Article 10 Preliminary Scoping Statement

Horseshoe Solar

Livingston and Monroe Counties, New York

Case 18-F-0633

March 2019

Appendix B:

Preliminary Agricultural Integration Plan

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Preliminary Agricultural Integration Plan

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1 Purpose

Horseshoe Solar Energy LLC (HSS) has enlisted Agrivoltaic Solutions LLC (AVS) of Ithaca, NY to help develop a plan for the integration of farming into the Facility Site. HSS and AVS will identify and work with local farmers to explore a commercial sheep business that can be located at the Facility, both performing vegetation maintenance and supporting a standalone agricultural enterprise. This will be a symbiotic model that will ensure the preservation of the land's agricultural integrity and will allow it to continue to function as part of the regional farm economy. Other non-sheep enterprises that are complementary to solar, such as honeybees and hay crops, will also be explored with farmers if they are interested, although the primary focus will be on solar grazing.

2 Introduction to Solar Grazing

Solar grazing is the practice of grazing livestock on solar farms. Sheep are the most common solar grazing animals, as they are the species best suited to this work. For the safety of the solar array at the Facility, sheep are the only livestock that would be recommended for grazing under and immediately adjacent to the panels.

Solar grazing is an extension of two different techniques in commercial livestock operations. The first is targeted grazing, which the "carefully controlled grazing of livestock to accomplish specific vegetation management objectives. Under targeted grazing management, livestock are used as a tool for improving land health…" [1]. Targeted grazing techniques include systematic planning, monitoring, and evaluation for vegetation and livestock at sites. Plans are made by the managing farmer or grazier for each location that will be grazed using targeted grazing. Other applications of targeted grazing include using livestock to reduce wildland fire danger, perform weed control, and aid in land restoration projects. Targeted grazing in New York State currently includes using sheep in vineyards to manage suckering, undervine cover crops and grass growth around the vines.

The second technique is called contract or custom grazing. This is a production system for livestock owners where the livestock owners are paid to graze. The livestock owner enters into a written contract that defines payment terms and the responsibilities of each party. Contract grazing offers farmers an opportunity to start or expand operations without purchasing land or making a permanent commitment to land. Contract grazing offers an income stream to livestock owners without many of the costs typically associated with other farming. It also offers landowners, farmers and regulatory bodies assurance that land is being managed in a environmentally responsible manner, improving the water quality, reducing

[1] Society for Range Management Blog, Accessed at: www.targetedgrazing.org

the potential for soil erosion and improved potential for good wildlife habitats to co-exist at sites[2]. In the case of a site like HSS, a sheep farmer in the area could start or expand operations at the Facility Site, once it is constructed. The farmer can plan a production cycle because they can count on an income stream from the vegetation maintenance contract that HSS would sign with them. This income stream will enhance farm profitability and incentivize management focused on vegetation maintenance to specifications set by the solar operator.

3 Vegetation Management

From the perspective of the solar array operator, the sheep would serve the purpose of a vegetation maintenance service that is low impact and allows the site to achieve its energy generation targets. The practice of contracting with sheep farmers is increasingly common for solar site operators. It aligns with company sustainability mandates and the sheep outperform mechanical mowing equipment when managed using good grazing practices. Site operators don't need to adjust panel heights but may need to make limited accommodations for the grazing operation. One example of this might be the alignment of gates and corridors to promote the easy flow of livestock around the fenced solar paddocks. A range of press and publications support the idea that few modifications are needed at solar arrays and that generally solar grazing works seamlessly at solar arrays.[3]

Solar grazing is a highly effective form of vegetation management at solar sites. With proper grazing management, 100% vegetation compliance is to be expected. Sheep, regardless of the breed, can graze under the solar panels and around the posts leaving an evenly clipped set of vegetation. Achieving the same results with mechanical mowers and equipment on uneven terrain is typically expensive, slow work that landscape contractors are hired to do. The mowing equipment has the added negative impact of stirring up dust and rocks, which can reduce the efficiencies of the solar modules and damage them. Sheep simply walk underneath the panels and create an even palette of clipped vegetation.

The vegetation that is found on most established NY solar arrays is typical of a hay field. There is no universal standard planting technique or seed mix for the state, but most solar sites are seeded with a low growing blend of plants that includes grasses and legumes. This blend of grasses and legumes typical to solar sites aligns nicely with what most sheep farmers would seed to their pastures, with some local variation in the selections.

The shading from the panels creates opportunity for a more diverse array of plants than might normally found in an open hay field. The solar modules typically drip into this area as well, leading to a moister zone under the panels and drier sunnier alleys between them. One benefit to this is that any grazing animals will have a wider array of food offerings than is typical for a pasture. This gives the solar arrays an added benefit and resilience in providing forage to grazing animals, which is an advantage that farmers appreciate. A study[4] on this was conducted in Oregon at a solar array, which is informative but due to the difference in the climate between New York and Oregon the research results should not be directly applied to New York solar arrays.

