Vegetation Management
Request for Proposals
Horseshoe Solar, New York

Release date: 11/11/2019
Site visits: 12/03/2019 10:00AM
Final proposals due: 12/31/2019

1. INTRODUCTION Request for Vegetation Management Proposal

Invenergy requests a proposal for the maintenance and management of vegetation at the Horseshoe Solar facility. The Project has an expected generating capacity of 180 MW_{AC} to be constructed on approximately 1,260 acres.

The proposal will detail the steps necessary to perform these services and the associated costs to implement them. If the contractor submitting the proposal is not available to perform certain tasks, they should identify a subcontractor or decline to bid on those tasks. The Contractor's plan should be consistent with the methods outlined in this "Request for Proposal". Invenergy encourages the Contractor to identify opportunities to improve the plan and make it more specific and appropriate for the Project conditions based on the contractor's local knowledge and expertise.

This request is to establish market research, provide information early in the planning process to potential contractors, and to gauge levels of interest. This bidding round is conducted primarily to obtain pricing information for planning purposes and not to be taken as a commitment by Invenergy as implied or otherwise to issue a solicitation or award a contract. However, proposals at this stage will be given priority during the final bidding process prior to site commissioning. At a minimum, proposals should be made for 7-year contracts starting in 2022. Bidders may propose longer durations.

The Horseshoe project is being planned to accommodate grazing sheep as a partial or whole solution to vegetation management. Proposals should be for either mechanical methods, grazing methods, or a combination of both, but *it is not* necessary to include both. Grazing sheep are planned as the preferred method of maintenance at this facility, and grazing proposals are encouraged.

To better inform grazing proposals, a site-specific grazing plan has been provided in Exhibit C.

Contractor's plan will comply with all applicable federal, state, and local laws, ordinances, and regulations as well as any necessary special use permits and/or land use permits to which the Project is subject.

Please note that proposals that consider grazing of non-sheep species such as goats or cows will not be considered.

2. Description of Site Conditions

The proposed facility is a utility-scale solar project located in the towns of Caledonia and Rush in Livingston and Monroe Counties, respectively. The land is currently farmed with commodity crops and the soils are mostly graded as prime. Corn, soybeans, dry beans, and wheat are the most common crops that have been planted on the site.

The project will include approximately 25 separately fenced areas that for the purposes of the grazing plan and RFP, have been grouped into 9 spatially-connected sections.

Invenergy's intention is to perform soil testing to inform exact species suitable for seeding on the site. Per the grazing plan, this seed mix will be formulated to provide appropriate forage material in preparation for grazing of sheep.

For the purposes of this RFP, the availability of on-site water should be assumed to be limited to non-existent. Perimeter fences themselves and vegetation exterior to the fences are outside the scope of this RFP, although Contractor may make small repairs or gap-closures to prevent predator intrusion or sheep escape in consultation with Invenergy staff.

If Contractor plans to use managed sheep grazing, Invenergy is to provide Contractor with a site-specific prescribed grazing plan, which will inform Contractor of the estimated number of animals required to maintain an effective stocking rate, number and frequency of animal moves, and rest periods between grazing passes. If contractor is to use managed grazing, the proposal shall adhere to the parameters of the prescribed grazing plan.

3. SCOPE OF WORK

Contractor's proposal will contain at least one of two sections. Proposals may include both.

1) **Grazing Vegetation Management**
   a. Animals
      i. Number and age of sheep
      ii. Sheep breed
      iii. Herding and/or Guard dogs
   b. Types of additional temporary fencing, if applicable
      i. Include quantity and type of portable fencing to be used, i.e. electric netting or other, as well as type of charger to be used
   c. Sheep Transportation
      i. Vehicle Size & Class
      ii. Trailer Size
   d. Water Equipment
      i. On site water delivery methods, i.e. Truck, Tractor, tank size, etc.
   e. Other equipment
      i. Safety or security, PPE etc.
   f. Back up or supplemental mechanical vegetation management
      i. Type(s) of mower
         1. Deck width
         2. Turning radius

3. Ground speed
ii. Type(s) of Herbicide
iii. Hand tool(s)

g. Any deviation from the provided Grazing Plan

2. Mechanical Vegetation Management

Contractor will provide a detailed list of equipment that they plan to use, including, but not limited to:

a. Type(s) of Mower
   i. Deck width
   ii. Turning radius
   iii. Ground speed
b. Type(s) of Herbicide
c. Other equipment, i.e. RTV, etc.
d. Hand Tool(s)/weedwhackers

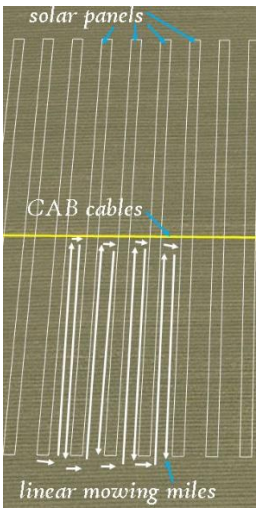
3. Vegetation Management Strategy

Contractor will provide a schedule of the frequency and timing of mows/grazings over the course of a year as well as a plan showing how the provided schedule is subject to change based on weather and other influencing factors.

Invenergy is to provide Contractor with site drawings prior to contract execution to finalize pricing, including, but not limited to, locations of:

- CAB/BLA system (above-ground DC cabling)
- Above-ground DC cabling bisecting each row along the tracker systems
- Geological features
- Drainage ditches
- Inverters/Pad-mounted transformers
- Wetland areas
- Mechanical Blocks

Shown: CAB/BLA Above-ground DC Cables



Based on current project design, the Contractor should be aware that the presence of above-ground DC cabling system creates dead-ends within each row, increasing the total number of tractor-miles required to be mowed. There are 960 linear miles of panels to be mowed. See white arrows in the illustration at left showing how this was calculated.

