

# ASTGU ANNUAL REPORT

## PURPOSE

This Annual Report form is required to be completed and submitted annually for all projects with the MA Department of Energy Resources (DOER) which received qualification as an Agricultural Solar Tariff Generation Unit (ASTGU) under the SMART program. The form is provided to demonstrate conformance with the general provisions required for ASTGUs in 225 CMR 20.00; in particular pertaining to Section 20.06(1)(d) therein as well as associated ASTGU Guidelines; and specifically pertaining to annual reporting requirements.

The completed form will be reviewed by DOER and the MA Department of Agricultural Resources (MDAR) to determine that the farm is in conformance with all ASTGU provisions in general under the SMART Program, although more specifically to the annual production requirements.

## BASIC FARM INFORMATION

Farm Contact Person Name: Paul Knowlton  Farm Owner  Farm Operator

Farm Name: Knowlton Family Trust

Legal Structure:  Sole Proprietor  LLC  Corporation  
 Partnership  Other Trust

Mailing Address: 43 Estabrook St, Grafton, MA 01519

Street Address (if different): \_\_\_\_\_

Contact Phone: 774-535-1381 Contact Email: pknowltonandsons@gmail.com

Check all that apply:  Solar facility owner  Landowner  Applicant

Current Type of ASTGU Farm Operation (Check all that apply):

Vegetables  Fruit  Livestock  Poultry  Hay  
 Nursery  Other \_\_\_\_\_

Total Acreage in ASTGU Farm Production: 12 acres forage, 2 acres vegetables

Gross Annual Revenue for ASTGU Farm Production: Total \$ 6,952

Are any major modifications to the farm business expected in the next 5 years?  Yes  No  
(Check all that apply.)

Business Legal Structure  Operation Type  Expansion  Diversification  
 Retirement  Sale  Subdivision  Other \_\_\_\_\_

## BASIC SOLAR PROJECT INFORMATION

Solar System Company Owner: BWC Lake Ripple, LLC

Solar System Company Address: 282 Century Place, Suite 2000, Louisville, CO 80027

Solar Company Contact Person/email/tel#: Aravind Satheesh Aravind.satheesh@aes.com  
813-573-0515

**ASTGU Project Start-Up/History Information:**

Date ASTGU Approved by DOER: 6/11/19

Date Solar Portion of ASTGU Project Commenced Construction: 12/31/20

Date Solar Portion of ASTGU Project was Completed & Operational: 4/6/22 (placed in service)

Date Original Agricultural Portion of the ASTGU Project Commenced: 4/1/22

Date Original Agricultural ASTGU Portion of Project Harvested/Sowed Products: 11/20/23

How many complete years, that is both solar and agricultural production, has the ASTGU been in operation? 3 years \_\_\_\_\_

**SOLAR ARRAY DESIGN – PLEASE PROVIDE AS-BUILT SYSTEM INFORMATION**

Please provide the following information regarding the solar array design:

Nameplate capacity AC (in MW): (i) 0.24MW; (ii) 1.76 MW (Note: 1 MW=1000 kW)

Expected annual generation AC (MWh): 3,971.8 MWh (Note: 1 MWh=1000 kWh)

Acreage of farmland over which array is to be installed: (i) 2.09 acres, (ii) 11.54 acres

System type:  Fixed  Tracking  Other \_\_\_\_\_

Height of lowest panel edge (in feet): Ten feet six inches

Height of lowest elevated horizontal mounting (in feet): Ten feet

Type of mounting (mono poles, racking, etc.): Fixed tilt

Description of materials and process to be used for ground penetration: An excavator with a post-driver was used to pound galvanized steel posts into the ground and all-terrain lifts were used to install the panels and wiring.

Number of panels, capacity per panel, and panel spacing:

(i) SMALL ARRAY (fixed-tilt, 832 bi-facial Astronergy New Energy Technology panels); 410-watt modules; every third panel was removed within the racking table; rows are spaced at 16.7 feet (panel edge to panel edge).

