

CASE NO. 895-AT-18

SUPPLEMENTAL MEMORANDUM #9

April 11, 2018

Petitioner: Zoning Administrator

Request: Amend the Champaign County Zoning Ordinance to add “Solar Farm” as a new principal use under the category “Industrial Uses: Electric Power Generating Facilities” and indicate that Solar Farm may be authorized by a County Board Special Use Permit in the AG-1 Zoning District and the AG-2 Zoning District; add requirements and fees for “Solar Farm”; add any required definitions; and make certain other revisions are made to the Ordinance as detailed in the full legal description in Attachment A.

Location: Unincorporated Champaign County

Time Schedule for Development: As soon as possible

Prepared by: **Susan Burgstrom**
Senior Planner

John Hall
Zoning Administrator

Brookens Administrative Center
1776 E. Washington Street
Urbana, Illinois 61802

(217) 384-3708

zoningdept@co.champaign.il.us

www.co.champaign.il.us/zoning

STATUS

This memorandum solely includes public input received since the April 5, 2018 ZBA meeting. Some submittals included studies; smaller reports have been included in this memo, and several larger reports (100+ pages) have been posted online only.

ATTACHMENTS

- A Legal advertisement
- B Email from Patrick Brown received April 5, 2018, with attachment: Dudek Noise Data memorandum dated April 5, 2018
- C Email from Mallory Seidlitz received April 6, 2018
- D Email from Jeremy Ruhter received April 6, 2018
- E Email from Patrick Brown received April 6, 2018
- F Email from Tim Montague received April 9, 2018, with attachments: pictures with measurements
- G Email from Patsi Petrie received April 9, 2018
- H Email from Nick Mento received April 9, 2018, with attachment posted online: Property Value Impact Study for Grundy County solar farm by Cohn Reznick
- I Email from Patsi Petrie regarding Alice Englebretsen Facebook post received April 11, 2018
- J Email from Scott Willenbrock received April 10, 2018
- K Email from Bruce Hannon received April 10, 2018
- L Email string between Andy Robinson and John Hall dated April 9-11, 2018
- M Email from Amanda Pankau received April 11, 2018
- N Email from Patrick Brown received April 11, 2018
- O Email from Nancy Holm received April 11, 2018
- P Email from Eileen Borgia received April 11, 2018

Q Email from Rebecca McBride received April 11, 2018
R Email from Rebecca Sinkes received April 11, 2018
S Email from Dave Thornton received April 11, 2018
T Email from Elizabeth Kirby received April 11, 2018
U Email from Mark Ballard received April 11, 2018
V Email from Steve Errede received April 11, 2018
W Email from Marian Huhman received April 11, 2018
X Email from Staci Bromley received April 11, 2018
Y Email from Shannon Kurtenbach received April 11, 2018
Z Email from George Cruickshank received April 11, 2018
AA Email from Raymond Norton received April 11, 2018
AB Email from Valerie Bernard received April 11, 2018
AC Recommended noise level design goals and limits at residential receptors or wind turbine developments in the United States, by David M. Hessler and George F. Hessler, June 21, 2010, received from Frank DiNovo on April 11, 2018

Studies posted online:

- Property Taxes and Solar PV Systems: Policies, Practices, and Issues, by Justin Barnes, Chad Laurent, Jayson Uppal, Chelsea Barnes & Amy Heinemann, July 2013
- Oakland NC Property Values Impact Study, Kirkland Appraisals LLC, February 12, 2016
- Noise in Figures, European Agency for Safety and Health and Work, 2005, submitted by Rebecca Sinkes, received April 11, 2018

LEGAL PUBLICATION: WEDNESDAY, FEBRUARY 14, 2018

CASE: 895-AT-18

**NOTICE OF PUBLIC HEARING REGARDING A PROPOSED AMENDMENT TO THE
CHAMPAIGN COUNTY ZONING ORDINANCE.**

CASE: 895-AT-18

The Champaign County Zoning Administrator, 1776 East Washington Street, Urbana, has filed a petition to change the text of the Champaign County Zoning Ordinance. The petition is on file in the office of the Champaign County Department of Planning and Zoning, 1776 East Washington Street, Urbana, IL.

A public hearing will be held **Thursday, March 1, 2018, at 6:30 p.m.** prevailing time in the Lyle Shields Meeting Room, Brookens Administrative Center, 1776 East Washington Street, Urbana, IL, at which time and place the Champaign County Zoning Board of Appeals will consider a petition to:

Amend the Champaign County Zoning Ordinance as follows:

Part A. Amend Section 3 by adding definitions including but not limited to “NOXIOUS WEEDS” and “SOLAR FARM”.

Part B. Add paragraph 4.2.1 C.5. to indicate that SOLAR FARM may be authorized by County Board SPECIAL USE permit as a second PRINCIPAL USE on a LOT in the AG-1 DISTRICT or the AG-2 DISTRICT.