4. Vegetation Management Requirements

The Contractor will complete a table outlining its maintenance plan and costs on an annual basis under two categories: Year 1; Year 2+

Year 1:

- Contractor will ensure that the vegetation does not reach above an average of 18 inches in height at any time. Contractor should mow vegetation no lower than 5 inches in height on average.
- Maintenance will be repeated once vegetation has returned to a height of 12-18 inches. Grazing frequency will be according to the Prescribed Grazing Plan with adjustments due to weather, field conditions, etc. at the flock manager's discretion.

Year 2+:

- Contractor will need to mow and/or graze the entire site at least twice.
- Contractor will ensure that the vegetation does not reach above an average of 18 inches in height at any time. Vegetation should not be cut or no lower than 5 inches in height on average.
- Grazing frequency will be according to the Prescribed Grazing Plan with adjustments due to weather, field conditions, etc. at the flock manager's discretion.
- Contractor will monitor any occurrences weedy vegetation on site. Integrated Pest Management techniques should be employed to control weeds, especially those not controlled by the sheep or large mowers. If a particularly aggressive or noxious weed begins to spread on-site, spot-spraying may be employed to reduce or eliminate it. When spot-spraying, Contractor will ensure that its field crews recognize the target species and avoid adverse impacts to the native vegetation. Pesticide applicators should be properly certified through NYS DEC.
- Contractor to provide plan for regularly identifying any invasive species on site and removing them.
- During maintenance visits, the Contractor will ensure ground cover is well-maintained. Progress updates and any additional recommended actions will be communicated with Invenergy, or other site operator, immediately following the site visit.
- Should Contractor determine the listed vegetation maintenance activities would not be suited for the site, it will list and explain appropriate maintenance activities for the site, including its

suggested mowing heights and frequencies; invasive species management activities; and other necessary maintenance operations.

4) Performance Guarantee

Contractor will propose performance guarantee criteria that it will use in its ongoing monitoring and maintenance of the site. In its proposal, Contractor will explain: (1) the methods of its monitoring strategy, to be incorporated into the maintenance schedule outlined above; (2) its proposed performance guarantee criteria and the methods/metrics to be measured (e.g. height of grass); (3) experience commitments of its monitoring staff; and (4) any additional inclusions necessary to ensure successful performance. Contractor will also propose how remedial work will be handled if the performance guarantee is not met.

5) Previous Experience/Qualifications

Contractor will detail any previous vegetation management experience. Contractor should outline: (1) its years of experience with vegetation management projects, emphasizing any solar experience; (2) the scope of current and past vegetation management projects in New York; (3) additional experience related to the project and/or site area.

6) Insurance

Contractor will be required to carry minimum insurance coverage as specified by Invenergy in Exhibit D of this RFP.

5. TIMEFRAME

To be included in this RFP and to attend the orientation and site tour, you must contact Lewis Fox or Lexie Hain of Agrivoltaic Solutions LLC: **HorseshoeRFP@gmail.com**

For any other questions related to Horseshoe Solar, contact Kate Millar kmillar@invenergyllc.com or call 607-882-1225

Invenergy will conduct a site orientation visit to the project site in Livingston County, Tuesday, December 3rd, 2019. Bidders should gather at 10 am at the Tractor Supply parking lot, 3356 Caledonia-Avon Rd, in Caledonia, NY. Cars will caravan from there. RSVP to HorseshoeRFP@gmail.com. Further discussions and site orientation can be held during those meetings. Final proposals are due by Tuesday, December 31st, 2019.

6. PROPOSAL REQUIREMENTS

Invenergy requests a concise proposal with a completed bid form found in Exhibit E. Through their bid, contractors agree to include:

- Commitments to adhere to schedule;
- A detailed performance guarantee that identifies when remediation would be necessary;
- Quality assurance/quality control procedures. Assume draft plan will need one round of review by Invenergy prior to producing a final plan.

Proposals should be for one or more of the 9 “site sections” (acreage and layout for each section are provided in Exhibit A and Exhibit B). Proposals should provide a cost per acre per year for the entire acreage that is bid upon. Management area includes areas **within** site perimeter fences. No areas outside of perimeter fenced areas (as defined in Exhibit A and Exhibit B) are to be included in cost estimates.

The Vegetation Management Proposal will be labeled “Confidential Business Information” on the cover page and in the header of all subsequent pages, unless otherwise indicated by Invenergy.

Proposals will be reviewed and feedback will be given, both after draft submissions and final submissions.

EXHIBIT A
SITE MAP

Please note that the site map is preliminary and subject to change. When proposing, assume an area of approximately 1,300 acres to be maintained.