(ii) LARGE ARRAY DESIGN - (fixed-tilt, 6,890 bi-facial Astronergy New Energy Technology panels); 410-watt modules; every third panel was removed within the racking table; rows are spaced at 16.7 feet (panel edge to panel edge).

*If you wish to provide additional descriptive information regarding the solar array design, including any system changes since original completion, you may include this information below, or in a typed attachment labeled "Solar Array Design."*

The large array sends energy to an energy storage facility comprised of 16 battery modules, Samsung SDI. Storage is 1.44 MWac. Both arrays are managed as Community Shared Solar.

---

## **AGRICULTURAL PLAN FOR DUAL-USE AREA**

Planned agricultural use, Year 1. Check all that apply.

Vegetable, fruit, grains, for human consumption

Hay

Livestock production

Poultry production

Horticulture

Floriculture

Aquaculture

Other, please describe: \_\_\_\_\_

Please fill the Crop Table results following this section for horticulture, flowers, vegetable, fruit, grain, and hay crops for your present year of operation. Fill out one Crop Narrative for each crop, detailing anticipated crop management (planting, irrigation, soil amendments, harvesting) and equipment to be used. **Crop Table – Current Season** follows this section. Also, please also fill out a **Crop Table – Next Season** and corresponding narrative at the end of this section with your best information available.

Please fill out the Grazing Table results following this section for livestock and poultry production for your present year of operation. Please also fill out the Grazing Narrative, detailing anticipated pasture and animal management and equipment to be used. **Grazing Table – Current Season** follows the Crop Table section. Also please fill out a **Grazing Table – Next Season** and corresponding narrative at the end of this section with your best information available.

### **Additional comments regarding agricultural production for Year 1:**

How did the Agricultural Production perform versus expectations? Please explain why/why not if you can:

Turkeys were a new unexpected pest this season and significantly reduced the total marketable yield of the strawberries. Woodchuck pressure also continued to be an issue, particularly with the kale and carrot areas, with all the plants before harvest could occur. The wet spring delayed soil preparation for planting spinach and the early summer heat caused the spinach to bolt before it could be harvested. Sweet corn was planted under a portion of the array and this performed better than expected.

Did you plant the crops/graze the animals as you originally intended when your Pre-Determination Application was approved? If not please explain.

Strawberries and leafy greens, namely kale, were grown as stated within the Pre-Determination Application. Corn and beets were planted instead of pumpkins and squash to see how they would produce in partial shade and because they were more economically viable this year.

Were the products marketable as anticipated? Please explain how the production values (weight/bushels etc) were determined.

The strawberries were successful overall, producing 174 quarts. This total would have been greater if the turkey pressure was lower. The corn yielded better than expected, producing 264 marketable ears of corn that were sold to the local community. From the areas unaffected by the woodchuck, the beets produced approximately 60 bunches which was better than expected since this is a new crop for the site. The planted carrots, kale and spinach did not result in a market yield due to the reasons listed below.

What occurred during the current season that wasn't anticipated? Positive & Negative.

The turkey and woodchuck pressure had significant negative consequences to the vegetables and strawberries this year. In addition, the wet/late spring followed by the hot summer caused bolting before the spinach was able to be harvested. Despite the turkeys, the strawberries performed well under the panels. The corn and beets grew well, which was somewhat unexpected and encouraging.

What Changes/Modifications do you expect to make to improve on production if needed?

Inquiries on the best way to remove the woodchucks and turkeys from the vegetable array are underway. Motion activated sprinklers, predator urine and other measures are being explored. Row cover may be applied next year to the rows of strawberries and young vegetable plants to act as a physical barrier against the turkeys.

Do you expect to grow the same crops on the land in years 2 and 3? Briefly describe your crop rotation plan and what you expect to be growing on the land for the next 5 years Will the same equipment be used? If not, is current array design compatible with future crop management needs and equipment?

For years 4 and 5, strawberries will continue to be grown and pumpkins/squash will be revisited. Exploration is underway regarding crops that are more able to be protected from pests and this will be reflected in an updated planting plan to be developed this spring. The current equipment and array design will be compatible with crop plans.

