BEFORE THE PUBLIC SERVICE COMMISSION OF WISCONSIN

Application for a Certificate of Public Convenience and Necessity of Vista Sands Solar LLC to Construct a Photovoltaic Electric Generating Facility, a Battery Energy Storage System, Collector and Project Substations, a 345 kV tie line, and 138 kV collector transmission lines (Vista Sands Solar Farm) in the Village of Plover and Towns of Plover, Buena Vista, and Grant, Portage County, Wisconsin	**9820-CE-100**

DIRECT TESTIMONY OF PAUL MATHEWSON
ON BEHALF OF CLEAN WISCONSIN

Q. Please state your name and business address.

A. Paul Mathewson. 634 West Main Street, Suite 300, Madison, WI 53703

Q. By whom are you employed and in what capacity?

A. I am employed at Clean Wisconsin as Science Program Director.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of Clean Wisconsin.

Q. Please describe your educational background.

A. I received a B.A. in biology with a concentration in environmental studies from Colby College, a M.S. in Environment & Resources from the University of Wisconsin-Madison's Nelson Institute for Environmental Studies, a J.D. from the University of Wisconsin-Madison law school, and Ph.D. in zoology (focus area: biophysical ecology) from the University of Wisconsin-Madison.

Q. Please describe your work experience.

A. Prior to entering graduate school, I worked as a field biologist on a variety of projects both within the United States and internationally. Projects included monitoring wildlife as bioindicators of environmental pollution and wildlife and habitat use surveys. In graduate school, my research focused on model animals' ecophysiological response to environmental stressors. Since 2014, I have worked as a Staff Scientist and Science Program Director at Clean Wisconsin where I support program staff on a wide variety research and analyses related to climate change, pollution, air quality, and water quality issues in Wisconsin. Through my academic research and role at Clean Wisconsin, I have authored or co-authored 29 peer-reviewed scientific publications. A copy of my Curriculum Vitae is attached to this testimony as Ex.-CW-Mathewson-1.

Q. Are you sponsoring any exhibits with your testimony?

A. Yes, I am sponsoring the following Exhibits:

Ex.-CW-Mathewson-1: Curriculum Vitae for Paul Mathewson

Ex.-CW-Mathewson-2: Nitrate Concentrations in Private Wells Near the Project Area from the Wisconsin Well Water Viewer

Ex.-CW-Mathewson-3: Statewide Neonicotinoid Pesticide Sampling Result Summary

Ex.-CW-Mathewson-4: Background on Water Quantity Concerns in Central Sands

Ex.-CW-Mathewson-5: WDNR Analysis of High Capacity Well Withdrawal on Buena Vista Creek

Ex.-CW-Mathewson-6: WDNR Analysis of High Capacity Well Withdrawal on Fourmile Creek

Ex.-CW-Mathewson-7: List of Studies of Greater Prairie Chicken Responses to Wind Energy Development

Ex.-CW-Mathewson-8: Sensitivity of North American Grassland Birds to Weather and Climate Variability

Ex.-CW-Mathewson-9: Carbon intensity of Wisconsin Electricity Generation

Ex.-CW-Mathewson-10: WDNR Greater Prairie Chicken Management Plan

Q. What is the purpose of your testimony in this proceeding?

The purpose of my testimony is 1) to discuss the environmental impacts of the proposed project, with an emphasis on the potential local environmental benefits this project could provide and 2) provide additional context related to the potential impact of the project on the Greater Prairie Chicken.

Q. Are you familiar with the Vista Sands Solar Project?

A. Yes. I have reviewed the project application, Applicants' direct pre-filed testimony, responses to data requests, and other documents related to this project.

Q. Please summarize your findings.

A. A well-designed and maintained solar project's environmental benefits are enhanced beyond the climate and air quality benefits of displacing fossil fuel generation when the facility is sited in a way where its physical footprint will enhance local environmental quality rather than displacing important natural habitat. By replacing row crop agricultural land with a solar farm vegetated with native grassland vegetation, Vista Sands project has the potential to provide numerous local environmental benefits, including improved local water quality, increased surface water streamflow, enhanced soil carbon sequestration, and improved habitat for many wildlife species—particularly imperiled pollinators.