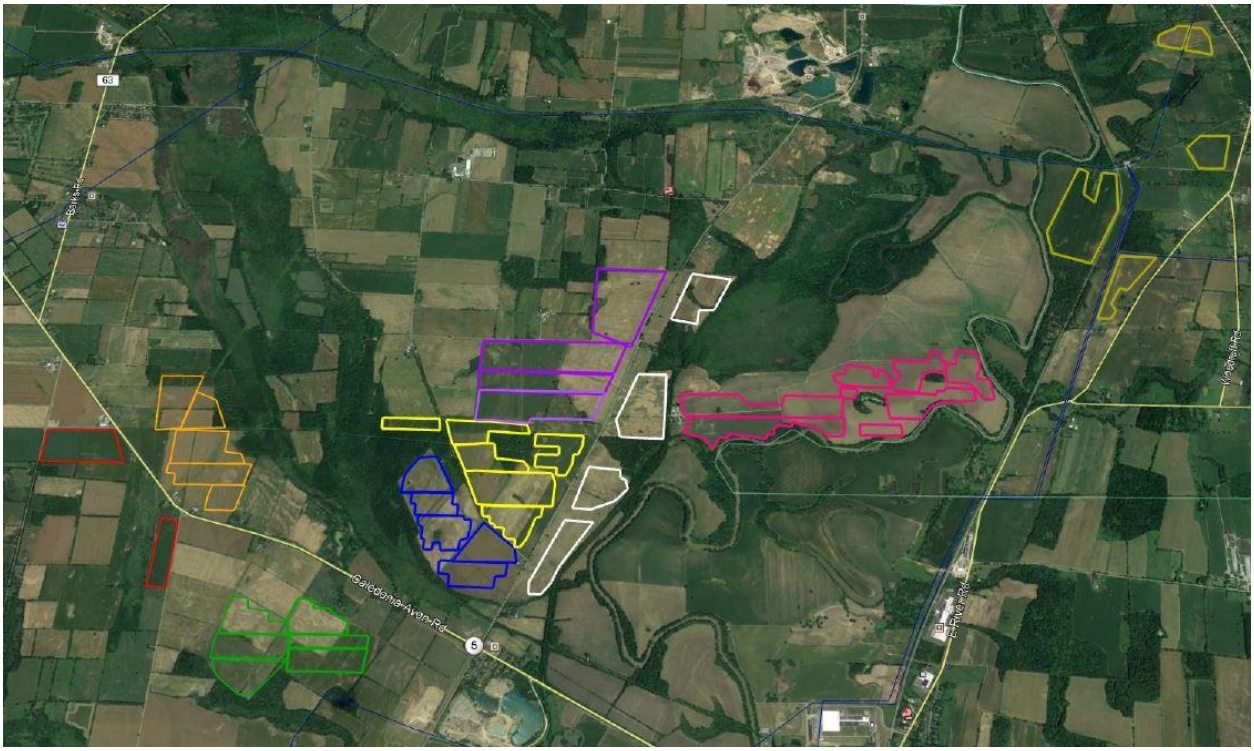


Figure 1. Horseshoe Project Site Layout with Distinctly Colored Sections (Trending West To East)

- Section 1 (117.5 acres) - 5 permanently fenced arrays / 24 grazing paddocks
- Section 2 (133.0 acres) - 5 permanently fenced arrays - 19 grazing paddocks
- Section 3 (132.0 acres) - 6 permanently fenced arrays - 22 grazing paddocks
- Section 4 (112.0 acres) - 5 permanently fenced arrays - 12 grazing paddocks
- Section 5 (156.0 acres) -6 permanently fenced arrays - 13 grazing paddocks
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- Section 7 (140.0 acres) - 4 permanently fenced arrays - 20 grazing paddocks
- Section 8 (216.0 acres) - 8 permanently fenced arrays - 27 grazing paddocks
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EXHIBIT B

APPROXIMATE SITE SECTION ACREAGE AND MOWER MILES

Please note that the acre figures are preliminary and subject to change. There are more acres listed than will be ultimately constructed. When bidding, assume no more than 1,260 acres to be maintained.

Section Number	Acres	Mowing Miles	Surface water available?
1	**117.5**	**75**	**No**
2	**133**	**85**	**No**
3	**132**	**84**	**No**
4	**112**	**72**	**Yes**
5	**156**	**100**	**No**
6	**289**	**185**	**Yes**
7	**140**	**90**	**No**
8	**216**	**138**	**Yes**
9	**188**	**120**	**Yes**

EXHIBIT C
PRESCRIBED GRAZING PLAN

Sheep Pasture Rotation and Grazing Plan for the Invenergy Horseshoe Solar project in Livingston and Monroe Counties, NY

Introduction

Ground-mounted solar sites, by nature of their design, have ample fenced areas. The fencing at solar sites is thus uniquely suited to serve as grazing areas or be subdivided into grazing paddocks in a pasture rotation with sheep. The perimeter fencing also serves as predator deterrent, the solar panels provide shading and shelter for inhabitants, and the solar arrays provide palatable pasture species for ruminant nutrition. In turn, rotationally grazed sheep provide adequate and comparatively cheap vegetation management, optimal ground coverage and thus reduced erosion and run-off, as well as agricultural usage of lands that can add to the viability of farming communities.

Useful Terms for Reference:

> *Project:* The Horseshoe Solar Project in its entirety.
>
> *Section:* The perimeter fencing of the Project creates the opportunity to divide the project into smaller areas for planning the sheep rotation based on the fencing that is already planned for the Project. The Project has 9 subdivisions known as *sections*. Each section will, as explored below, be 100 to 290 acres. One separate sheep flock will be assigned to each section by a flock manager. The precise number of sheep in a section may be adjusted over the season according to the flock manager. The flock is sized to be enough sheep to cover the entire section in a full rotation. A full rotation is +/- 40 days.
>
> *Permanently Fenced Array:* Sections are subdivided into contiguous groups of panels by perimeter fencing creating individual permanently fenced arrays. The entire group of permanently fenced arrays forms one contiguous block of fenced panel areas.
>
> *Paddock or Grazing Paddock:* This is the smallest unit under discussion. It is a grazing unit created by the design of this Prescribed Grazing Plan. Their individual average size for Horseshoe is projected at 6 acres.

The Invenergy Horseshoe Solar project, located in Livingston County NY, is planned for approximately 1,260 acres. Sheep grazing will be used to control vegetation at the Project site in order to:

- Prevent panel shading from vegetation,
- Control and remove invasive and unpalatable plant species,
- Avoid the growth of brush and s woody species under the solar panels,
- Maintain a diverse forage population to support optimal sheep nutrition,
- Encourage flowering forb and plant species to maximize pollinator habitat,
- Maximize the amounts of sequestered soil carbon through increasing top-soil amount and root matter, and
- Control erosion.