<b>Table A: Crop Production – Current Season</b>					
<b>Crop</b>	<b>Area planted (Row length and width or acreage, as appropriate)</b>	<b>Planting date(s) (approximate)</b>	<b>Harvest date(s) (approximate)</b>	<b>Expected productivity, total pounds harvested with dual use</b>	<b>Actual productivity, pounds, with dual use</b>
Strawberries	800 row feet	4/15/24	The month of June (Two times a week)	250 qts	174 qt
Beets	390 row feet	5/13/25	Late June through Early August	160 lbs	50-60 bunches (~100 lbs)
Carrots	130 row feet	5/13/25	N/A	118 lbs	N/A
Sweet Corn	540 row feet	5/19/25	Early September	380 ears	264 ears
Spinach	215 row feet	6/6/25	N/A	100 bunches	N/A
Kale	215 row feet	6/6/25	N/A	300 bunches	N/A

## **CROP NARRATIVE – Current Season**

*Please detail the crop management for this past season, including approximate **dates** and **equipment** used. The purpose of this form is to provide empirical data regarding compatible equipment usage and crop management needs. If you need additional space, please include a typed attachment labeled “Crop Narrative.”*

Crop: Strawberries

Planting Plan: The strawberry plants were transplanted in April of 2024 and have matured in this current 2025 season.

Soil Amendment Plan: During the first week of July, 20-20-20 granular fertilizer was applied to the strawberries at a rate of 150 lbs/acre with a broadcast spreader.

Cultivation Plan: A matted row system is used within the strawberry planting.

Irrigation Plan: No irrigation was applied this season.

Pesticide/Herbicide Plan: Pesticides were applied in accordance with IPM practices and product labels.

Harvest Plan: Strawberries were harvested by hand twice a week throughout the month of June. The harvesting period was cut short due to the severe turkey pest pressure eating the strawberries.

## **CROP NARRATIVE – Current Season**

Crop: Beets

Planting Plan: The beets were direct seeded on May 13. Seeds were sowed approximately 2-3 inches apart and each bed contained three rows of beets.

Soil Amendment Plan: During planting 13-13-13 granular fertilizer was applied at a rate of 150 lbs/acre.

Cultivation Plan: Beet plantings were tilled in between beds and hand weeded within the beds to suppress weed pressure.

Irrigation Plan: No irrigation was used this season.

Pesticide/Herbicide Plan: No pesticides nor herbicides were applied.

Harvest Plan: Beets were harvested by hand from June through August as needed for direct sales.

## **CROP NARRATIVE – Current Season**

Crop: Carrots

Planting Plan: The carrots were direct seeded at a rate of approximately 20 seeds per foot on May 16<sup>th</sup> using a Monosem seeder.

Soil Amendment Plan: During planting 13-13-13 granular fertilizer was applied at a rate of 150 lbs/acre with a broadcast spreader.

Cultivation Plan: The soil was tilled and fertilized prior to planting.

Irrigation Plan: No irrigation was used.

Pesticide/Herbicide Plan: No pesticides or herbicides were applied to the carrot plants.

Harvest Plan: No harvesting of carrots occurred.

## **CROP NARRATIVE – Current Season**

Crop: Sweet Corn

Planting Plan: The sweet corn seeds (cv. Silver Queen) were directed at a spacing of approximately 8-12 inches on May 19<sup>th</sup> using a Monosem seeder.

Soil Amendment Plan: During planting 9-20-14 fertilizer was applied at a rate of 250lbs/ac.

Cultivation Plan: The soil was tilled and fertilized prior to planting. Tilling between rows occurred throughout the season to control weeds.

Irrigation Plan: No irrigation was used this season.

Pesticide/Herbicide Plan: Besiege was applied once this season at a rate of 5 ounces/acre to manage Corn Earworm and Armyworms.

Harvest Plan: Ears of corn were hand harvested beginning in September.

## **CROP NARRATIVE – Current Season**

Crop: Kale

Planting Plan: Transplanting of kale seedlings occurred on 6/6/25 at a spacing of 18 inches apart.

Soil Amendment Plan: During planting 13-13-13 granular fertilizer was applied at a rate of 150 lbs/acre with a broadcast spreader.