Part C. Amend Section 4.3.1 to exempt SOLAR FARM from the height regulations except as height regulations are required as a standard condition in new Section 6.1.5.

Part D. Amend subsection 4.3.4 A. to exempt WIND FARM LOT and SOLAR FARM LOT from the minimum LOT requirements of Section 5.3 and paragraph 4.3.4 B. except as minimum LOT requirements are required as a standard condition in Section 6.1.4 and new Section 6.1.5.

Part E. Amend subsection 4.3.4 H.4. to exempt SOLAR FARM from the Pipeline Impact Radius regulations except as Pipeline Impact Radius regulations are required as a standard condition in new Section 6.1.5.

Part F. Amend Section 5.2 by adding “SOLAR FARM” as a new PRINCIPAL USE under the category “Industrial Uses: Electric Power Generating Facilities” and indicate that SOLAR FARM may be authorized by a County Board SPECIAL USE Permit in the AG-1 Zoning DISTRICT and the AG-2 Zoning DISTRICT and add new footnote 15. to exempt a SOLAR FARM LOT from the minimum LOT requirements of Section 5.3 and paragraph 4.3.4 B. except as minimum LOT requirements are required as a standard condition in new Section 6.1.5.

Part G. Add new paragraph 5.4.3 F. that prohibits the Rural Residential OVERLAY DISTRICT from being established inside a SOLAR FARM County Board SPECIAL USE Permit.

Part H. Amend Subsection 6.1.1 A. as follows:

1. Add SOLAR FARM as a NON-ADAPTABLE STRUCTURE and add references to the new Section 6.1.5 where there are existing references to existing Section 6.1.4.
2. Revise subparagraph 6.1.1 A.11.c. by deleting reference to Section 6.1.1A. and add reference to Section 6.1.1A.2.

Part I. Add new subsection 6.1.5 SOLAR FARM County Board SPECIAL USE Permit with new standard conditions for SOLAR FARM.

Part J. Add new subsection 9.3.1 J. to add application fees for a SOLAR FARM zoning use permit.

Part K. Add new subparagraph 9.3.3 B.8. to add application fees for a SOLAR FARM County Board SPECIAL USE permit.

All persons interested are invited to attend said hearing and be heard. The hearing may be continued and reconvened at a later time.

Catherine Capel, Chair
Champaign County Zoning Board of Appeals

TO BE PUBLISHED: WEDNESDAY, FEBRUARY 14, 2018 ONLY

Send bill and one copy to: Champaign County Planning and Zoning Dept.
Brookens Administrative Center
1776 E. Washington Street
Urbana, IL 61802
Phone: 384-3708

Susan Burgstrom

From: Patrick Brown <Patrick.Brown@baywa-re.com>
Sent: Thursday, April 05, 2018 4:56 PM
To: Susan Burgstrom
Subject: FW: Jacumba Noise readings
Attachments: Inverter_Noise_Memo.pdf

FYI I sent this to John.

Patrick Brown | +1 619 733 2649 | patrick.brown@baywa-re.com

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APR 05 2018

From: Jonathan Leech [<mailto:JLeech@dudek.com>]
Sent: Thursday, April 5, 2018 3:39 PM
To: Patrick Brown <Patrick.Brown@baywa-re.com>
Cc: David Hochart <dhochart@dudek.com>
Subject: RE: Jacumba Noise readings

CHAMPAIGN CO P & Z DEPARTMENT

Here's the memo by itself, while you wait to download the zipped file.

(See previous email for sharefile link).

Jonathan V. Leech, AICP, INCE
Acoustics, Air Resources & Transportation Group Manager

DUDEK

621 Chapala Street
Santa Barbara, CA 93101
T: 805.308.8527
F: 805.963.2074

WWW.DUDEK.COM

Patrick Brown
Director of Development



BayWa r.e. Solar Projects LLC
17901 Von Karman Avenue Suite 1050 | Irvine | CA 92614, USA

C +1 619 733 2649
patrick.brown@baywa-re.com
www.baywa-re.us

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MEMORANDUM**RECEIVED**

APR 05 2018

CHAMPAIGN CO. P & Z DEPARTMENT

To: Patrick Brown, BayWa Energy
From: Jonathan V. Leech, Senior Accoustician
Subject: Inerter Noise Measurement Results
BayWa Jaumba Solar Development
San Diego County, California
Date: April 5, 2018
Attached: Field Measurement Data Spreadsheet & Video Files

This memo provides the results of a noise measurement program conducted to address noise generation levels for the electrical inverter typically employed by BayWa for solar energy generation projects. Measurements were conducted on April 4, 2018, at the BayWa Jaucmba Solar Farm in San Diego, California

Meteorological Conditions

The following conditions were present during the measurement, these conditions do not preset any adverse affects with respect to normal outdoor noise transmission or attenuation.