To achieve these goals a rotational grazing system will be implemented. Rotational grazing is a technique where animals are moved as one group, from one pastured area (“paddock”) to the next (Hodgson, 1979). Only one paddock is grazed at any given time throughout the rotation, while the other paddocks are given

a rest period to achieve pasture regrowth. Compared to set-stock grazing, rotational grazing inhibits weed growth, improves the health of pasture, sustains healthy vegetation, and improves sheep health.

Background on Solar Grazing as an industry:

- European solar arrays have co-located with grazed sheep at ground mounted arrays for better than 15 years. There is no official history logged, but the French, Spanish, British, and Germans each have employed solar grazing for more than ten years. In the case of the British, who have a long history of sheep farming, the critical mass of graziers has increased due to Brexit. Farmers have increased their leases to solar firms in order to stabilize income streams in times of economic uncertainty, and these farmers are already sheep farmers with an eye to maximizing grazable land. The BRE National Solar Centre has published several guides to solar grazing, available at www.bre.co.uk/nsc. Probably the largest example of an organized firm to use solar grazing is FRV. The Spanish operations & maintenance firm works in Australia, South American and Europe and uses sheep at its utility scale operations to manage vegetation.
- In the United States and Canada solar grazing has been established over the past 6-8 years. The regions with the most ground-mounted solar have the earliest traditions around solar grazing: California and North Carolina. Both of these states have utility scale arrays over 500 acres that have been grazed for 6 or more years. In California one site, Topaz Solar, is 3,500 acres and 550 MW. This particular site is famously managed with endangered species and strict California Conservation goals. The sheep on site produce Climate-Beneficial Wool to sell through the California Fibershed cooperative.
- In the United States most early solar grazing was attributable to the European origins of the practice. Solar developers with a European background and exposure to European solar grazing have solicited area farmers to bid on the vegetation maintenance contract at their solar sites in North America. In Vermont and Ontario there are two solar sites built at sheep farms and planned for solar grazing by firms that are European-based. In North Carolina solar firm O2EMC founded a second firm dedicated to solar grazing: Sun Raised Farms is a network of sheep farmers stretching from Virginia to South Carolina and in its 8th year. Sun Raised Farms is operated by a European-American who brought the concept to North Carolina: Tanje Olsen. Currently Sun Raised works with a host of firms and faces competition from a number of other sheep-based operations, including Carolina Solar Services.
- There are a host of other grazed solar arrays in North America with other origins. The most common among these is when a solar project is built in an agricultural community and the neighboring farmers approach the developer for an opportunity to graze the array with their livestock. Often done with a trial period, individual farmers from New Jersey to Arizona are finding partners in solar firms. The full-time grazier Julie Bishop of Solar Sheep LLC in New Jersey started her firm 5 years ago exactly this way. She now grazes community solar sites across southern New Jersey with over 350 ewes.
- Finally, the other model emerging is one with origins in conservation. Minnesota Native Landscapes and Environmental Restoration, of Florida, are both firms that specialize in vegetation management with specialized goals. Using livestock to achieve these goals was part of their project portfolio. Working with grazing plans, strict regulations around environmental management and sheep was the norm: now solar grazing is too. Environmental Restoration is currently managing more than 1500 acres of ground mounted solar for Tampa Electric Company, entirely with sheep. It manages additional solar for Florida Power & Light. Minnesota Native Landscapes is working at a community scale and with the strictest biodiversity and pollinator guidelines in the United States.

Rotation planning:

This plan is guided by principles found in the New York State Soil & Water Conservation Agricultural Environmental Management Tier 2: Pasture Management Worksheet. “Pastures should be

managed to ensure optimum forage production, not only for the economic well-being of the agricultural operation, but for soil health, the prevention of soil erosion and water quality, through controlled access and reduced runoff." Additionally, Prescribed Grazing Management, which is the nature of this document, is defined as "the controlled harvest of vegetation by grazing or browsing animals managed with the intent to achieve a specific objective" (https://www.nys-soilandwater.org/aem/techtools.html). The objective in this case is to manage the vegetation at the solar array with grazing sheep using a planned rotation. Additional objectives, which form the spirit of this document, are located in the AEM Tier 2 land stewardship goals (https://www.nys-soilandwater.org/aem/aemcc.html).

The Horseshoe Solar Project was assessed for a planned grazing rotation based on the preliminary panel layout. This layout was subdivided in the civil drawings by agricultural or chain link perimeter fencing into 8 different spatially connected sections (Figure 1). Each of these fenced sections are further subdivided into individually fenced areas, again, with agricultural or chain link fence. The grazing plan requires these additional subdivisions to facilitate rest time and growth time for the vegetation at the solar array. Rest time and growth rates of vegetation are the fundamental elements around which rotational grazing are planned.

This grazing plan allows that there will be 8 managed flocks of sheep across the Horseshoe Project. Each one of the 8 *sections* will be grazed by a separate flock and enrolled into a separate grazing rotation. The following nomenclature is used to describe the specific localities of the grazing rotation:

Project → Section → Permanently Fenced Array → Grazing Paddock

For larger utility scale solar projects such as Horseshoe, a sheep rotation for each *section* of the project is planned, resulting in one separate sheep flock per section. The flock is sized to be enough sheep to cover the entire section in a full rotation, i.e. for Section 1, the amount of sheep needed to graze 118 acres in a +/-40 day rotation. The precise number of sheep in a section may be adjusted over the season according to the flock manager. The precise number of planned sheep per section can be found in Table 2. Grazing Plan Invenergy Horseshoe Solar.