Cultivation Plan: The soil was tilled prior to planting. No additional cultivation of the kale occurred.

Irrigation Plan: No irrigation was used.

Pesticide/Herbicide Plan: No pesticides or herbicides were applied to the kale plants.

Harvest Plan: No harvesting of the kale occurred since woodchuck ate all of the plants while they were still small.

## **CROP NARRATIVE – Current Season**

Crop: Spinach

Planting Plan: The spinach was direct seeded on June 6<sup>th</sup>. This was later in the season than anticipated, mainly due to the spring being particularly wet this year, limiting the soil preparation work that needed to be performed before planting.

Soil Amendment Plan: During planting 13-13-13 granular fertilizer was applied at a rate of 150 lbs/acre with a broadcast spreader.

Cultivation Plan: The soil was tilled prior to planting. No additional cultivation of the spinach occurred.

Irrigation Plan: No irrigation was used.

Pesticide/Herbicide Plan: No pesticides or herbicides were applied to the spinach plants.

Harvest Plan: No harvesting of spinach occurred.

<b>Table B: Grazing Production – Current Season</b>							
<b>Type(s) of animal grazed</b>	<b>Area grazed (acreage)</b>	<b>Grazing pressure # animals per acre</b>	<b>Purpose (e.g. meat, dairy, eggs)</b>	<b>Grazing period(s)</b>	<b>Harvest date(s) if applicable</b>	<b>Expected productivity with solar array</b>	<b>Actual productivity with solar array</b>
Hereford Cattle	~12 acres	0.58 cattle per acre (7 total)	Meat	All season	4/7/25	1500lbs of meat (3 animals)	1500 lbs of meat

**GRAZING NARRATIVE – Current Season**

*Please detail the past season animal and pasture management, including **dates and equipment** used. The purpose of this form is to provide empirical data regarding compatible equipment usage and production needs. If you need additional space, please include a typed attachment labeled "Grazing Narrative."*

Type(s) of Animals Grazed: Hereford Cattle

Pasture Management Plan: List any anticipated seeding, soil amendment, irrigation, pesticide, mowing, etc., including approximate dates and equipment used.

No soil amendments nor reseeding occurred this year since the forage stand was lush from prior years' amendments. No irrigation nor pesticides were applied. Woody weeds were removed by hand throughout the pasture as needed.

Animal Management Plan:

For each type of animal grazed, describe management regarding housing/shelter, water source, fencing, movement, disease treatment, harvest, etc. that was carried out within the solar array area. Describe equipment used in these activities.

A herd of seven Hereford cattle were grazed on all 12 acres of the site throughout the growing season. The cattle reside in the heavy use area, which contains a lean-to shelter, during inclement weather. Their water source is an agricultural well. There was no evidence of disease in the herd, so no medications were administered. A dump truck and tractor were used to load and feed hay bales during the winter months. Three cattle were processed in April for meat.

Describe any modifications to the solar array design that were made in order to reduce the risk of animal damage to the solar array, or risk of electrocution to animals.

No additional modifications were made this year.

<b>Table A: Crop Production – Next Season</b>					
<b>Crop</b>	<b>Area planted (Row length and width or acreage, as appropriate)</b>	<b>Planting date(s) (approximate)</b>	<b>Harvest date(s) (approximate)</b>	<b>Expected productivity, total pounds harvested without dual use</b>	<b>Expected productivity, total pounds, with dual use</b>
Strawberries	800 row feet	4/15/24	June-July	250 quarts	200 quarts
Winter squash / pumpkins	2500 row feet	Early June	September/October as ready	1600 lbs	1200 lbs

## **CROP NARRATIVE – Next Season**

*Please detail the crop management planned for next season, including approximate **dates** and **equipment** used. The purpose of this form is to provide planned data for the upcoming season regarding compatible equipment usage and crop management needs. If you need additional space, please include a typed attachment labeled “Crop Narrative.”*

Crop: Strawberries

Planting Plan: The strawberry plants that were transplanted in 2024 continue to mature and fruit.