Temperature: 76 degrees (F)

Sky: Sunny & Clear

Wind: 3 MPH (SW)

Humidity: 64 %

Measurement Protocol

Sound level measurements were conducted using a SoftDB Piccolo model sound level meter. This model is an integrating sound level meter which meets the current American National Standards Institute (ANSI) criteria for a Type 2, general purpose sound meter. Measurements were performed using a tri-pod to portion the meter at 5 feet above the ground, consistent with protocols established for environmental sound assessment.

Measurements were performed at 10, 50, 100, 200, and 400 feet from the inverter, with the sound level meter oriented in the direction of the inverter. Measurement results are presented below for

*Memorandum**Subject: Noise Measurement Results, Electrical Inverter, BayWa Jacumba Solar Farm*

the average sound level (L_{EQ}) maximum sound level (L_{max}) and minimum sound level (L_{min}) during each measurement. The measurements were each 10 minutes in duration. The measurements were conducted between noon and 1:30 PM, when inverter activity is at a peak for the day.

Location / Distance from Inverter	Average Sound Level L_{EQ} dBA	Maximum Sound Level L_{MAX} dBA	Minimum Sound Level L_{MIN} dBA
Site 1 – 10 feet from Inverter	56.4	58.9	54.4
Site 2 – 50 feet from Inverter	53.3	65.4	47.6
Site 3 – 100 feet from Inverter	49.9	61.6	42.4
Site 4 – 200 feet from Inverter	46.1	60.8	37.6
Site 5 – 400 feet from Inverter	47.7	62.8	35.9
Site 6 – Background Ambient Level	55.7	64	39.7

The sound level measurements document an expected lowering (attenuation) of sound levels with further distance from the inverter, through a distance of 200 feet from the inverter. At 400 feet, measured sound levels are slightly higher than at 200 feet, which indicate they are influenced by other sound sources in the vicinity of the project. Without influence from other sources, the expected sound level at 400 feet would be approximately 43 dBA L_{EQ} . The ambient noise measurement location was approximately 300 feet to the north of the facility perimeter, and 300 feet west of a local road. Traffic on the local roadway appears to be the primary contributor to the ambient noise environment.

Video Recordings

A short audio/video recording was also captured at each measurement location to present a more complete perspective of a “receiver” experience. The videos were captured with an iPhone, and are transmitted with this memo.

Site	Response	dBA weighting				2.0 dB resolution stats					
Date hh:mm:ss	LeqPeriod	Leq	Lmax	Lmin	L1%	L5%	L10%	L50%	L90%	L95%	
Site 1: 10 feet 4/4/2018 12:38	Slow Response 10.3 min	56.4	58.9	54.4		57	57	55	55	55	
Site 2: 50 feet 4/4/2018 12:49	Slow Response 10.0 min	53.3	65.4	47.6		63	59	57	47	43	
Site 3: 100 feet 4/4/2018 13:01	Slow Response 10.0 min	49.9	61.6	42.4		57	51	51	47	47	
Site 4: 200 feet 4/4/2018 13:14	Slow Response 10.0 min	46.1	60.8	37.6		55	51	49	41	39	
Site 5: 400 feet 4/4/2018 13:26	Slow Response 10.0 min	47.7	62.8	35.9		57	53	49	41	37	
Site 6: Ambient outside arrays 4/4/2018 12:00	Slow Response 10.0 min	55.7	64	39.7		62.2	59	57	53	49	

Susan Burgstrom

From: John Hall
Sent: Tuesday, April 10, 2018 3:28 PM
To: Susan Burgstrom
Subject: FW: Solar Panels in Sidney

From: Patti Petrie [<mailto:pattsi2@gmail.com>]
Sent: Friday, April 6, 2018 9:09 AM
To: John Hall <jhall@co.champaign.il.us>; Aaron Esry <ale7496@yahoo.com>
Subject: Fwd: Solar Panels in Sidney

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APR 06 2018

CHAMPAIGN CO. P & Z DEPARTMENT

FYI, P2

----- Forwarded message -----

From: Mallory Seidlitz <malloryseidlitz@yahoo.com>
Date: Fri, Apr 6, 2018 at 8:41 AM
Subject: Solar Panels in Sidney
To: pattsi2@gmail.com

Dear Ms. Petrie,

My name is Mallory Seidlitz, and I live on the south end of Longview Road in Sidney, approximately one mile from the proposed solar panels.

Though I am not opposed to the use of solar energy, I am opposed to using some of the best farm land in the county for that purpose. Not only do I have minor nuisance concerns about the noise level and the aesthetic, but I also feel that it would impact our community in major ways. Our property values will decrease, and flooding may be increased without plant systems to slow down and absorb extra moisture.