I. LOCAL ENVIRONMENTAL CO-BENEFITS OF VISTA SANDS SOLAR PROJECT

Q. Can you summarize the potential local environmental benefits of a solar farm replacing row crop agriculture?

A. Yes, as I have documented in fuller detail in several previous dockets[1], there are a number of potential environmental benefits of a solar farm replacing row crop agriculture. Row crop agriculture is an important source of some of Wisconsin's most widespread water quality issues, including nitrate, phosphorus, pesticide and sediment pollution. Intensive row crop agriculture often requires chemical inputs in the form of nitrogen and phosphorus fertilizers and pesticides which leach through the soil into the underlying groundwater aquifers or run off into nearby surface waters. Similarly, the regular disturbance and periodic lack of vegetative cover on an active row crop field increases erosion of soil from the fields, along with the accompanying

[1] Badger State Solar, docket no. 9800-CE-100, PSC Ref. # 376645; Onion River Solar, docket no. 9805-CE-100, PSC Ref. # 401873; Langdon Mills Solar, docket no. 9818-CE-100, PSC Ref. # 464266; Koshkonong Solar, docket no. 9811-CE-100, PSC Ref. # 425276; Silver Maple Solar, docket no. 9813-CE-100, PSC Ref. # 482212. Any information contained in this citation, based solely on this citation, is not record evidence (NRE).

phosphorus bound to the soil. Nitrate from agricultural land is Wisconsin's most widespread groundwater contaminant, and phosphorus pollution is the leading cause of surface water impairment in the state. Finally, the historic conversion of natural lands to row crop agriculture has led to significant wildlife habitat loss and soil carbon loss.

An appropriately designed and maintained solar farm replacing row crop agriculture can help address these adverse environmental impacts. First, the solar farms will not require fertilizer inputs, as well as dramatically reduced pesticide application. Second, erosion is greatly reduced, particularly when vegetated with perennial, deep-rooted vegetation. The deep roots will help hold soil in place and the vegetation and soil remains undisturbed, in contrast to active crop field. The perennial, undisturbed vegetation also provides improved wildlife habitat for small animals that can pass through or fly over the fencing. This is particularly pronounced when pollinator habitat is intentionally established, as pollinators have experienced a dramatic decline due to habitat loss.

The perennial, deep rooted vegetation will also help promote soil carbon sequestration, reversing the historic losses due to agricultural conversion.

Q. In your opinion is the proposed project likely to provide any of these potential environmental co-benefits?

A. Yes, I think the project as proposed is likely to provide many of these environmental co-benefits.

First, the vast majority of the land used by the project is currently row crop agriculture. Ex.-VS-Application-Appendix W. The vegetation management plan indicates that the project will be

vegetated with native deep-rooted grasses. Ex.-VS-Application-Appendix I. This perennial, undisturbed vegetative cover will help to hold soil in place to prevent erosion and help promote carbon sequestration. The seed mixes include forbs flowering in the spring, summer, and fall, providing food resources for local pollinators. This includes the endangered Karner Blue Butterfly which is important given that the project is located in Karner Blue Butterfly Federal High Potential Range. Ex.-VS-Application: 85.

The project is proposing to use wildlife-friendly fencing that includes larger openings in the bottom to allow small and medium-sized wildlife to pass through. Response-Data Request PSCW-Grant-4. The project is also proposing wildlife-friendly mowing maintenance of the vegetation. Once the desired vegetation is established, mowing will occur less than once a year and will be conducted outside of May 10-August 1, the primary nesting season of ground nesting birds. In areas within a mile of greater prairie chicken leks, mowing will occur outside of April 15th -August 1st. Ex.-VS-Application-Appendix I.

Finally, the sandy soils of the Central Sands and the shallow depth of the groundwater aquifers make drinking water wells in this area particularly vulnerable to nitrate and pesticide contamination. Indeed, according to the Wisconsin Well Water Viewer, 21% of private wells in the two Townships in the project area have nitrate levels above the health-based groundwater standard of 10 mg/L. Ex.-CW-Mathewson-2. Levels over 70 mg/L have been found here. Statewide sampling of neonicotinoid pesticides in private wells indicates that the Central Sands region has higher rates of detection than other parts of the state. Ex.-CW-Mathewson-3. Vista Sands has committed to not use neonicotinoid pesticides. Response-Data Request-PSC-Grant-5.