Soil Amendment Plan: Soil testing will be performed in the spring and soil amendments will be applied accordingly.

Cultivation Plan: The plants will continue to be trained in a matting row system, letting the runners root. Tillage between beds and hand weeding within the beds will likely occur to manage weed pressure.

Irrigation Plan: Overhead sprinklers may be employed for early frost protection. No other irrigation is anticipated.

Pesticide/Herbicide Plan: Pesticides and/or herbicides may be applied following IPM practices and product labels.

Harvest Plan: Strawberries will be harvested by hand throughout June and July.

Crop: Pumpkins/squash

Planting Plan: The pumpkins and squash will be direct seeded in early June, planting two seeds approximately 3 ft apart.

Soil Amendment Plan: Soil testing will be performed in the spring and soil amendments will be applied accordingly.

Cultivation Plan: Tillage between beds and hand weeding within the beds will likely occur to manage weed pressure.

Irrigation Plan: No irrigation is planned but is available if needed.

Pesticide/Herbicide Plan: Pesticides and/or herbicides may be applied following IPM practices and product labels.

Harvest Plan: Harvesting of the pumpkins and squash will occur September to October.

<b>Table B: Grazing Production – Next Season</b>							
<b>Type(s) of animal grazed</b>	<b>Area grazed (acreage)</b>	<b>Grazing pressure # animals per acre</b>	<b>Purpose (e.g. meat, dairy, eggs)</b>	<b>Grazing period(s)</b>	<b>Harvest date(s) if applicable</b>	<b>Expected productivity without solar array</b>	<b>Expected productivity with solar array</b>
Hereford Cattle	Approx. 12 acres (divided into 4 sections)	2-3 cattle per acre (7-9 cattle total)	Meat	8	1-2 cattle every four months	2,000 lbs of meat	2,000 lbs of meat

## GRAZING NARRATIVE – Next Season

*Please detail the next season animal and pasture management, including **dates** and **equipment** used. The purpose of this form is to provide planned data for the upcoming season regarding compatible equipment usage and production needs. If you need additional space, please include a typed attachment labeled “Grazing Narrative.”*

Type(s) of Animals Grazed: Hereford Cattle

Pasture Management Plan: List any anticipated seeding, soil amendment, irrigation, pesticide, mowing, etc., including approximate dates and equipment used.

It is anticipated that 100 lbs/acre of 13-13-13 and 500 lbs/acre pelletized lime of with trace minerals will be applied to the pasture in the spring to support the forage stand in 2026. Ongoing weed management efforts will continue. No reseeding nor irrigation is anticipated.

Animal Management Plan:

For each type of animal grazed, describe management regarding housing/shelter, water source, fencing, movement, disease treatment, harvest, etc. that was carried out within the solar array area. Describe equipment used in these activities.

Four to six yearlings will be added to the herd in April or May to maintain a rolling herd size of seven. Harvesting of one or two cattle is planned every four months. Animal health is a priority, and a vet will be engaged if there are signs of disease within the herd. Electric fencing will be installed within the site to divide the pasture into four rotational grazing sections (approximately 3 acres each) and there will be two grazing periods in each paddock during the growing season. The cattle will have access to their water source and shelter from each paddock.

Describe any modifications to the solar array design that were made in order to reduce the risk of animal damage to the solar array, or risk of electrocution to animals.

No modifications are anticipated within the site.

## **Waiver for Decreased Yield**

### **i. Waiver for Decreased Yield**

Due to unforeseen circumstances, such as but not limited to weather events, pests, or change in crops, the projected agricultural yield for any given year may be lower than stated in the agricultural plan or previous year's annual report. In these instances, an applicant can request a waiver to the Department for the decreased yields. The applicant must demonstrate to the satisfaction of the Department, and in consultation with MDAR, that a waiver is warranted for good cause. Waiver requests must be submitted by November 1st of the applicable calendar year and sent to [DOER.SMART@mass.gov](mailto:DOER.SMART@mass.gov).

\*\*Please note that this project was approved in June of 2019 and is subject to the ASTGU guidelines in place at that time, thus the ASTGU is not subject to this provision.