The solar panels proposed at HSS would move slowly throughout the day, following the sun. These single axis trackers will also create microclimates for plant and insect communities due to the shade cast by the

[2] Midwest Perennial Forage & Grazing Working Group, Factsheet 1 of 4 in the Contract Grazing Series. 2013. *The Basics of Contract Grazing*. Accessed at http://www.iowabeefcenter.org/information/ContractGrazing1Basics.pdf
[3] American Solar Grazing Association. Accessed at https://www.solargrazing.org/news
[4] Oregon State University, Chad Higgins. 2018. *Solar Arrays could be used as resources for plant productivity, study shows.* https://today.oregonstate.edu/news/solar-arrays-could-be-used-resources-plant-productivity-study-shows

modules, as described above. However, the shade under the panels will not be as dense as in a fixed ground mount array. The rotation of the panels will shed rain fairly evenly across the ground, which could be advantageous in dry summers.

Tree, shrub and vine seedlings can appear at solar sites when tree seeds are carried by wind, animals or other mechanisms into the site. Sheep can eat young seedlings and set back tree saplings and other taller vegetation, preventing shading of the panels and overgrowth. The sheep, when managed properly, will help maintain a meadowlike appearance of perennial grasses, flowers and herbs. The practice of rotational grazing, which is recommended for the health of the livestock, is also the practice that results in the best control of the height of the vegetation. The Pasture Project website[5] provides further overview of rotational grazing.

4 Experience and Project Examples

Solar grazing works at scales similar to that proposed by HSS. For example, a 500-acre solar array in South America performs all of its mowing with grazing sheep. The sheep provide wool and meat to the South American marketplace. The shepherds are schooled agronomists working for a specialty utility scale solar operations provider. The firm, FRV, is now planning to graze multiple utility scale sites in Australia.

A similar example at this scale exists in Biscoe, North Carolina. The Montgomery Solar Array, a 450-acre ground-mounted solar site has been grazed since its opening in 2016. Sheep exclusively graze this site as well as over 1500 acres of additional ground-mounted solar arrays across the state. This grazing operation is managed by Sun Raised Farms. The Montgomery Array also serves as a teaching facility for farmers interested in becoming solar graziers.

Farmers benefit from the potential access to specialty markets from the sheep products, such as what Sun Raised Foods offers their network of solar graziers in North Carolina, Virginia & Georgia. Sun Raised Farms solar grazed lamb is offered at gourmet outlets, locavore restaurants and through specialty online sales. A premium price is generated and regional market distinction is achieved. These marketing channels and market development opportunities exist in New York as well. There is a well-established set of privately and publicly funded opportunities to aid Livingston County Farmers in selling solar grazed meats. These include Certified New York Grown, a publicly funded program, and Certified Grassfed, a privately funded designation. Certified Solar Grown & Grazed is a planned offering of the American Solar Grazing Association, expected by 2020.

5 Contract Structure Considerations

The Cornell University Atkinson Center for a Sustainable Future funded a 2018 study to further investigate solar grazing. The key take home messages for Livingston and Monroe County farmers are:

1. The grazing contracts are typically directly between solar operators and sheep farmers. Less often, the contracts are bid upon by landscaping contractors and then subcontracted to a sheep farmer. This second system has the advantage of being less expensive for the farmers as they don't need to carry the required site insurance. Most landscaping firms carry high levels of risk insurance and meet the criteria set by the solar site owners.

[5] The Pasture Project. 2016. *Making Sense of the Many Systems of Rotational Grazing*. Accessed at: http://pastureproject.org/pasture-management/rotational-grazing-systems/

2. Most farmers who currently solar graze have annual contracts at the solar sites. Some contracts offer automatic renewal and great flexibility for the grazing farmer, with multi-year extensions. This allows the sheep farmers to plan their flock growth and make other management and budgeting decisions. Contracts for solar grazing typically specify a maximum vegetation height but some do not, and either specify a stocking density of the sheep or a daily rental rate per head. Example contracts developed by the American Solar Grazing Association can be found at: https://www.solargrazing.org/farmer-resources

3. Solar grazing is new enough in New York that the marketplace is still developing. Solar site operators expect to pay for vegetation management at sites and budget for this operating expense. Most solar site operators will have experience quoting several landscaping services and perhaps even a specialty solar landscaping firm, but only a few companies have experience working with sheep farmers at solar sites. Sheep farmers must realize these concepts and capture the opportunity to work cooperatively with the site operators.