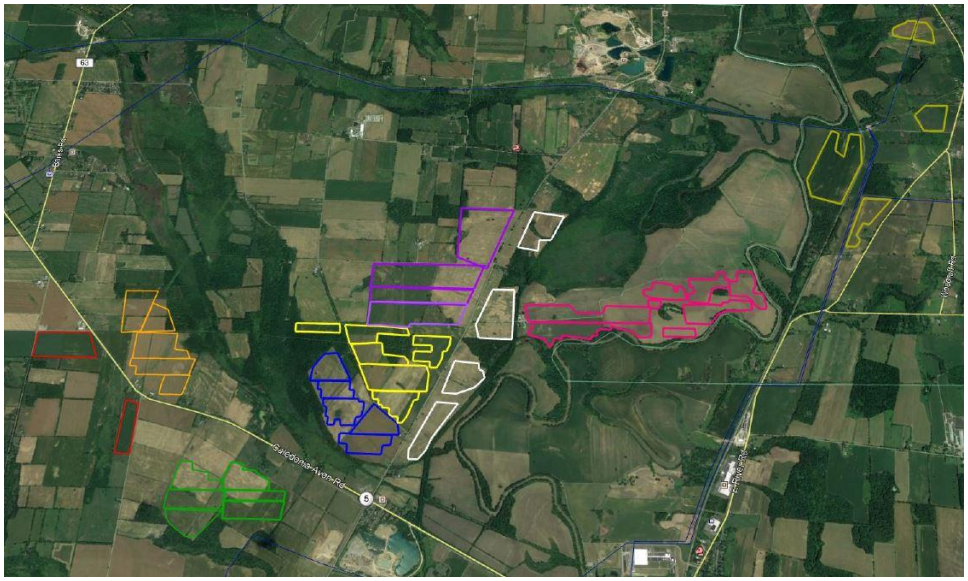
Each individual section of the Horseshoe Project is not directly connected but spatially separated by roads, wetlands, woods or residential zones. The advantage to a flock manager of considering each section individually is threefold:

1. The flock remains within one section and can potentially be moved with minimal trucking;
2. The size of each flock remains manageable within the fenced sections; and
3. The individual sections can be administered individually, i.e. bid on and subsequently managed by different farmers during the RFP process.

The grazing plan requires additional division of the solar array into smaller grazing units. These grazing units, known as *paddocks*, are created by using the planned permanent perimeter fencing and portable, battery charged Electronet® fencing. The Electronet® is a portable fence that is a product familiar to farmers in in the grazing community. It is a white, lightweight fence that is energized using a portable battery, battery/solar, or 110V power supply. This fencing is simple to power on/off and will only be located inside the fenced areas. Its use is to facilitate grazing inside the permanently fenced areas only.

The Electronet® will be installed by the grazing manager according to the grazing plan. It will allow for an optimal use of the permanent fencing to form some paddock walls while others will be formed entirely by lengths of portable fencing. It is a versatile product that will allow the grazing manager a high

level of control over the vegetation. The portable, battery charged Electronet® fencing would allow for a simple, logical rotation.



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The grazing paddock calculations are based on the total number of sheep per section and a targeted number of days per graze (four days or less). The targeted days to graze are the key factor guiding each grazing paddock's planned acreage. The grazing paddock's size uniquely determines the overall number of possible grazing paddocks within each array and, ultimately, section. Together with the rest period this determines the grazing rotation.

The number of grazing paddocks in each permanently fenced array is dependent on a unique set of factors. The number depends on the size and layout of the permanently fenced arrays, the panel

orientation, and the space used for access roads, inverter pads, and other non-forage producing areas. These specifics can be determined considering each array separately.

Permanently fenced array (ac) / Grazing paddock size (ac) → Number of paddocks (#)
Rest period (days) / Number of paddocks (#) → Grazing days per paddock (days)

The amount of time the sheep will spend in a given area, or, how often the sheep should be moved, should be considered through the lens of forage regrowth. To allow for optimal plant regrowth, the time any flock spends in any one grazing paddock should not exceed 4 days. The regrowth of forage species starts after 4 days of being grazed. Furthermore, a 4-day maximum rotation day period reduces fecal matter contamination, minimizes the creation of sacrifice areas, and improves pasture hygiene.

The rest time for a given grazed area is largely guided by management for the sheep flock's health. The rest time can be considered the window during which the sheep are not present in a given area and the space is given a rest.

The pasture rest period (time between grazing periods) in the US Northeast should not be less than 40-days to minimize internal parasite pressure for sheep. Internal parasites are a health risk to the sheep but not to humans. Internal parasites of sheep are not zoonotic, but a threat only to the health of sheep. This health risk to sheep is minimized by following the following prescriptive grazing plan.

A common internal parasite specific to ruminates is the stomach nematode *H. contortus* or barber pole worm. It has a life cycle of 40-days, thus a clean pasture can only be achieved with rest periods of 40+ days to avoid reinfection through ingestion of larvae. However, in effective grazing regimens with parasite-resistant sheep flocks, exceptions can be made by the flock manager if the vegetation pressure is too high to adhere to a 40-day rest period before re-grazing.

In conclusion:

A flock will flow on a rotation through each section of the solar site, eating vegetation with the given area and moving at the direction of the flock manager.

The recommended grazing period for any given area of a solar array is not to exceed 4 days. The flock manager may determine that the right grazing period for the sheep is just a few hours or a full 4 days. This decision is determined typically by the quantity of vegetation available and other pasture or flock management goals, which is further explained below. It is recommended that the sheep not return to this same grazed area for 40 or more days. This 40- day rest is recommended typically to allow the sheep to graze pastures and stay healthy.

Other details to consider when planning for solar grazing:

In newly commissioned solar sites, full vegetation coverage cannot be expected in the first 1-2 years. Additionally, access roads, inverter pads and other site infrastructure will reduce the overall vegetation cover. Our estimate for NY State solar sites lies between 65 and 85% vegetation coverage for new sites. This number should be estimated and considered separately for each individual paddock. This number will be adjusted as reseeding efforts take effect.

