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Kent A. Chandler
Chairman

July 7, 2022

PARTIES OF RECORD

Re: Case No. CASE NO. 2021-00235

Notice is given to all parties that the attached document that Ms. Bridget Coots presented during the public comment portion of the June 30, 2022, Public Hearing has been filed into the record of this proceeding.

If you have any comments you would like to make regarding the contents of the document, please do so within five days of receipt of this letter. If you have any questions, please contact Heather Temple, Staff Attorney III, at Heather.Temple@ky.gov.

Sincerely,

Linda C. Bridwell, PE
Executive Director
On Behalf of the Siting Board

Attachment

Submit

CONSIDERATIONS FOR FUTURE UTILITY SCALE SOLAR FARM DEVELOPMENTS

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H.B. Price Professor

Department of Agricultural Economics
University of Kentucky

September 2020

College of Agriculture, Food and Environment
Agricultural Economics

Considerations for Future Utility Scale Solar Farm Developments

By Alison F. Davis, PhD
H.B. Price Professor, Department of Agricultural Economics
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September 2020

An effort to rely on renewable resources instead of nonrenewable has the potential to meet the increased global demand for electricity. Both solar and wind energy have the potential to offset a significant fraction of non-renewable electricity demands, yet it occupies extensive land when deployed at levels large enough to meet global demand. With continuing cost declines, led by federal and state incentives, solar power is playing an increasingly important role in how states meet their energy needs. There is growing concern that large renewable energy installations will displace other land uses. This brief explores the considerations for individual farmers, communities, and local leaders before any final decisions are made and/or contracts signed.

1. Prioritizing lands of marginal use to limit impacts to food production

Figure 1 (next page) highlights the expected demand in new solar utility-scale installations. Each year, this forecast for increased capacity roughly translates into a minimum of 134,000 acres of land.[1] Robert van der Horst (2019) explored the impacts after grassland and partial cropland in the Netherlands dedicated to grain & starch farming were converted into solar farming land.[2] He found that if 1% of the Dutch agricultural land area was dedicated to solar farming, land and food prices only deviated by 0.5%. However, when significant larger tracks of agricultural land were dedicated to solar energy production, sparing potential of solar energy development across four nonconventional land cover types: the built environment, salt-affected land, contaminated land, and water reservoirs (as floatovoltaics), within the Great Central Valley in California, a globally significant agricultural region where there is significant competition between land for food production, urban development, and conservation. Their study reveals that this area could accommodate solar energy development on nonconventional surfaces in ways that may preclude loss of farmland and nearby natural habitats that also support agricultural activities by enhancing pollinator services (e.g., wild bees) and crop yields. In addition, a recent article highlighted potential renewable energy sites including abandoned mine lands, brownfields, superfund sites, etc.[3]

Land is more valuable if building a solar farm is less expensive to construct. Ideally, land would be: flat (less than 5 degrees of slope; more is acceptable if it slopes to the south), clear of trees, structures or other obstacles, free of ponds, streams, creeks, etc., and bordered by a road that will provide easy access to construction crews.[4] These conditions are typically found on prime agricultural farm land.

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[1] Simple rule of thumb is that 1MW solar power should require about 7.9 acres. Depending on the specific technology, a utility-scale solar power plant may require between 5 and 10 acres per megawatt (MW) of generating capacity. Source: https://www.nrel.gov/docs/fy13osti/56290.pdf

[2] Robert R. van der Horst, "Solar Farms on Agricultural Land: a Partial Equilibrium Analysis." MSC Thesis, Wageningen University and Research, September 25, 2019.

[3] https://www.southernenvironment.org/uploads/words_docs/Solar_EnvReviewProcess_SitingSolar_Final.pdf

[4] https://www.solarlandlease.com/lease-rates-for-solar-farms-how-valuable-is-my-land

The protection of prime soils and prime farmland should be prioritized. Other farmland and marginal farmland should be pursued for standard ground-mounted solar array, dual-use should also be considered, if possible (AFT, 2020).[5] If solar projects are still proposed on prime soils, they should be agricultural dual-use projects, ensuring continued production is prioritized. Dual-use projects will be a challenge for lands that have been used for crop and livestock production but would be better suited for small animal grazing, i.e. sheep (but not goats).