Thus, to the extent that the project will reduce nitrate and pesticide application to fields in the area, this will help mitigate the current contamination problems in the project area. The applicant

estimates that the project area currently receives 3 million pounds of fertilizer and 73,000 gallons of insecticide annually. Direct-VS-Pekar-10. This project will substantially reduce, if not completely eliminate all those applications, greatly benefiting the local environment.

Q. Are there any other potential local environmental benefits of the Vista Sands project that you have not discussed in previous dockets?

A. Yes. In previous dockets, and as summarized above, I have discussed water quality benefits of solar farms. In addition to water quality benefits described above, this project has the potential to provide important water quantity benefits.

Q. What are quantity concerns in the part of Wisconsin where this project is being proposed?

A. This project is located in an area of the state referred to as the Central Sands. Ex.-PSC-DEIS-DEIS: 41. The hydrology in this area is characterized by a close connection between groundwater and surface water, the latter of which includes numerous high quality trout streams and lake prized for recreational opportunities. Ex.-CW-Mathewson-4. A rapid increase in high capacity wells in the region to support irrigated agriculture, has led to concerns that this increased withdrawal is reducing surface water flow, adversely impacting the aquatic ecosystems. Ex.-CW-Mathewson-4.

Q. Are surface waters in the Vista Sands project area being impacted by high capacity irrigation wells?

A. Surface waters in the project area are likely being negatively impacted by high capacity well pumping. A recent analysis of high capacity well pumping for a proposed well in the Buena Vista Creek watershed, which this project is located in, found that current pumping by high capacity wells in the area reduces streamflow in Buena Vista Creek by 59%. Ex.-CW-

Mathewson-5. For context, for nearby 4 Mile Creek, the Wisconsin Department of Natural Resources (WDNR) calculated a tolerable depletion that still protected fish communities of 14%. Ex.-CW-Mathewson-6.

Q. How will this project help with these water quantity issues?

A. This project is anticipated to take 56 wells out of normal operation. Ex.-PSC-DEIS-DEIS: 41. In a typical year these wells pump a cumulative total of one billion gallons of groundwater; in dry years they can pump over 2 billion gallons. Draft EIS page 42. These wells account for 20% of the total high capacity well withdrawal in the Greater Buena Vista Area. Ex.-PSC-DEIS-DEIS: 42

Of the 56 wells, 49 will only pump at "maintenance levels" a de minimus annual withdrawal to keep the well permit active; the remainder will operate at partial capacity to irrigate fields outside of the project area. Ex.-PSC-DEIS-DEIS: 42. Exact amounts of continued pumping are not provided in the draft EIS

Thus, this project should be expected to result in a somewhat less than 20% reduction in streamflow depletion in Buena Vista Creek. This will provide an important, if unquantifiable, benefit to this Class II trout stream that is already stressed from high capacity well pumping.

This benefit will be particularly pronounced in dry years when already-low surface water levels are combined with the increased need for irrigation water withdrawal.

II. GREATER PRAIRIE CHICKEN IMPACTS

Q. What is the purpose of your testimony regarding the potential impacts of the Vista Sands Project on the Greater Prairie Chicken?

A. The purpose of my testimony is to fill in what I think is an incomplete picture of the current state of science regarding the impacts of renewable energy development on the Greater Prairie Chicken (GRPC). As noted in the draft EIS, there are no published studies regarding the response of GRPC to solar development. However, there has been some study of responses of GRPC to wind energy development, which provides some useful insight—particularly with respect to potential adaptability to renewable energy development—that is largely ignored by the draft Environmental Impact Statement (DEIS). Full citations to all the studies referred to in this section are found in Ex.-CW-Mathewson-7.

Q. What has past research found regarding the impact of wind energy development on the Greater Prairie Chicken?

A. There are a number of studies that evaluated the impact of wind energy development on various aspects of GRPC behavior, reproduction, and survival which are not discussed in the draft EIS. While wind development and solar development have different landscape impacts and thus may elicit different responses from GRPC, wind energy development in GRPC habitat is the closest analogy that has been studied to date.