As previous management regimes for solar sites might consist of hay fields, crop fields, marginal pastures or brush areas, the vegetation coverage is expected to be heterogeneous. Therefore, vegetation sampling must be performed in order to determine sheep stocking rate and density, which is a requirement prior to establishing a grazing rotation. Tabular dry matter and nutrient values as they are

published for uniform stands of established crops, hay field or other, are not adequate for evaluating solar array site vegetation for grazing. A detailed organic matter (OM) vegetation sampling protocol is published on the American Solar Grazing Association (ASGA) website. The grazing rotation will largely depend on the amount of forage dry matter (DM) growing within the individual areas. anager may perform vegetation sampling at intervals to analyze the nutritional value of the forage.

Forage analysis laboratories such as Dairy One provide detailed analyses that can be used to calculate the available DM per grazing paddock from submitted OM samples. Dry matter is a percent of total percent plant weight minus water content. These DM values are necessary to establish the amount of available feed for sheep, and eventually the sheep stocking rate and density. Typically, pasture DM values in the Northeastern US for well-maintained pastures are between 18-25%, depending on the season. Pasture utilization should be between 70 and 85% to ensure optimal regrowth and animal nutrition. Thus, pasture refusals (uneaten vegetation remaining after grazing) should be part of the calculation and should be between 15% and 35%.

It is recommended to graze uniform animal groups that are either dry (non-lactating) ewes, open (non-pregnant) ewes, ewes in their early stages of pregnancy, yearling ewes or growing lambs of at least 60 lb. (or alternatively, 50% of their mature body weight in case of small breeds). In the case of groups of growing lambs, the lambs should be of the same sex or the males should be castrated.

Depending on the breed and uniformity of the group of sheep, an average weight for the individual animals in the flock can be determined.

Table 1 gives an overview of BW (body weight) and feed intake across popular Northeastern sheep breeds. According to NRC nutritional requirements for small ruminants (NRC, 2007), daily DM consumption per animal can be estimated as a percentage of bodyweight.

Table 1. Body weight and feed intake

Breed	***Stage of production***	***Body weight, lbs***	***Feed intake, DM %BW***	***Feed intake, lbs DM***
Katahdin hair sheep	Growing lamb, 50% mature BW	65	2.5	1.6
	Yearling	110	3.0	3.3
	Open, dry ewe	130	3.5	4.6
Polypay composite	Growing lamb, 50% mature BW	80	2.5	2.0
	Yearling	130	3.0	3.9
	Open, dry ewe	160	3.5	5.6
Texel	Growing lamb, 50% mature BW	90	2.5	2.3
	Yearling	150	3.0	4.5
	Open, dry ewe	180	3.5	6.3

These calculations can be used to determine the optimal number of sheep per paddock according to body weight and stage of production. By using this with the chosen grazing rotation days (or rest period), the stocking rate (the necessary sheep number for the calculated grazing time within each paddock) can be calculated. Once the stocking rate is determined, a grazing plan can be established (see Table 2):

Forage Species:

Soil testing will be performed at the Horseshoe Solar site before the commencement of grazing. The soil testing will inform the exact species suitable for seeding on the site. A typical pasture blend for solar sites would include a 60-70% grasses [2-4 species that are regionally adapted, meet solar site height criteria and are selected for grazing suitability], 30% legumes [2-4 species that meet the above criteria} and up to 10% forbs [broadleaf plants that are tolerant to grazing, regionally adapted, non-toxic to sheep and contribute to the site's biodiversity]. In addition to this various establishment species may be recommended to reduce soil erosion and serve as nurse crops for the perennial solar site pasture mix, above.

Item	*Section 1*	*Section 2*	*Section 3*	*Section 4*	*Section 5*	*Section 6*	*Section 7*	*Section 8*	*Section 9*	*Approximate Total Project*
Section size, ac	117.5	133.0	132.0	112.0	156.0	289	140.0	216.0	188	Total project design ~1,300 acres
Individually fenced arrays, #	5.0	5.0	6.0	5.0	6.0	4.0	4.0	8.0	5	43.0
Grazing paddocks, #	23.5	19.0	22.0	12.0	13.0	34.0	20.0	27.0	37.5	170.5
Grazing paddocks, ac	5.0	7.0	6.0	8.0	12.0	8.5	7.0	6.0	5	
Rest period, days	45	45	45	45	45	45	45	45	45	45.0
Grazing days per paddock	1.9	2.4	2.0	3.8	3.5	1.4	2.3	1.7	1.2	
Grazeable area per section % and ac	75% 88.1	75% 99.8	75% 99.0	75% 84.0	75% 117.0	75% 204.0	75% 105.0	75% 162.0	75% 141.0	75% 971.9
Organic matter per yard², lbs	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Dry matter % and per yard², lbs	18% 0.4	18% 0.4	18% 0.4	18% 0.4	18% 0.4	18% 0.4	18% 0.4	18% 0.4	18% 0.4	18% 0.4
Dry matter per ac, lbs	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742
Sheep weight, lbs	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160	160.0
DM intake % body weight and lbs	3.5% 5.6	3.5% 5.6	3.5% 5.6	3.5% 5.6	3.5% 5.6	3.5% 5.6	3.5% 5.6	3.5% 5.6	3.5% 5.6	3.5% 5.6
Total acreage	**117.5**	**133.0**	**132.0**	**112.0**	**156.0**	**272.0**	**140.0**	**216.0**	**188.0**	**1,295.5**
Total sheep	**426.5**	**482.8**	**479.2**	**406.6**	**566.3**	**987.4**	**508.2**	**784.1**	**682.4**	**5,323.5**
Stocking rate	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**	**3.6**

Table 2. Grazing Plan Invenergy Horseshoe Solar

Typically, well managed Northeast pastures can achieve yields above 2,500 lbs DM per acre. The yield in the grazing plan draft above is substantially lower; it is expected that the solar array pastures will take time after establishment to reach their potential. It is necessary to plan a grazing rotation prior to the grazing season, which would be used to guide a flock manager's rotation plan. The flock manager would then use his/her own experience and observation to decide daily if the rotation plan is reasonable and responsible, and to make necessary adjustments in rotation days and stocking rates.