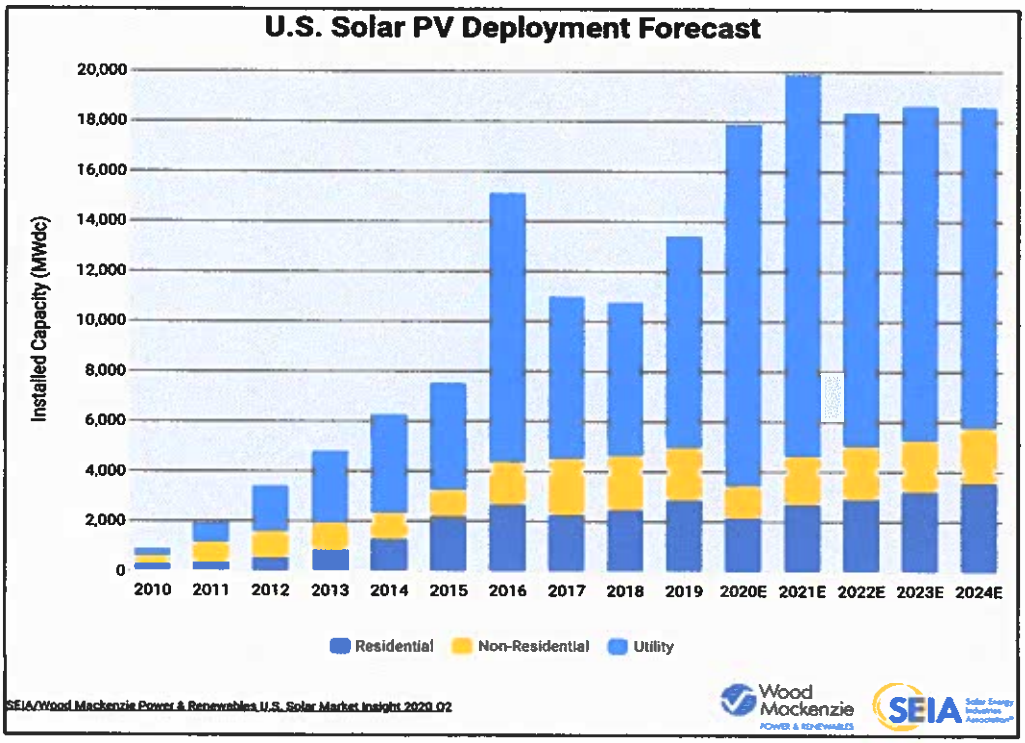

Figure 1. U.S. Photovoltaic Installation Forecast, 2010-2024

2. Understanding the contract

There are federal and often times state incentives that make solar farming technology economically feasible. However if these incentives disappear and/or the technology changes that impacts the cost effectiveness of existing solar arrays, what impacts would this have on the existing lease and the potential abandonment of the farm? Solar farms left idle will decrease the land values of both the solar farm as well as nearby property values. It is essential that the contract is reviewed by legal experts. In the state of Ohio, solar developers must post a bond to pay for decommissioning if the company ceases operations or goes bankrupt.

Currently, most solar operators include a decommissioning plan, however those plans vary by developer and might not provide the degree of protection that will ensure land is restored back to its prior use. Panels only have an expected life span of 20-25 years. PV panels are made of

[5] Solar Siting Guidelines for Farmland, American Farmland Trust New England, Northampton, MA: American Farmland Trust, January 2020. https://s30428.pcdn.co/wp-content/uploads/2020/01/AFT-solar-siting-guidelines-Jan-2020.pdf

mostly recyclable materials, including glass and aluminum, making it possible to recover and reuse the materials after the panel's life. Only recently, have there been efforts to identify mechanisms for recycling the panels to manage solar PV waste and end-of-life disposal of the panels. Make sure that the solar company has a viable decommissioning plan that spells out the terms of disposal, land grading, restoring soil quality (particularly if concrete is used in construction) and restoration of the site to its original condition. Because of these known issues, ensure developers include a comprehensive decommissioning plan, based on the actual construction of the site, as well as requiring developers to post a bond to make sure they are still around at decommissioning time. During the lease negotiation, it is important to clearly articulate who will be responsible for large financial liabilities, including real estate taxes, landowner insurance premiums, and other expenses associated with the property.