Two studies evaluated the impact of wind energy development on adult female survival (Winder et al. 2014a; Smith et al. 2017). Both found that wind energy development did not negatively impact survival. Indeed, Winder et al. (2014a) even found a significant increase in survival following the construction of a wind energy facility. This was hypothesized to be due to predator avoidance of the wind energy facility. However, a follow up study (Smith et al. 2017) found no evidence of avian predator or coyote avoidance of wind turbines. There was a trend of

increasing overall mammalian abundance further from wind turbines. Thus, given the apparent lack of avoidance by most predators in this study, further study is needed to better understand the mechanism for the observed increase in survival.

Two studies evaluated the impact of wind energy development on GRPC nest site selection and nesting success (McNew et al. 2014; Harrison et al. 2017). Both found no impact of the development on either nest site selection or nesting success.

Winder et al. (2014b) found that adult females were not displaced by the construction of wind turbines, but did expand their home range size and did avoid turbines during the breeding season. However, the authors did emphasize how a concurrent demographic study (Winder et al. 2014a) did not find a negative demographic effect to the observed increase in home range size or turbine avoidance during the breeding season. Thus, while there may be some behavioral changes, there's no evidence to date they are negatively impacting the population.

Raynor et al. (2019) investigated the effect of anthropogenic noise impacts from wind energy development, and did not find any avoidance of wind turbines.

Proximity to wind energy facility had no effect on female lek attendance (Smith et al. 2016).

Males at leks closer to wind energy facilities spent less time in non-breeding behavior than those at leks further away, possibly to compensate for the effects of noise disturbance. Proximity to wind energy facilities did not affect time spent on booming displays or flutter jumps. (Smith et al. 2016).

Winder et al. (2015) investigated patterns of lek site persistence in relation to proximity to wind energy construction. Across all lek sites observed, there was no impact of turbine proximity on lek persistence post-construction. Size of lek pre-construction and land cover type

(grassland or cropland) were significant predictors of post-construction persistence. Smaller leks and leks in cropland were significantly more likely to be abandoned post-construction. Given the lack of relationship to turbine proximity, it is unclear whether these abandonments are related to the wind energy development or if they are simply the result of less-than-ideal lek sites being naturally abandoned.

When Winder et al. (2015) subsetted their data to only lek sites <8 km from a turbine, they did that leks >3 km from a turbine were less likely to be abandoned than those closer to turbines. However, this subsetted analysis did not control for habitat type or pre-construction lek size. As noted earlier, the study found that, regardless of proximity to turbine, leks in cropland were significantly more likely to be abandoned. Within this subset, 5 of the 9 leks within 3 km of a turbine were in cropland, while all 8 of the leks between 3-8 km of a turbine were in grassland, which are more likely to persist anyway, regardless of proximity to turbines.

For leks that remained active, distance to turbine had no detectable effect on rates of change (Winder et al. 2015). Lek persistence was positively related to number of males counted at a lek site; and with grassland cover surrounding the lek.

Whalen et al. (2018) found that male GRPC at leks near wind energy facilities had altered vocalizations, potentially in response to turbine noise or noise from service roads. Some of the changes were consistent with attempts to overcome masking effects of background noise. However, the authors clearly stated that the impact of these vocalization changes on breeding success is dependent on the function of the vocalizations, which at this point is underdetermined. If the vocalizations are critical to attracting females to a lek, then increased background noise could be important. However, evidence suggests that the vocalizations are more a product of

male-male competition on the lek, in which case the impact of background noise on mating dynamics is minimal.

Q. Are there other insights from research into wind energy development on GRPC that is relevant to this project?

A. Yes, the draft EIS states that greater prairie chickens and lesser prairie chickens respond similarly to infrastructure development, and its evidence for the negative impacts on anthropogenic structures includes a list of references almost entirely related to studies reporting responses of lesser prairie chickens Ex.-PSC-DEIS-DEIS: 53. However, it is important to note that at least two studies evaluating the impact of GRPC to wind energy development have explicitly concluded that GPC do not appear to be as sensitive to energy development disturbance as lesser prairie chickens (Winder et al. 2014b, Harrison et al. 2017).

Q. What is the relevance of these studies to this proceeding?

A. To be clear I do not have any specialized knowledge of the GRPC, and I respect the opinion of the WDNR biologists and other intervenors who have spent years studying this animal. However, I think it is important to acknowledge that at least with respect to wind energy development, there is limited evidence of significant negative impacts on GRPC populations. Indeed, the GRPC has been shown to be adaptable, and at least one population was documented to increase following the wind development.

Given the lack of any observational study of the impact of solar development on GRPC, it is important to consider both the opinion of GRPC experts as to what the response may be, as well as findings regarding actual GRPC response to other forms of renewable energy development.

Q. Do you have any other comments regarding the proposed project's impact on the GRPC?

A. A couple of other important points that I think should be considered in the discussion of the impact of this project on the GRPC. First, unmitigated climate change can have negative impacts on grassland bird species including prairie grouse like the GRPC, particularly with respect to increased periods of extreme heat, drought, and heavy rainfall. Ex.-CW-Mathewson-8. Solar development like this one is an important part of the solution towards mitigating climate change due to fossil fuel combustion. Wisconsin's electricity generation mix is one of the most carbon intensive in the country, meaning that rapid deployment of carbon-free electricity generation in Wisconsin is particularly important. Ex.-CW-Mathewson-9.

Second, the leading cause of population decline for this GRPC population has been the conversion of grassland to agriculture. Ex.-CW-Mathewson-10. This project will reverse this conversion trend in the areas around the panels by converting row crop agricultural fields to grassland habitat. Again, GRPC response to solar has not been studied to date and therefore the possibility that they may not avoid the panel area cannot be dismissed. To the extent that GRPC end up not avoiding the panels, the native grassland being established by this project could confer a benefit to the population.

All that said, a final point that I think is important but have not seen made explicitly in this docket is that general tenet of conservation biology is that smaller populations are more vulnerable to perturbations than a larger population. Given the very small size of this GRPC population (Ex.-CW-Mathewson-10), even a relatively minor disturbance will cause more harm to the population's health than it would to a larger population. Thus, given the vulnerability and

importance of this population to the continued existence in the state, I support reasonable efforts to minimize or offset the impact of this project on the GRPC, as well as any initiatives to monitor and study the impact of solar development on this population. As noted above and in the draft EIS, this is an important knowledge gap that would help to inform future solar siting near GRPC and other prairie grouse habitat.

VI. CONCLUSIONS

Q. Do you have a concluding statement?

A. Displacing coal and gas energy production with solar energy production broadly has significant environmental and public health benefits in terms of reduced air pollution and greenhouse gas emissions that help to mitigate climate change. A solar project's environmental benefits are further enhanced when the facility is sited in a way where its physical footprint will enhance local environmental quality rather than displacing important natural habitat. As I have outlined, it is my opinion that this proposed project will provide local water quality and quantity benefits through reduced nutrient and pesticide applications and groundwater withdrawals. Furthermore, this project will likely improve local wildlife habitat quality for many species, in particular pollinating insects, by replacing current row crop agriculture with native vegetation.

I support many of the recommendations listed in the draft Environmental Impact Statement to further enhance its local environmental benefit and minimize local impacts, including:

- Removal of red fescue from the seed mix to minimize threat to the establishment of native prairie grasses. I am aware of other solar projects in the state have used seed mixes without fescues, indicating that it is not an essential component;

- Reasonable efforts to proactively mitigate and monitor the impacts on the Greater Prairie Chicken and other species of conservation concern;
- Strategically providing wildlife corridors between arrays to minimize funneling of large mammal movement into areas that could increase vehicle collisions;
- Have the applicant work with the WDNR to ensure all mowing protocols are followed to minimize impacts on listed grassland bird species

It is encouraging that the Applicant has made substantial modifications to the original plan to help to minimize many of these important concerns. The GRPC conservation strategy (Ex.-VSS-Bub-2), the increased number of wildlife movement corridors between fenced arrays (Response-Data Request PSCW-Grant-7), and eliminating overhead transmission lines (Direct-VSS-Pekar-s) will all reduce the project's adverse impacts on local wildlife. These, and any additional modifications to further avoid and mitigate wildlife impacts are important to balance the critically important goals of a rapid transition to clean energy and protecting biodiversity.

Q. Does this conclude your testimony?

A. Yes.