Two examples of common adjustments to rotation plans include: First, in late spring after rain events and with the warming weather, stocking rates may have to be increased to be able to clear the vegetation growth. Secondly, in the summer, sheep may have to be moved from paddock to paddock faster than they were in spring or fall due to the slowed growth of dormant cool-season vegetation.

Flock management across the Project:

Regardless of season, ad libitum clean and fresh water access is crucial for animal welfare (NRC, 2007). Site-specific amenities like well water or connection to municipal water lines are ideal, but transported water is typical of solar grazing operations. For sheep of the recommended production stages (non-lactating and > 60 lbs growing lambs), water requirements are very low in spring and fall. This will change in the hot and dry summer months, when the forage DM is high and the pastures mature. The ample shade created by the solar panels tends to reduce consumption on sites, but the table below can be referenced when when planning water sourcing (Ontario Ministry of Agriculture, Food & Rural Affairs http://www.omafra.gov.on.ca/english/engineer/facts/07-023.htm#5).

Animal Type	Weight Range (kg)	Water Requirement Range[a] (L/day)	Average Typical Water Use[b] (L/day)
Feeder lamb	27-50	3.6-5.2	4.4
Gestating meat ewe/ram	80	4.0-6.5	5.25
Lactating meat ewe plus unweaned offspring	80+	9.0-10.5	10
Gestating dairy ewe/ram	90	4.4-7.1	5.75
Lactating dairy ewe	90	9.4-11.4	10.4

Water Consumption by Sheep[7]

[a] A result of the animals' environment and management.

[b] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.

Granulated mineral feed (Cargill, 2019) must be available ad libitum and contain adequate concentrations. This is an important animal welfare and nutritional requirement that cannot be overstated. Mineral feed should be offered in troughs that can be moved with the flock according to the rotation and rotation days. Mineral feed is specially blended and commercially available for sheep producers.

Sheep will be visually inspected on every rotation day by the flock manager. Moving the flock(s) to their next paddock is a great time to seek out, monitor, and treat sheep.

A closer inspection of each member of the flock is recommended at regular intervals (every 6 weeks on site). This inspection is only possible with the use of a handling system. Handling systems for sheep can be portable or permanent. A well thought-out handling system (example pictured here: https://www.premier1supplies.com/sheep-guide/wp-content/uploads/2012/10/25223cs.jpg) will be an essential tool for the flock manager. The handling system can be located at a central location for each section and be permanent, or it can be collapsible and transported on a trailer. Either way, the possibility to gather the flock(s) to perform management tasks at any given time throughout the grazing season must

be ensured. The system must allow gathering, leading in a single-file line through a treatment chute, stopping, and sorting of sheep. There are several commercial manufacturers of these systems available in the US, including Sydell, Premier 1 and D-S livestock.

Animal health and well-being:

Each spring, before the flocks begin the grazing season, certain protocols are recommended to ensure they are in optimal health before their work at the solar site begins.

Sheep care and protocols should include, and can be done in a handling system chute:

- Feet must be checked and trimmed
- Ear tags replaced or added, in compliance with USDA regulations
- Wool sheep must be shorn
- Wool sheep should be tail-docked (shortly after birth).
- Body-condition scored before moving on site. This is a measurement that can easily be performed in a chute on-site and is part of normal management chores. It provides information about the nutritional and health status of any animal on site and can be used to adjust the grazing rotation.
- Sheep should be individually handled and scored using the FAMACHA (FAffa MAlan CHArt) protocol, a visual inspection of the blood vessels under the lower eyelid. FAMACHA scoring is a standard practice in the sheep industry developed in South Africa to promote more effective practices for management of internal parasites that cause anemia and, sometimes, mortality.
- In compliance with FAMACHA protocols, sheep that score high should be treated with a commercially available de-wormer 24 hours prior to entering the pastures every season. Prior to being moved onto the solar site, the sheep should be kept in a dry-lot and be fed hay after deworming. This practice prevents reinfection of the sheep.

Approximately every six weeks at the solar array the flocks should be run through the handling systems with the following objectives:

- FAMACHA (Wyk and Bath, 2002),
- 5-point checks (Bath and van Wyk, 2009) and parasite monitoring or treatment.

Additional vegetation management services that should be considered part of the job of the flock manager:

- Spot mowing and weed treatment
- Spot-reseeding if any bare areas emerge
- Pasture fertility management

Conclusion:

A successful grazing rotation on large solar sites with sheep is based on the following:

- Initial, planned grazing rotation
- Experience and ability to observe when the rotation days and stocking density must be adjusted throughout the season
- A well-managed and clean, healthy flock deployed on pasture
- Stringent treatment protocols for flock specific health issues
- Fulfilled nutritional requirements
- Access to mineral feed and clean and fresh water 24/7
- Pasture hygiene (limited fecal contamination, moving of high frequency areas like water and mineral)

- Health checks on every rotation day
- Well-designed handling systems for 6-week animal checks and parasite monitoring and treatment

Literature

Bath, G. F., and J. A. van Wyk. 2009. The Five Point Check© for targeted selective treatment of internal parasites in small ruminants. Small Ruminant Research 86(1):6-13. doi: https://doi.org/10.1016/j.smallrumres.2009.09.009

Cargill. 2019. Cargill Lamb & Sheep Mineral Premix, http://blogs.cornell.edu/newsheep/management/feeding/agway-sheep-mineral-mix/.