3. Weighing short and long-term benefits and consequences

Table 1. 2018 Cash Rents in Kentucky

Sub-Region	Cropland (Good/Fair)	Tobacco (With Barn/ Without Barn)	Hay (Improved/ Non-Improved)	Pasture (Improved/ Non-Improved)
Far West	$170/130	$410/250	$45/25	$55/25
Mid West	$210/150	$510/310	$55/35	$45/30
Near West	$160/110	$300/230	$50/35	$50/30
South Central	$180/130	$270/200	$50/30	$40/25
Bluegrass	$130/90	$400/290	$50/30	$45/25
North Central	$140/100	$350/220	$65/40	$45/25
North East	$140/100	$370/230	$50/35	$35/25
South East	$60/40	$100/50	$50/30	$35/25

Per acre per year value based on 2018 survey of Agriculture and Natural Resource County Extension Agents. Total of 70 completed surveys.

Source: https://agecon.ca.uky.edu/files/kycashrentnew.pdf

Currently, solar farms are leasing land at prices ranging from $400 to $1,200 an acre. These lease rents are higher than the current cash rents Kentucky farmers are receiving for cropland and tobacco (Table 1). In the short-run there are financial benefits, particularly for older farmers who are battling a downturn in the agricultural economy. It is important to make decisions with the long term in mind. How does the present value of the lease payment offered by the developer compare to the expected long-term return if the land was in production? Agriculture, much like the national economy, has times of both expansion and recession, and this current downturn is not expected to be permanent. In addition, as rents rise because of the increased demand for land, other farmers will have a difficult time paying higher prices to farm the land. Loss in land will eventually result in the loss of local businesses who supply seed, fertilizer, and chemical dealers, hardware and lumber suppliers, equipment manufacturers and others. A long-term concern is after the solar lease agreements, will farmers be able to afford to put the land back into production? Those farmers who do end up leasing their land for solar

development should have a farm transition plan in place prior to conversion. If a farmer chooses to only lease part of their land, it is important to recognize that farming depends on size of scale to make a profit. As a farmer scales down, it will become more and more difficult to remain in the farming business.

The figure below highlights that there are job impacts from the installation of solar systems, which are considered short-term employment impacts as these workers will move from site-to-site. The other employment impacts occur in manufacturing of the panels and trade and distribution, which currently do not exist within the state of Kentucky. Currently, a significant share of the electricity generated through these proposed solar farms are slated to be distributed to areas with higher populations, so Kentuckians might not benefit from or utilize the generated electricity. It is important to note that compared to other industries, the long-term revenues and job impact are negligible. For example, Topaz Solar Farm (5,000 acres) is located in San Luis Obispo. PG&E (Pacific Gas and Electric) buys the power from Topaz. There are zero solar-based utility revenues in San Luis Obispo County. All revenues and jobs are provided to San Francisco where PG&E is headquartered.