   Every solar site operator works within a budget to prevent shading on the panels. Vegetation management is only one component of solar maintenance, along with winter snow removal and fence and electrical systems maintenance. For sheep farmers to become successful solar graziers they must charge for their services at a price point that meets expectations of solar site operators and provide a level of service that keeps the facility generating energy. They must also work through the specific logistics that a solar site requires.

4. Rotational grazing is the recommended best practice for grazing solar arrays. This is the practice of moving livestock to different sections of pasture (in this case, enclosed in the solar array) periodically in order to maintain healthy, nutritious forage (food) for the livestock. The guide, Four Steps to Rotational Grazing[6], by Penn State Extension, provides the scientific basis and tools by which a farmer can gauge how many sheep are suited to an area at a given time.

   Typical stocking rates per acre at solar sites in the eastern US range from about 2 to 4 adult sheep per acre per grazing season. Lambs can be grazed at solar sites, as can older sheep. The forage density and animal units are aligned for each site to determine appropriate stocking density, as they would be for other grazing operations. The only additional information required is the maximum vegetation height and/or leading edge of the solar panels, in order to comply with contract requirements and prevent shading.

5. Output: solar grazing should have a similar output of sheep products as other pasture-based livestock rearing systems. For business planning purposes, solar graziers should consult grass-fed sheep operations. Specialty operations, such as wool production can be explored on this basis as well. There are no restrictions that solar array operators or operations place on specialty product development.

[6] Penn State Extension, J. Craig Williams, Marvin Hall (1996) *Four Steps to Rotational Grazing.* Accessed at: https://extension.psu.edu/four-steps-to-rotational-grazing

6 Plans for Working with Local Livestock Farmers

AVS's contracted solar sites in the Finger Lakes could serve as educational examples for farmers in the region. If Livingston and Monroe County farmers are interested in diversifying their farming operations and learning more, the farmers at AVS can arrange for them to visit grazed solar sites in the Finger Lakes. These tours would work to inform project area farmers on essential mechanics of a solar grazing operation and help them in evaluating enterprises that could be located at the HSS project.

The essential topics include wells or water sources, sheep handling areas, and perimeter and interior fencing options. Sheep handling techniques, transportation options, stocking rates and management systems are typically discussed during site visits. The nuances of contracts, insurance, leases, and other legal matters will be covered, with supporting resources provided as available. Pre-construction requests of the farmer, including seed mixes, electrical & water access and gate placements will be discussed. The timing and coordination of such requests can result in major cost savings and more successful co-location of agriculture and renewable energy deployment.

The fundamentals of vegetation management at solar sites will be covered as part of solar site tours with interested farmers. The details of vegetation management could be covered with additional support from grazing consultants, such as those at publicly funded agencies such as NRCS and USDA or found privately through grazing consultancies. Additional details could be covered by connecting farmers to the Cornell Sheep Program experts or by arranging with members of that program to lead trainings.

A mix of modern solar technologies are displayed at sites throughout the Finger Lakes. Farmers could become familiar with basic solar terminology and array layout through this accessible format. Electrical service personnel from a regional firm could be asked to meet farmers at a site. During the course of normal solar array operation electrical service personnel typically overlap with vegetation maintenance contractors.

Finally, solar site seed mixes, questions on vegetation and vegetation management techniques will be addressed as part of any site visits. Complimentary agriculture, with a special focus on pollinator friendly plantings and commercial level beekeeping will be discussed.

The Article 10 process is a multiyear, multistep process that will have the advantage of allowing interested Livingston and Monroe County farmers to make plans for farming at Horseshoe Solar. During the time that HSS will be in the Article 10 process, the National Renewable Energy Lab's current co-location research project, called Inspire, will come to its conclusion. The Inspire project is expected to generate data on number of concrete agriculture & solar-compatible enterprises, including solar grazing. Applicable lessons in co-location will be developed from this and information sharing could occur with Livingston County farmers. Thus, co-location opportunities can be explored with both the farmer and the developer during the permitting process and be formalized with a site lease before project commissioning. HSS and AVS will work directly with interested farmers to develop business plans if they are interested, or at a minimum direct them to the resources for business planning.

HSS and AVS will direct interested farmers towards draft legal contracts for co-location of farming at the site. If farmers are interested in solar grazing with sheep, we will work with them to review the engineering plans for the Facility Site. We will also review with the farmers the options for sheep handling facilities or other co-location infrastructure typically employed at solar arrays in other locations.

AVS may also be involved in support with high level grazing plans, sheep sourcing plans and marketing opportunities for solar-grown specialty products. AVS may also perform other soil and vegetation testing, and engage with Cornell Extension, NRCS and the Cornell Sheep Program to provide ongoing support to these farmers.

7 Solar Grazing Guidelines and Resources

New York State's Agricultural Environmental Management [AEM] Program provides recommended assessments for the solar grazier and Invenergy's solar site manager to follow[7]. This voluntary program administered by New York Soil & Water provides valuable assessment tools that could be applied to HSS.

One such assessment tool is the AEM Tier 2 Worksheet Pasture Management[8], which provides guidelines for prescribed grazing management. A directory of assessment tools and guidelines for best practice are found on the AEM Tier 2 Information Sheets and Training Modules site[9]. These include resources that could provide solar graziers with incentives and training modules on useful best practices, such as how to store soil carbon through good pasture management and how to best manage nutrients on a farm. An outline of the AEM program steps[10] and a list of AEM planners[11] are found on the project website.

If these guidelines are adhered to, HSS anticipates that sheep grazing on long-term perennial forages beneath solar arrays will inherently result in a high level of environmental stewardship with few resource concerns. Once the assessments are made, a conservation plan for HSS can specify recommendations for best management practices based on the NRCS practice standards and tools. A conservation plan is Tier 3 in the AEM protocol and next step with an AEM certified planner.

There are more technical guidelines and additional resources to aid in the creation of a grazing regime at the Facility Site. A book titled *Prescribed Grazing on Pasturelands*[12] serves as a resource specifically around gauging initial stocking densities for the Facility Site with grazing sheep.

The federal Natural Resources Conservation Service, or NRCS hosts a series of resources that would not be required from regulatory standpoint but could serve as resources from a voluntary best practices standpoint for the solar array. The NRCS Field Office Technical Guide[13], or FOTG can be used as a locally specific, searchable resource.

8 Other Agricultural Opportunities

Solar grazing provides the tools to achieve stable, high-yielding pastures at solar sites for many years, which also provide complimentary habitat for pollinator plants and animals. In the United Kingdom a

[7] New York State AEM Program Core Concepts. Accessed at: https://www.nys-soilandwater.org/aem/aemcc.html
[8] AEM Tier 2 Worksheet *Pasture Management.* Accessed at: https://www.nys-soilandwater.org/aem/forms/PastureManagement.pdf
[9] AEM Technical Tools. Accessed at: https://www.nys-soilandwater.org/aem/techtools.html
[10] AEM Base Funding. Accessed at https://www.nys-soilandwater.org/aem/basefunding.html
[11] AEM Documents. Accessed at: https://www.nys-soilandwater.org/aem/aemdocuments.html
[12] Conservation Outcomes from Pastureland and Hayland Practices, Chapter 3. *Prescribed Grazing on Pasturelands.* Accessed at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1080495.pdf

[13] United States Department of Agriculture, Field Office Technical Guide. Accessed at: https://efotg.sc.egov.usda.gov/#/

guideline is offered to solar site operators with a specific schedule for grazing to benefit pollinator species[14]. Some states, such as Vermont, offer a guideline to solar developers known as a pollinator scorecard or checklist[15]. One of these scorecards is under development in New York.

Good grazing practices, such as those seen at rotationally grazed solar sites will offer opportunities for co-location of a commercial-level honey operation at Horseshoe Solar. Bare Honey is a Minnesota based firm that produces solar honey across the Midwest[16]. Its typical business practice is to partner with and train local beekeepers in the techniques for locating bees at solar arrays. It then provides buyers, such as the 56 Brewery in Minneapolis with honey for their solar honey sourced beer[17].

An increasing number of cideries, breweries and distilleries use honey in crafting specialty products. This avenue may be explored by Bare Honey for the HSS Project. Other complimentary agricultural uses are largely in the research or trial phases in the United States. In the United Kingdom, where ground mounted solar has been installed at a volume to have this kind of data, there are poultry operations at solar arrays[18]. HSS will continue to explore these and other opportunities for integration of agricultural productivity at the Facility Site.

[14] BRE (2014) Biodiversity Guidance for Solar Developments. Eds G E Parker and L Greene. *BRE National Solar Centre Biodiversity Guidance for Solar Developments.* Accessed at: https://www.bre.co.uk/filelibrary/pdf/Brochures/NSC-Biodiversity-Guidance.pdf
[15] Pollinator Friendly Solar Initiative of Vermont. 2018. *Solar Site Habitat Scorecard.* Accessed at: https://www.uvm.edu/sites/default/files/Agriculture/Pollinator_Solar_Scorecard_FORM.pdf
[16] Bare Honey 2013. Accessed at: www.barehoney.com
[17] *Unveiling the World's First Beer with Solar Honey.* Accessed at: https://growlermag.com/event/unveiling-worlds-first-beer-solar-honey/
[18] BRE (2014) *Agricultural Good Practice for Solar Farms* Ed J Scurlock. Accessed at: https://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/NSC_-Guid_Agricultural-good-practice-for-SFs_0914.pdf