HODGSON, J. 1979. Nomenclature and definitions in grazing studies. Grass and Forage Science 34(1):11-17. doi: 10.1111/j.1365-2494.1979.tb01442.x

NRC. 2007. Nutrient Requirements of Small Ruminants: Sheep, Goats, Cervids, and New World Camelids. The National Academies Press, Washington, DC.

Wyk, J. A. V., and G. F. Bath. 2002. The FAMACHA system for managing haemonchosis in sheep and goats by clinically identifying individual animals for treatment. Vet. Res. 33(5):509-529.

EXHIBIT D
INSURANCE REQUIREMENTS

Consultant will be responsible for liability caused by Consultants or its subconsultants or subcontractors, for loss or damage caused arising out of the Scope of Work in this agreement. Consultant shall ensure that any subcontractor or subconsultant it engages to perform Work shall maintain adequate insurance coverage subject to Consultant's discretion.

Consultant shall be responsible for maintaining, at Consultant's sole cost at all times during the performance of Work hereunder, all insurance Consultant deems appropriate including first and third-party insurance for bodily injury and property damage. All types of insurance (including but not limited to commercial general liability, automobile liability for hired and non-owned, employer's liability, professional liability and contractor's pollution where applicable. The limits of liability shall be at Consultant's discretion but not less than One Million Dollars ($1,000,000) per occurrence and in the aggregate. Except for Consultant's professional liability policy (if applicable to Scope of Work), Horseshoe Solar Energy LLC shall be included under all policies as additional insured and a waiver of subrogation in favor of said additional insured for all policies required under this Scope of Work.

Within five (5) business days of contract execution and upon Request, Consultant shall provide evidence of insurance coverage. Failure to maintain insurance or adequate insurance shall neither be construed as a waiver of Consultant's obligations nor relieve Consultant or its subcontractors/subconsultants of their obligations under this agreement. Consultant's insurance shall be primary without right of contribution by any insurance maintained by Horseshoe Solar Energy LLC.

EXHIBIT E
Bid Form
Questions and completed bid forms shall be submitted by email to HorseshoeRFP@gmail.com.

Company Name:
Contact:
Phone Number:
Email:
Address:

A. Proposal Type (Pick at least 1 of 2)

1: Grazing Management Proposal

Provide a written overview of the frequency and timing of grazing over the course of a year as well as a plan showing how the provided schedule is subject to change based on weather and other influencing factors. Please indicate if you plan to use to supplemental mechanical management:

Description of current operations:

Size of current sheep flock #
Average Age
Description of Current Farming Practices (wool, lamb, dairy, other)
Breed(s)
Herding Dogs #
Breed
Guard Dogs #
Breed

Include estimated number of animals required to maintain an effective stocking rate, number and frequency of animal moves, and rest periods between grazing passes. If contractor is to use managed grazing, the proposal shall adhere to the parameters of the prescribed grazing plan. Please provide a description of any deviations from provided Grazing Plan. For grazing bids, contractor should include and describe in their cost estimates a plan for some mechanical mowing or other mechanical vegetation control throughout the season if it becomes a necessity:

Description of Activities

This form should be filled out with estimated type and frequency of vegetation management activities for both year 1 and year 2+. Please fill out only that which applies to your proposal.

	Year 1	Year 2+
Number of mature ewes		
Number of youngstock		
Number of grazing management hours per month		
Mowing hours per month		
Weed whacking/hand mowing/spraying hours per month		
Water hauling hours per month		
Other flock management hours per month		
Number of personnel		
Estimated start and end date of grazing season		
Other hours per month		

Back-up or Supplemental Mechanical Vegetation Management equipment
Type(s) of mower)
Deck Width
Turning Radius
Ground Speed
Type(s) of herbicide
Other weedwhackers/hand tools

Notes:

2. Mechanical Management Proposal

Provide a written overview of the frequency and timing of mows over the course of a year as well as a plan showing how the provided schedule is subject to change based on weather and other influencing factors:

Type(s) of mower:
Deck Width:
Turning Radius:
Ground Speed:
Type(s) of herbicide:
Other weed whackers/hand tools:

Description of Activities

This form should be filled out with estimated type and frequency of vegetation management activities for both year 1 and year 2+. Please fill out only that which applies to your proposal.

	Year 1	Year 2+
Number of mowings per year:		
Labor hours per mowing:		
Herbicide applications per year:		
Labor hours per application:		
Weed whacking/hand trimming: hours per year		
Other hours per year:		
Notes:		

B. Performance Guarantee

(1) Briefly outline monitoring strategy:

(2) Explain performance guarantee criteria and the methods/metrics to be measured (e.g. height of grass):

(3) action plan for remediation if site becomes out of compliance, i.e. increased stocking rate, immediate or more frequent mowing:

(4) any additional inclusions necessary to ensure successful performance:

C. Previous Experience/Qualifications:

List any prior vegetation management experience (include any relevant solar experience, scope of current and past NY projects, highlight experience related to the project and/or project area:

D. Cost Quote Year 1

Please refer to Exhibit 1 and 2 for figures and acreages. It is recommended that your bid be based on approximately 1,300 total acres of maintenance.

Section bid upon	1	2	3	4	5	6	7	8	9	Total
$/acre total bid price grazing (includes any supplemental mowing)										
$/acre total bid price mowing										

Cost Quote Annual basis after first year

Section bid upon	1	2	3	4	5	6	7	8	9	Total
$/acre total bid price grazing (includes any supplemental mowing)										
$/acre total bid price mowing										

Notes: