Farm is an example of five successful on-farm solar projects generating 4.9 MW of electricity and approximately $150,000 per year in net revenue and cost savings. Project snapshots are summarized below to describe the financial benefits of solar power and viable business models Hunt Farm used on their dairy. Solar power requires a large investment to buy and install the solar panels and the benefits are spread out over a long period, typically over 10 years. Hunt Farm's business models addressed these problems and found ways to integrate installation, ownership, operation, and financing into a profitable on-farm business, so as the price of solar panels decrease, more dairy farms are going solar.

PROJECT 1 (2012)

In 2012, Hunt Farm installed a 55-kW solar photovoltaic system. The solar array is mounted on the roof of a 52' x 212' freestall barn. The power is used nine months of the year to power the parlor, milk cooling and lighting.

55 kW Roof Mounted Solar

Farm Annual Net Revenue	$24,000 annual net electricity cost savings.
Capital investment	This project was financed by the farm through Farm Credit East loan.
Solar Investment Tax Credits	The farm financed the project using 30% solar ITC.
Solar Renewable Energy Credits	SREC revenue accrues to the farm.
Grants	Hunt Farm received a $20,000 USDA grant through the USDA Renewable Energy for America Program (REAP) to help finance the project.
Total Installation Cost	This project was financed by the farm.
Annual O&M Cost	$1,000,000 per year. The solar developer monitors and maintains the system through a minimal cost O&M contract.
Solar Consultant	Jordan Energy was retained by Hunt Farm as a solar project consultant.

PROJECT 2 (2013)

In 2013, Hunt Farm entered into a land lease agreement with a solar developer to install a 3.3-megawatt land mounted solar photovoltaic system located on 12 acres of marginal farmland. The electricity is purchased by the utility company through a 20-year power purchase agreement.

3.3 MW Ground Mounted Solar Array

Farm Annual Net Revenue	$61,500 net annal profit from a 20-year land lease agreement with the solar developer
Capital Investment	$9 million financed by project developer. No cost to the farm.
Tax Credits	The developer financed the project using 30% solar ITC.
Solar Renewable Energy Credits	SREC revenue accrues to the project development company.
Total Installation Cost	$9 million financed by project developer. No cost to the farm.
Annual O&M Cost	$ 20,000,000. The solar developer monitors and maintains the system. No cost to the farm.
Solar Consultant	Jordan Energy was retained by Hunt Farm as a solar project consultant.

PROJECT 3 (2016)

In 2016, Hunt Farm installed a 145-kW solar photovoltaic system. The solar array is leased by the dairy and mounted on a barn roof. The dairy sells power to a restaurant tenant where the Hunt's own the building.

145-kW Roof Mounted Solar Array

Farm Annual Net Revenue	$20,000 net annal profit from power sales and solar renewable energy credit sales
Farm Capital Investment	$354,000 total lease payment over 10 years with a 20% buyout ($75,866) at year ten
Tax Credits	$111,780 accrued to CoBank/Farm Credit Leasing
Solar Renewable Energy Credits	$41,160 in solar renewable energy credits revenue per year
Grants	None
Total Installation Cost	$379,000
Annual O&M Cost	$2,000
Solar Project Developer	Jordan Energy & Food Enterprises, LLC

PROJECT 4 (2017)

In 2017, Hunt Farm installed a 16-kW ground mounted solar photovoltaic system on 2 acres of marginal farmland. The power is supplied to a campground and event venue on the farm's property.

16-kW Ground Mounted Solar Array

Farm Annual Net Revenue	$4,500 of electricity cost savings per years
Farm Capital investment	$51,000,000 total payment over 10 years with Farm Credit East loan.
Tax Credits	$15,000 ITC taken by farmer.
Solar Renewable Energy Credits	$5,000,000 in solar renewable energy credits revenue per year
Grants	None
Total Installation Cost	$51,000,000
Annual O&M Cost	$500
Solar Project Developer	Jordan Energy & Food Enterprises, LLC

PROJECT 5 (2019)

In 2019, Hunt Farm partnered with Jordan Energy to develop a 1.4 MW ground mounted solar photovoltaic system through a ten-year land lease to own. located on 7 acres of marginal farmland. The electricity is purchased by the utility company through a power purchase agreement.