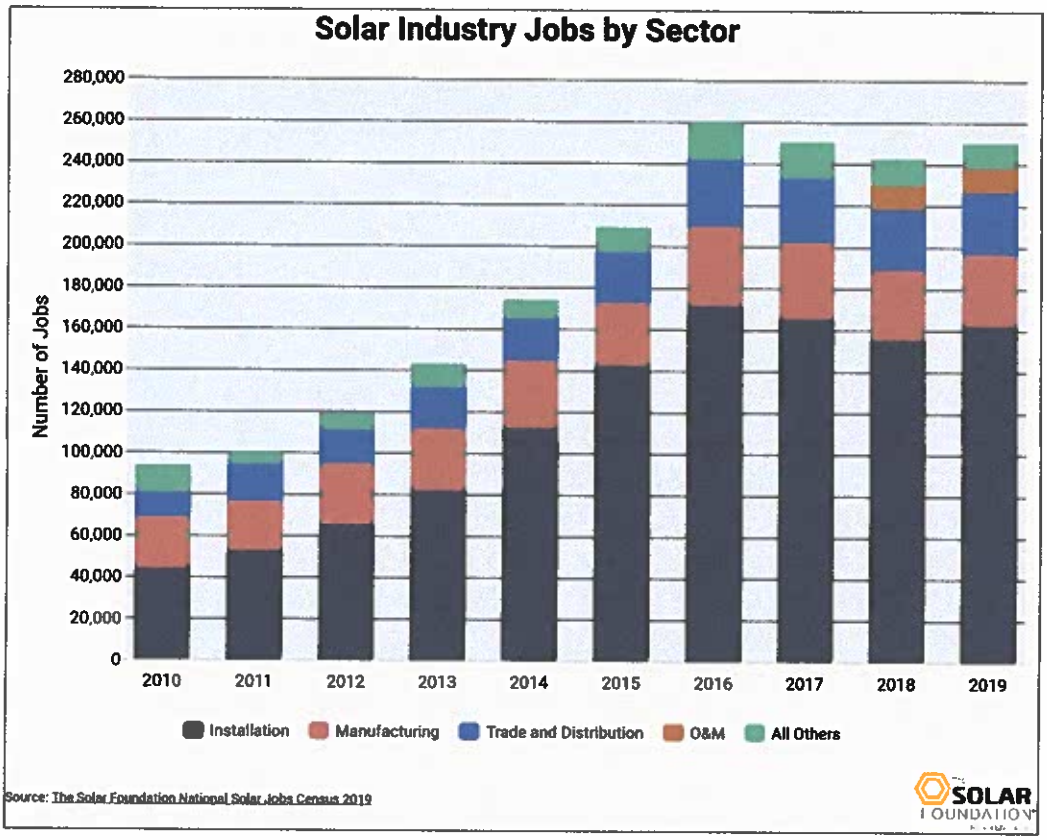

Figure 2. Solar Industry Employment
Source: https://www.seia.org/solar-industry-research-data

KRS 132.450 requires that agricultural or horticultural land be assessed at use value based on its income-producing ability and comparable sales of farm-land, rather than its fair market value for development. Agricultural land is defined as any tract of 10 acres or more used for

the production of crops, livestock, tobacco or timber, any tract of five acres or more used for commercial aquaculture, or any tract meeting the requirements for payments for a participation in an agricultural program based on a contract with the state or federal government. Horticultural land is any tract of five or more acres used for the commercial cultivation of a garden or orchard, or for raising fruits, nuts, vegetables, flowers or ornamental plants. This statute was designed to be a leveling field for agriculture. When the land is converted to other purposes including other special use agriculture, residential, commercial, or industrial, there will be likely be an increase in tax revenues generated for the local community. In the long-term, when the lease ends, if the land is not usable for any other purpose or is abandoned, then the tax revenues could be reduced to zero.

4. Exploring the land and environmental impacts

Because solar panels capture 20% of the light for about 5 hours of the day, the rest of that solar energy will pass through to the ground. As a result grasses, broadleaf weeds, and eventually woody shrubs will grow. There are three ways that solar farms can address this potentially unwanted vegetation: herbicides, mowing, ground cover, or a combination of all three. It's likely that a non-trivial amount of herbicide will need to be used to minimize weeds. In addition, landowners will still need to maintain equipment to remove unwanted vegetation or soil, grade roads or paths, mowing etc. Ongoing weed, shrub, and small tree maintenance is needed.

> *"High rates of herbicides, frequent mowing, and the use of mulches, rock, or plastic will all have negative impacts on the land from herbicide residues, soil compaction and erosion, and particles of damaged panels left in the soil resulting in contamination from heavy metals and rare earth elements used in solar panels. Remember, you still own this land and you will be held responsible for water runoff, cleanup, and off-site effects and the eventual need to replace fertility lost."*
>
> – Ron Heiniger, NCSU Professor and Extension Specialist

Solar can be installed in flood plains, but all electrical equipment will have to be installed above the projected level of flooding. Raising equipment could increase the cost of installation and may negatively impact the project economics. Also, the cost of insurance will be higher for PV systems in a flooding area. An area that will not be flooded may be better suited for PV installation.

5. Recognizing the positive and negative impacts on wildlife

In 2018, researchers at the Department of Energy's Argonne National Laboratory found that stable pollinator populations facilitated by pollinator-friendly solar farms allowed nearby agricultural land to be pollinated and, ultimately, boosted crop yields. Planting pollinator-friendly vegetation in solar farms provides multiple ecological and economic benefits to stakeholders. Using native plants as ground cover can help recharge groundwater, reduce

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