### **ii. Failure to Report**

If the ASTGU fails to submit an annual report, the Department may declare the project ineligible for the ASTGU adder for one year. If the annual report is not completed for a second year, then the Department may permanently disqualify the ASTGU from continuing to receive the ASTGU Adder for the remainder of the STGU's tariff term.

I hereby certify that I have personally examined and am familiar with the information submitted herein. and, based upon my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete.

Paul R Knowlton  
Signature of Landowner

01-22-2026  
Date

Farm Operator and Landowner

I/we hereby certify that the information submitted regarding the current farm conditions and practice and the Agricultural Plan for the Dual-Use Area is accurate and complete to the best of my/our knowledge and intentions, and that I/we have engaged with the University of Massachusetts Amherst Clean Energy Extension and thereby its agricultural extension service to review the Agricultural Plan and its compatibility with the solar array structures and shading. Further, I/we agree, conditional on being provided eligibility to the SMART program as an ASTGU, to submit a report, through a template provided by the University of Massachusetts Clean Energy Extension, annually throughout the duration of the SMART incentive with ASTGU adder, on the operations and productiveness of the solar array and agriculture along with any changes to the Agricultural Plan for the following year. I/we understand that failure to maintain productive agricultural activities and annual reporting may result in the disqualification of the facility as an ASTGU in the SMART program.

Paul R Knowlton  
Signature of Farm Operator

01-22-2026  
Date

Paul R Knowlton  
Signature of Landowner

01-22-2026  
Date

Solar Facility Owner

I hereby certify that the information submitted regarding the Solar Array Description and inputs and outputs of the Shading Analysis is accurate and complete to the best of my/our knowledge and intentions.

\_\_\_\_\_  
Signature of Solar Facility Owner

\_\_\_\_\_  
Date

**SIGNATURES AND ATTESTATIONS**

Prior to submitting the Pre-Determination Form, please read and sign as directed below.

Landowner

I hereby certify that I have personally examined and am familiar with the information submitted herein, and, based upon my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete.

\_\_\_\_\_  
Signature of Landowner

\_\_\_\_\_  
Date

Farm Operator and Landowner

I/we hereby certify that the information submitted regarding the current farm conditions and practice and the Agricultural Plan for the Dual-Use Area is accurate and complete to the best of my/our knowledge and intentions, and that I/we have engaged with the University of Massachusetts Amherst Clean Energy Extension and thereby its agricultural extension service to review the Agricultural Plan and its compatibility with the solar array structures and shading. Further, I/we agree, conditional on being provided eligibility to the SMART program as an ASTGU, to submit a report, through a template provided by the University of Massachusetts Clean Energy Extension, annually throughout the duration of the SMART incentive with ASTGU adder, on the operations and productiveness of the solar array and agriculture along with any changes to the Agricultural Plan for the following year. I/we understand that failure to maintain productive agricultural activities and annual reporting may result in the disqualification of the facility as an ASTGU in the SMART program.

\_\_\_\_\_  
Signature of Farm Operator

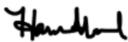
\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Landowner

\_\_\_\_\_  
Date

Solar Facility Owner

I hereby certify that the information submitted regarding the Solar Array Description and inputs and outputs of the Shading Analysis is accurate and complete to the best of my/our knowledge and intentions.



\_\_\_\_\_  
Signature of Solar Facility Owner

1/27/2026

\_\_\_\_\_  
Date

# Electronic Record of Contracts

This document was generated as a record of certain contracts created, accepted and stored electronically.



## Summary of Contracts

This document contains the following contracts.

Title	ID
ASTGU report - Grafton 2025.	64a11780-0ea4-4b48-87a5-913949ecd5ef

## Contract signed by:

<b>Hanna Wood</b>	Signer ID:	357d5610-544b-454f-91b3-cd2bd18851e9
	Email:	hanna.wood@aes.com
Date / Time:	Jan 27, 2026 at 10:41 PM UTC	
IP Address:	136.226.87.5	
User Agent:	Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/144.0.0.0 Safari/537.36	