1.4-MW Ground Mounted Solar Array

Farm Annual Net Revenue	$27,000 land lease revenue per year
Capital investment	Solar developer financed the project. No financial investment from the dairy.
Tax Credits	Solar developer using investment tax credits.
Solar Renewable Energy Credits	Solar renewable energy credits revenue accrues to the project development company
Grants	None
Total Installation Cost	No cost to the farm. The solar development company financed the project.
Annual O&M Cost	No cost to the farm. The solar developer monitors and maintains the system
Solar Project Developer	Jordan Energy & Food Enterprises, LLC

KEY ISSUES AND CHALLENGES

George Hunt Jr. says his family's operation teamed up with Jordan Energy to design and develop solar projects that reduced the farm's overhead costs without investing a large amount of capital. "We started by understanding the farm's unique energy needs and opportunities for on-grid solar power versus off-the-grid solar power", said Bill Jordan, CEO of Jordan Energy & Food Enterprises, LLC. Over the past twelve years, Hunt Farm developed five projects on their land, taking advantage of tax incentives, grants and solar business models that provides long-term stable income, as described below:

On-Grid Solar

On-grid solar systems are the least expensive and most popular systems for dairies. Hunt Farm developed three on-grid solar projects financed by the solar developers with no investment from the dairy. Two of the solar systems sell all the electrical generation to the utility company through 20-year power purchase agreements. Farm revenue is generated through leasing the land where the solar panels are located. The other solar systems where solar panels are mounted on the freestall barn roof, a neighboring building's roof, and on the campground, are all on the Massachusetts net-metering program. Whenever the solar power generation exceeds each site's electricity needs, the excess solar power is fed back into the power grid and purchased by the utility company in the form of a credit on the utility bills. Hunt Farm developed two solar system that supply power to buildings outside of the actual farm. These systems generate electricity that is sold to a restaurant where the Hunts own the building and to a campground and event venue located on the

farm's property, generating a positive revenue stream to the dairy. Solar developers financed the systems that are now being leased by the farm. For Hunt farm, these two remote net metered solar projects were good options since installing solar panels near the restaurant and campground was less expensive than running utility power lines to each location.

Off-Grid Solar Land Leases

Hunt Farm has entered into two land lease agreements whereby the solar developer is leasing the land in order to provide energy storage options directly to the utility. As the utility distribution network has become more saturated due to the increases in solar projects in the area, utility owned storage is being added to the grid to support the additional distributed generation resources.

Solar Investment Tax Credits

What is a tax credit?

A tax credit is a dollar-for-dollar reduction in the amount of income tax you would otherwise owe. For example, claiming a $1,000 federal tax credit reduces your federal income taxesdue by $1,000.[1]

What is the federal solar tax credit?

The federal solar energy credit is a tax credit that can be claimed on federal income taxes for a percentage of the cost of a solar photovoltaic (PV) system.[2] (Other types of renewable energy are also eligible for similar credits but are beyond the scope of this guidance.)

The system must be placed in service during the tax year and generate electricity for a home located in the United States. There is no bright-line test from the IRS on what constitutes "placed in service," but the IRS has equated it with completed installation.[3]

A solar PV system had to be installed before December 31, 2019, to claim a 30% credit. This decreased to 26% for systems installed in 2020 – 2022 (extended by congress Dec. 2020) and to 22% for systems installed in 2023. This tax credit expires in 2024 unless Congress renews it. There is no maximum amount that can be claimed.

Am I eligible to claim the federal solar tax credit?

You might be eligible for this tax credit if you meet all of the following criteria:

- Your solar PV system was installed between January 1, 2006, and December 31, 2023.
- The solar PV system is located at your primary or secondary residence in the United States, or for an off-site community solar project, if the electricity generated is credited against, and does not exceed, your home's electricity consumption.[4]
- You own the solar PV system (i.e., you purchased it with cash or through financing, but you are neither leasing nor are in an arrangement to purchase electricity generated by a system you do not own).
- The solar PV system is new or being used for the first time. The credit can only be claimed on the "original installation" of the solar equipment.

1 The federal tax credit is sometimes referred to as an Investment Tax Credit, or ITC.

2 26 U.S.C. § 25D, https://www.govinfo.gov/app/details/USCODE-2011-title26/USCODE2011-title26-subtitleA-chap1-subchapA-partIV-subpartA-sec25D.

Source: U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy

3 IRS. 2018, March 2. IRS private letter ruling 201809003. https://www.irs.gov/pub/ irs-wd/201809003.pdf. Note: A private letter ruling may not be relied on as precedent by other taxpayers.

4 The IRS has permitted a taxpayer to claim a section 25D tax credit for purchase of a portion of a community solar project (IRS. 2015, September 4. IRS private letter ruling 201536017. https://www.irs.gov/pub/irs-wd/201536017.pdf. Note: A private letter ruling may not be relied on as precedent by other taxpayers.)

What expenses are included?

The following expenses are included:

- Solar PV panels or PV cells used to power an attic fan (but not the fan itself).
- Contractor labor costs for onsite preparation, assembly, or original installation, including permitting fees, inspection costs, and developer fees.
- Balance-of-system equipment, including wiring, inverters, and mounting equipment.
- Energy storage devices that are charged exclusively by the associated solar PV panels, even if the storage is placed in service in a subsequent tax year to when the solar energy system is installed (however, the energy storage devices are still subject to the installation date requirements).
- Sales taxes on eligible expenses.

KEY BENEFITS

Economic benefits – The added revenue and cost reductions from on-farm solar systems provides income to sustain the dairy:

- Leasing marginal farmland to solar developers for on-grid projects generates a stable revenue stream from non-productive crop land.
- Ground mounted solar systems owned by the dairy produces additional revenue by selling electricity to tenants through power sales agreements.
- A solar array mounted on the roof of a freestall barn provides low cost solar power to the milking parlor, milk cooling equipment and lighting, reducing operating costs.
- There are no dollars invested by the dairy in some of these projects, and they provide a positive cash flow.

Environmental stewardship — The dairy producer is a better steward of the environment, since solar systems produce "clean energy" without air pollution, solid waste, or other environmental contaminants. Additionally, solar farms make excellent neighbors because they are entirely self-contained and no fossil fuel is required, which means no air pollution which reduces greenhouse gas emissions. Solar panels have few moving parts, with almost no maintenance and little noise or odor.

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Energy cost and supply stability — Because the amount of sunlight the farm receives is relatively consistent, solar energy will help keep the farm's electricity costs and supply stable. There was no initial investment by the farm in some of the solar projects and power purchase agreements and the utility's net metering program allows the dairy more control of their net energy costs. On-farm solar generation also provides backup power to the farm ensuring continued operations during electrical outages.

SYSTEM ECONOMICS

The total costs including capital equipment and installation is estimated to be just over $400,000 including design, permitting, engineering, groundwork, pads, solar panels and interconnection. These costs are considered estimates because the system was installed in phases and some of the final cost will not be known until the end of the initial lease period. To achieve optimal system performance Hunt Farm works with Jordan Energy to monitor and track performance of each solar array,

scheduling maintenance when performance drops below established levels. The annual operating costs of the five systems combined is less than $10,000 per year.

> *"We started by understanding the farm's unique energy needs and opportunities for on-grid solar power versus off-the-grid solar power.*

KEY LEARNINGS

George Hunt indicated that there were several things that he would pass on to other dairymen who were considering installing solar energy systems.

1. Find and work with a project developer that has dairy experience, one that knows the challenges dairies face these days, one that can bring project financing, and maybe even one willing to replace a barn roof. George said several times he liked the personal service provided through a smaller solar company that focused on the value to the farmer. Larger companies reminded him of used car salesmen without straight talk, overpromising their service. "Flash in the pans" is what he called them. They wanted to sell 5MW larger deals when George was interested in both large and small arrays.
2. George feels a solar project should be required to pay all of the taxes on the land that they lease, not just the increase that occurs after the project is built. Once a piece of property is used for a solar installation it has less ability to be used for other purposes, if the sole purpose is solar, then the project should pay all the taxes. If there are other revenue streams an equitable split based on the acreage and revenue is appropriate.
3. He did not feel it was inappropriate to receive lease payments during construction, although he did recognize that it may need to be lower than what is received when the project is producing power. This provides an incentive to the developers and keeps them focused on getting the project completed.
4. George said he found working with the utility companies particularly challenging and that they are often slow to act. You need to expect unexpected delays. In one instance, the transformer on the utility pole was too small to handle the solar generated power. National Grid owned the transformer, but ATT owned the pole, which was also too small to support a newer, heavier transformer. Coordinating with two utilities was difficult for George and took a lot longer than he thought. ATT finally replaced the pole, and National Grid replaced the transformer, but no-one expected this delay.
5. Knowledge and experience with the power regulations of the state is essential, whether it is Net Metering or Feed-in-Tariffs (see sidebar for definitions), as is familiarity with all the contract terms and conditions, power purchase agreements and state/federal incentive programs.

CONCLUSION

The decision to install a solar power generation system is not one to take lightly. "You don't know, what you don't know," according to George. Jordan Energy understood this and became a trusted partner by working with the Hunts and teaching them what they needed to know.

Financing can be "too slow" in making an offer to finance solar systems. Entities like Farm Credit and CoBank, who are more familiar with solar projects, can be more responsive than programs that don't have the same track history in the space.

SOLAR TERM GLOSSARY

Half the battle of learning about the solar energy industry is understanding the jargon. Whether you are just getting started or need a little refresher, review our simple definitions below to gain better insight on the solar industry.

Feed-In Tariff (FIT)

A feed-in tariff is a pricing policy that promotes the use of renewable energy sources. Feed-in tariffs are long-term agreements that allow utilities to purchase energy from customers who use FIT-eligible sources to generate renewable energy. Rooftop solar panels are often eligible for FIT programs, so solar users can receive a set payment for any electricity that is produced and delivered to the grid. However, not all states offer FIT programs.

See Also Net Metering

Kilowatt/Kilowatt Hours

A kilowatt (kW) is a measure of power — the demand at any given time. A kilowatt-hour (kWh), on the other hand, is a measure of energy — the consumption of power over a period of time. A kWh is the power demand (kW) multiplied by the total amount of time the power is being used (in hours). So, if a 30-watt bulb is running for 24 hours, 720 watt-hours or .72 kWh is consumed (30 watts times 24 hours).

The average household consumes about 30 kWh per day. If your solar panels receive five hours of peak sunlight per day, you need 6 kW of output (30 kWh divided by 5 hours — that is your demand) to cover 100% of your energy use. A typical solar panel can produce between 250 and 270 watts of peak power during ideal conditions, which means you will need about 24 solar panels to make a 6-kW array.

Meter

This is what monitors the energy production of your home solar system. You are probably familiar with the traditional meter, but if you get solar panels, you will need a bi-directional or digital meter.

Net Metering

Net metering is a billing system that allows users with a solar array to send excess or unused solar energy back to the utility grid for nearby users to consume. This system helps solar power users gain significant savings per month on their utility bills.

When energy demand is low during the day, a typical solar panel system produces more electricity than one household can utilize. Net metering allows users to gain credits for the excess energy their solar panel systems produce during this time. Then, during the evening or periods of peak usage, a household can use these credits to consume electricity that is already paid for.

Net metering benefits vary between states. To learn about your state's net metering policies, check out the Database of State Incentives for Renewables & Efficiency® (DSIRE).

Photovoltaic (PV)

The term photovoltaic (PV) comes from two root words: "photo" (light) and "voltaic" (voltage).

In physics, "photovoltaic" refers to anything that produces electricity when exposed to light or other radiant energy. Solar cells, solar modules, and solar panels are often referred to as PV cells, PV modules, and PV panels to express how their electricity is produced.

SOLAR TERM GLOSSARY

Power Purchase Agreement (PPA)

This is a type of solar-purchasing contract. A developer finances a solar energy system and installs it on a customer's property—usually at little to no cost for the customer. The energy produced is then sold to the customer at a set cost that is cheaper than traditional utility rates. When the agreement ends, the customer often has the option to extend the term, remove the equipment, or purchase the array from the developer at a reduced cost. For more information on PPAs, check out our Solar Financing Options post.

Note that under this type of agreement, the developer receives any tax credits or rebates for a given array.

Real-Time Pricing

Real-time pricing (RTP) is a type of time-varying rate (TVR): it empowers users to pay for the actual price of electricity at any given time and save on utilities by adjusting their personal energy use during periods of high or low demand.

RTP policies vary from state to state, and the cost of electric power can vary significantly within a 24-hour period — cost depends on a variety of factors, including expected supply and demand, temperatures, fuel prices, or even a generator outage. Despite these cost fluctuations, however, users tend to pay the same price regardless of when their energy is consumed.

With RTP, a user receives a price signal in short intervals that reflects the real cost of consuming electricity during that time. This pricing system requires the installation of a smart meter to transmit electricity cost data but can save users an average of 15% on their utility bills.

Source: Solar Power Authority
https://www.solarpowerauthority.com/

Newtrient's mission is to help all dairy farmers reduce the environmental footprint of manure while enhancing their economic opportunities and their social license to operate. The information contained in this case study was developed with the cooperation of the organizations involved and Newtrient has endeavoured to make sure it is accurate and complete as possible.

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