Furthermore, it is my understanding that the energy garnered from these panels will not benefit our village or surrounding areas, nor will we see an decrease in energy costs. To me, it is difficult to understand why placement of these panels in our community would be allowed.

Respectfully, I ask that you please consider my opinion (and the opinions of other village members) when making zoning decisions regarding the solar panels.

Thank you for your time.

Sincerely,
Mallory Seidlitz

Susan Burgstrom

From: John Hall
Sent: Friday, April 06, 2018 11:54 AM
To: Susan Burgstrom
Subject: FW: FCC ID SMA Solar Inverters

Follow Up Flag: Follow up
Flag Status: Flagged

-----Original Message-----

From: jeremy@thatlittlefarm.com [mailto:jeremy@thatlittlefarm.com]
Sent: Friday, April 6, 2018 11:53 AM
To: John Hall <jhall@co.champaign.il.us>
Subject: RE: FCC ID SMA Solar Inverters

Sorry one other item that I forgot to mention on previous email;

From my understanding if their equipment is under Part 15b then they may not need an FCC ID because it is a self certifying criteria but they still need to be able to provide test results that demonstrate that they are within the Part 15b guidelines from an accredited testing lab. I think this might be the case but there cuts aren't specific.

Regards,
-Jeremy R

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APR 06 2018

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Susan Burgstrom

From: John Hall
Sent: Friday, April 06, 2018 10:10 AM
To: Susan Burgstrom
Subject: FW: FCC ID SMA Solar Inverters

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CHAMPAIGN CO. P & Z DEPARTMENT

Follow Up Flag: Follow up
Flag Status: Flagged

-----Original Message-----

From: jeremy@thatlittlefarm.com [mailto:jeremy@thatlittlefarm.com]
Sent: Friday, April 6, 2018 10:06 AM
To: John Hall <jhall@co.champaign.il.us>
Subject: FCC ID SMA Solar Inverters

Hello Mr. Hall,

I am submitting this information per your request last night for additional clarification for Part 15 devices

I feel this website does a good job explaining the rules associated with PV solar inverters RFI

<http://www.cosjw.com/pv-solar-inverters-and-fcc-part-15/>

Here is the cut sheet that I used for the reference of our meeting per SMA inverters that are listed in the plans on file for "Prairie Solar 1"
Prog #USA.DEV.0284

Manf. Cut -

<http://files.sma.de/dl/24390/SC1850-US-2750-EV-US-DUS181215W.pdf>

Located on the website

<https://www.sma-america.com/products/solarinverters/sunny-central-1850-us-2200-us-2500-ev-us-2750-ev-us.html>

Manf Cert list (on manf website) -

No US certifications listed.

(Keep in mind CFR 47 are the rules not the certs)

Here is the FCC ID lookup tool (enter SMA SOLAR into the applicant's name and search)

<https://apps.fcc.gov/oetcf/eas/reports/GenericSearch.cfm>

If you have any questions please feel free to ask.

Regards,
-Jeremy R

Susan Burgstrom

From: John Hall
Sent: Friday, April 06, 2018 3:35 PM
To: Susan Burgstrom
Subject: FW: Inverter EMC Standards and FCC Compliance
Attachments: 150717_FCC Part 15 SC XXXXUS_EN.PDF; Grounding for reduction of the radiant emission.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

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CHAMPAIGN CO. P & Z DEPARTMENT

From: Patrick Brown [<mailto:Patrick.Brown@baywa-re.com>]
Sent: Friday, April 6, 2018 3:26 PM
To: John Hall <jjhall@co.champaign.il.us>
Subject: Fwd: Inverter EMC Standards and FCC Compliance

John,

Please find the info from SMA on the Inverter EMC.

Pb

From: Drew Corrao
Sent: Friday, April 6, 2018 11:58:48 AM
To: Patrick Brown
Cc: Daniel Harsadi
Subject: FW: Inverter EMC Standards and FCC Compliance

See attached and below. Let me know if this gives you what you need.

Drew Corrao | Director of Estimation | M +1 310 936 5067 | drew.corrao@baywa-re.com

From: Peter King <Peter.King@SMA-America.com>
Sent: Friday, April 6, 2018 9:56 AM
To: Drew Corrao <Drew.Corrao@baywa-re.com>; Max Velasco <Max.Velasco@sma-america.com>
Cc: Daniel Harsadi <Daniel.Harsadi@baywa-re.com>
Subject: RE: Inverter EMC Standards and FCC Compliance

Hi Drew,

Our FCC Part 15A compliance, is a self-declaration. We test to international standards, that allow us to comply with FCC regulations.

See attached compliance letter, and supplemental grounding information.

Let me know if you have any questions or concerns.

We will have some new, more powerful PV inverter models, by 2021 if you want to consider them for this project, Max and I can give you a presentation sometime.

Best Regards,

Peter King | Sr. Application Engineer | SMA America – [Cell \(916\)-316-9263](tel:916-316-9263) [Office \(916\)-625-3174](tel:916-625-3174) Peter.King@SMA-America.com

From: Drew Corrao <Drew.Corrao@baywa-re.com>
Sent: Thursday, April 05, 2018 8:17 PM
To: Max Velasco <Max.Velasco@sma-america.com>; Peter King <Peter.King@SMA-America.com>
Cc: Daniel Harsadi <Daniel.Harsadi@baywa-re.com>
Subject: Inverter EMC Standards and FCC Compliance

Hi Max / PK,

In one of our 150MW projects for 2021 where we have interconnection apps with SMA, the county is asking questions about how the inverter accomplishes EMC standards and FCC compliance. Do you have a FCC ID and certificate? If I'm asking the wrong question, please explain your FCC compliance further. Thanks.

Best regards,

Drew Corrao
Director of Estimation



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To whom it may concern

Author Daniel Greger

Phone +49 561 9522- 0

Fax +49 561 9522- 100

E-Mail info@SMA.de

Date 17.07.2015

SC XXXX-US Compliance to FCC Part 15 Class A

We confirm that the central inverters of the SC XXXX-US series are in compliance with FCC Part 15 Class A requirements.

Conditions for compliance with FCC Part 15 Class A:

In order to comply with the limit values as stipulated under FCC Part 15 Class A, the inverters must be duly installed according to a prescribed grounding system (see documentation on installation requirements for SC XXXX-US).

Furthermore the SC XXXX-US has been certified for the following standards:

- IEC 61000-6-4:2006 + A1:2010
- EN 61000-6-4:2007 + A1:2011
- EN 55022:2010
- CISPR 22:2008 modified class A

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APR 06 2018

CHAMPAIGN CO. F & Z DEPARTMENT

Yours sincerely

SMA Solar Technology AG

i.V. Florian Bechtold

Head of Product Group Inverter

Business Unit Utility

i. A. Daniel Greger

Technical Product Manager

Business Unit Utility



Grounding for reduction of the radiant interference emission

In order to fulfill IEC61000-6-4 and CRISPR 22, we recommend both a meshed grounding configuration for the inverter and MV transformer and also signal transmission via optical fiber technology using cameras and monitoring technology. This will counteract possible interference sources.

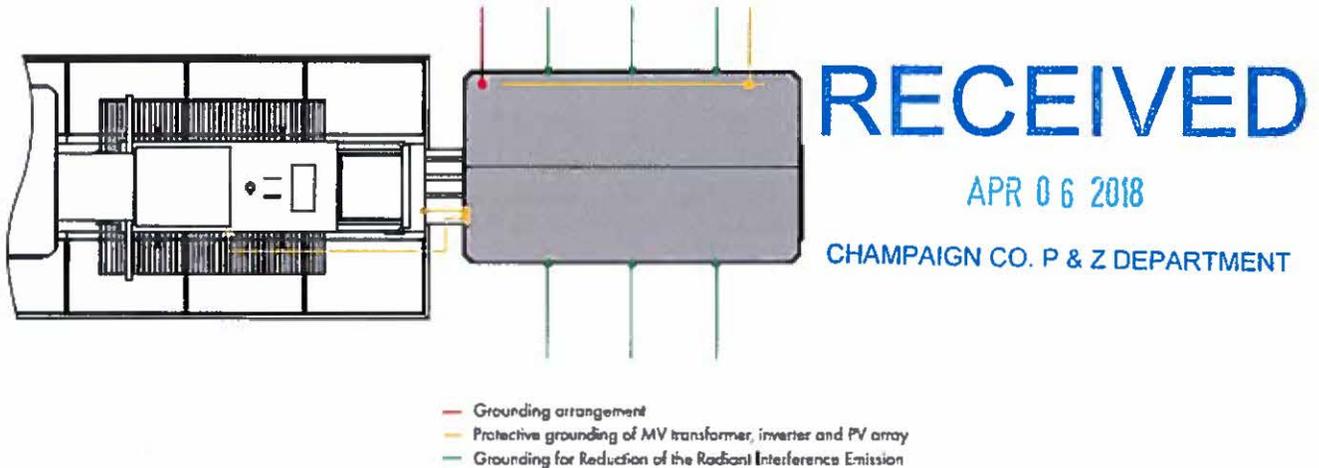
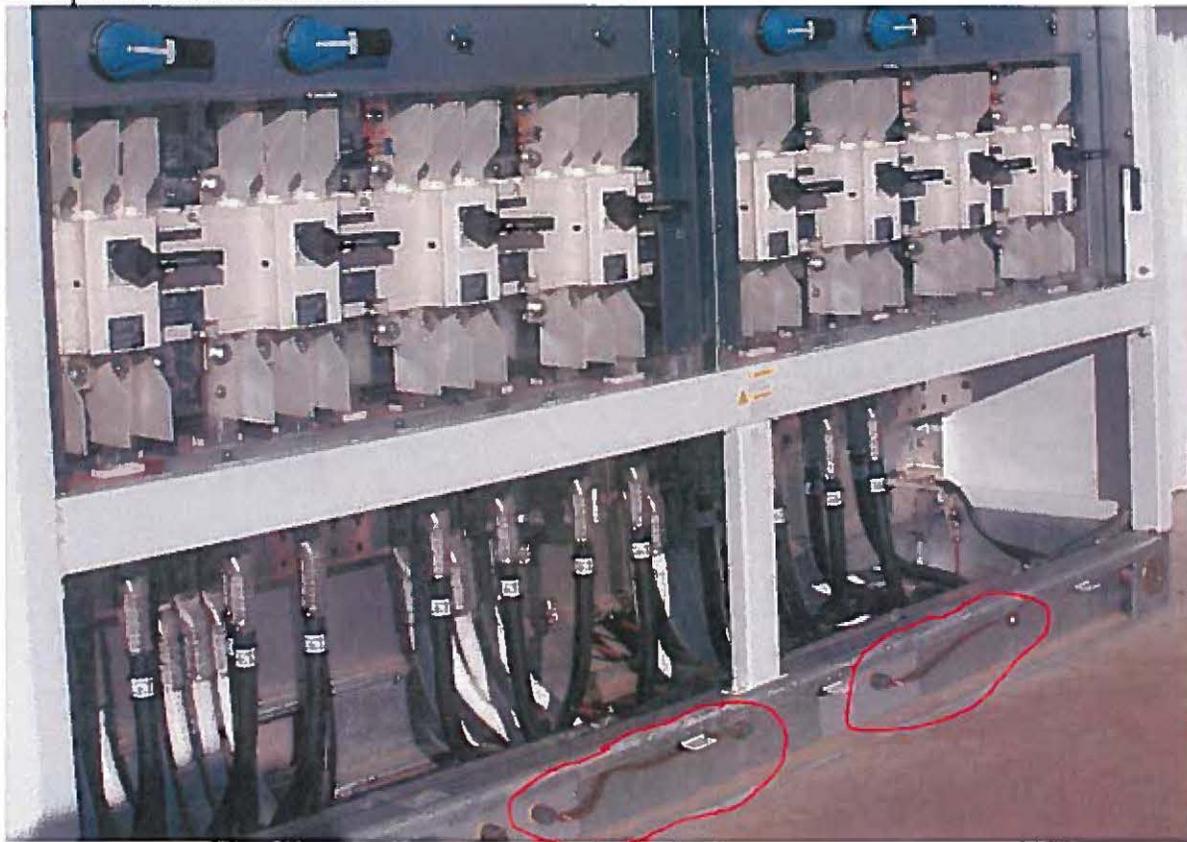


Figure 23: Grounding concept of the PV system

Example from a recent installation



Susan Burgstrom

From: John Hall
Sent: Monday, April 09, 2018 8:09 AM
To: Susan Burgstrom
Subject: FW: Measured photos of Uofl Solar Farm

Follow Up Flag: Follow up
Flag Status: Flagged

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APR 09 2018

CHAMPAIGN CO. P & Z DEPARTMENT

-----Original Message-----

From: Montague, Tim [mailto:TMontague@CECCO.com]
Sent: Saturday, April 7, 2018 4:22 PM
To: John Hall <jhall@co.champaign.il.us>
Cc: Patrick Brown <patrick.brown@baywa-re.com>; Haug, Brian <BHaug@CECCO.com>
Subject: Measured photos of Uofl Solar Farm

Hi John,

I got a 200 ft tape and took some measured distance photos<<https://drive.google.com/drive/folders/1XLD3mOSSLIG5SX8z4xY8dn-kpptBq9zR?usp=sharing>> of the Uofl Solar Farm both from the South (looking at the black side of the array) and from the East (looking west towards the side of the array). The photos are identified in the name. I also measured the height of the fence which is 7 ft at the top of the barbed wire. The white truck in the distance is a Ford F150 for scale.

Notice when you are at 200 ft (from East and from South) that the fence becomes almost invisible unless you are parallel to the fence.

It sure seems to me that 200 ft is a safe distance at which many other landscape features will dominate...bushes, trees, buildings.

Thanks for your work on the solar ordinance!

Tim Montague

Solar PV Sales & Business Development
Continental Electrical Construction Co.
815 Commerce Drive, Suite 100
Oak Brook, IL 60523

c: 217.722.0429 | tmontague@cecco.com<<mailto:tim@cecco.com>>

www.cecco.com<<http://www.cecco.com/>>

100 Years of Innovation & Quality | 1912 - 2012 Monthly Webinar: Solar Works for Illinois<<https://cecco.com/contact/solarwebinar/>>

5 Ways Solar Reduces Operating Expenses<<http://cecco.com/blog/5-ways-solar-reduces-operating-expenses/>>

A Cash Crop Called Community Solar<<http://cecco.com/blog/community-solar-coming-illinois/>> Is Spreading to Fields and Farms Of Illinois



Susan Burgstrom

From: John Hall
Sent: Monday, April 09, 2018 8:08 AM
To: Susan Burgstrom
Subject: FW: solar panels electromagnetic interference
Attachments: 67440.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

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APR 09 2018

CHAMPAIGN CO. P & Z DEPARTMENT

From: Patti Petrie [<mailto:pattsi2@gmail.com>]
Sent: Sunday, April 8, 2018 11:21 AM
To: Willenbrock, Scott S <willen@illinois.edu>
Cc: Philip Krein <ptkrein@gmail.com>; John Hall <jhall@co.champaign.il.us>; Aaron Esry <ale7496@yahoo.com>; Frank DiNovo <fdinovo@gmail.com>
Subject: Fwd: solar panels electromagnetic interference

Scott, thank you for this useful input that I am sharing with several who are involved within the process of developing the solar farm ordinance.

Hi, to Phil Krein.

P2

----- Forwarded message -----

From: Willenbrock, Scott S <willen@illinois.edu>
Date: Sun, Apr 8, 2018 at 11:10 AM
Subject: RE: solar panels electromagnetic interference
To: Patti Petrie <pattsi2@gmail.com>
Cc: "Krein, Philip T" <krein@illinois.edu>

Patsi,

I have no issues with electromagnetic interference at my house.

I did a little research and came up with this summary (attached) from the US Navy. They are keenly interested in this due to the importance of communications to their work.

I also asked Phil Krein, Professor of Electrical and Computer Engineering at the U of I (copied). He has been working in the field of photovoltaics for many years. Here is what he said:

Electromagnetic interference in solar panels and arrays is linked to the inverters, not the panels themselves. A poor inverter in effect has the panels as antennas to radiate interference. This is why inverters have to qualify under FCC regulations, and must be tested for interference. Not trivial, but inverters must pass FCC standards. From a county perspective, requiring equipment and installations that meet the National Electric Code and UL certifications should cover this.

Solar farms sometimes apply a different code (NESC), but a requirement for properly certified components should still be adequate. There is a formal complaint process at FCC for equipment that causes interference.

Scott

=====

Scott Willenbrock

Professor of Physics, University of Illinois at Urbana-Champaign
Provost Fellow for Sustainability
Affiliate of the the [Institute for Sustainability, Energy, and Environment](#)
Resident of [Colonial Solar House](#)

From: Patsi Petrie [mailto:patsi2@gmail.com]

Sent: Saturday, April 07, 2018 7:02 PM

To: Willenbrock, Scott S <willen@illinois.edu>

Subject: solar panels electromagnetic interference

Scott, do you have any information/experience with electromagnetic interference from the solar panels on your home and garage? During the ZBA special meeting last Thursday, an electrical engineer brought up this issue. I have searched the internet and found articles on the interference. What I have not found is whether this is still a problem due to improved panels, is the problem aggravated when there is a large collection of panels in one spot as compared to several on a roof, and are there means to mitigate the problem, if it does exist.

Thanks for any information that you have to share. In turn, I will pass the information on to John Hall and ELUC members, but you could do so via a cc: when you respond.

P2

--

Patsi Petrie, PhD, FAICP

P2 Consulting

Champaign County Board, Past Chair , district 6,
Retired, Department of Urban and Regional Planning/DURP
University of Illinois at Urbana-Champaign/UIUC
<<mailto:patsi@uiuc.edu>>

College of Fellows, American Institute of Certified Planners

Professional Education and Outreach Programs
Past Chair APA Planning Women Division

APR 09 2018

CHAMPAIGN CO. P & Z DEPARTMENT

greenfleet.dodlive.mil/energy/repo



Electro-Magnetic Interference from Solar Photovoltaic Arrays



While the risk of electro-magnetic and/or radar interference from PV systems is very low, it does merit evaluation, if only to improve the confidence of site owners and other stakeholders.

Electro-Magnetic Interference

Electro-magnetic interference (EMI) is typically taken to mean radiofrequency (RF) emissions emanating from PV systems impacting nearby radio receivers, but can also include interference with communication devices, navigational aids, and explosives triggers.

The Federal Aviation Administration (FAA) has indicated that EMI from PV installations is low risk. PV systems equipment such as step-up transformers and electrical cables are not sources of electromagnetic interference because of their low-frequency (60 Hz) of operation and PV panels themselves do not emit EMI. The only component of a PV array that may be capable of emitting EMI is the inverter. Inverters, however, produce extremely low frequency EMI similar to electrical appliances and at a distance of 150 feet from the inverters the EM field is at or below background levels. Also proper inverter enclosure grounding, filtering, and circuit layout further reduce EM radiation.

Photovoltaic inverters are inherently low-frequency devices that are not prone to radiating EMI. No interference is expected above 1 MHz because of the inverters' low-frequency operation. In addition, interaction at lower frequencies (100 kHz to 1 MHz) is also very low risk because of the poor coupling of these extremely long wavelengths to free space, limiting propagation of the signal.

Additionally, the Code of Federal Regulations, Title 47, Part 15 regulates radio frequency (RF) emission from commercial products and many PV inverter manufacturers do qualify their residential or utility-scale equipment to this standard.

Radar Interference

Another concern is blocking or attenuation of nearby radar by the PV array, which are similar to other non-transmitting built structure like building or sheds in that they are constructed of metal and glass.

PV arrays have low profiles (i.e. height) relative to most built structures that may be found on or around airfields and in general airport radar systems (e.g., airport surveillance radar) are installed on elevated platforms or towers. The FAA has published a number of case studies that indicate that a setback of 250' to 500' between the leading edges of a PV array and existing radar equipment is sufficient to prevent blocking and/or signal reflection issues.

Siting Considerations

When considering sites for a PV array in close proximity to airfield navigational instruments or communications the tolerance of the equipment to EMI and susceptibility to radar signal blocking/attenuation should be considered. Fortunately, both of these concerns have been researched and vetted by the FAA and industry, and the following specifications should be applied:

1. PV system inverters should be sited at least 150' away from navigational and communications equipment that may be sensitive to EMI.
2. A minimum setback distance of 250' should be imposed between an airfields radar system and the leading edge of a PV array or any of its ancillary support equipment.

In the unlikely event that a PV array was to be built within the EMI setback distance, options are available to address interference if it were to occur. Inductor-capacitor (LC) filters can be installed to attenuate RF emissions at specific frequencies causing undesired interaction. Grounding of PV conductors either directly or via the inverter can also attenuate undesired RF emissions.

Additional Considerations

Where the FAA has identified interactions between PV systems and aircraft communication, this was often due to the prototype nature of the PV equipment in question. Some power electronics equipment operates at a higher frequency than we have discussed so far. This can be because the inverter uses advanced wide-bandgap semiconductors such as Silicon Carbide (SiC) or Gallium Nitride (GaN). Alternatively, the power electronics could be embedded within the PV module, which can enable or require a high switching frequency. In either case, these types of power conversion devices should be assessed for compliance with FCC emission limits, just as a conventional PV inverter would be.

As an illustration of the relative low allowable FCC limits, we can compare the maximum emission allowed for a FCC class-A compliant inverter with a typical cell phone. The maximum expected field strength for this inverter at a distance of 100' is very low- comparable to the field strength of a cell phone a mile away, and unlikely to be distinguishable from background noise.

In conclusion, with diligent procurement and siting of PV system components, including specifications for FCC Part 15 compliant equipment and observation of minimum setbacks from potentially sensitive equipment, it is unlikely that a PV system will cause negative interactions with existing equipment or operations.

"Due to their low profiles, solar PV systems typically represent little risk of interfering with radar transmissions. In addition, solar panels do not emit electromagnetic waves over distances that could interfere with radar signal transmissions, and any electrical facilities that do carry concentrated current are buried beneath the ground and away from any signal transmission." - [FAA Solar Guide](#).

"Prior research and field investigations of electromagnetic emission (EME) from Solar PV arrays concluded that they produce extremely low frequency EME similar to electrical appliances and wiring... At a distance of 150 feet from the inverters, these fields dropped back to very low levels of 0.5 mG or less, and in many cases to much less than background levels (<0.2 mG)." - [Air Force Tiger Team Investigation](#).

Useful References

1. Air Force Civil Engineering Center, Planning and Integration Directorate, Regional Planning Development Branch. 2014. Solar PV Compatibility Project Tiger Team.
2. Federal Aviation Administration (FAA). 2010. Technical Guidance for Evaluating Selected Solar Technologies at Airports. FAA-Office of Airports, Washington, DC. https://www.faa.gov/airports/environmental/policy_guidance/media/airport-solar-guide-print.pdf.
3. Araneo, R., S. Lammens, M. Grossi, and S. Bertone, S. 2009. "EMC issues in high-power grid-connected photovoltaic plants," *IEEE Transactions on Electromagnetic Compatibility*, 51(3), 639-648.
4. Di Piazza, M.C., G. Tine, C. Serporta, and G. Vitale. 2004. "Electromagnetic compatibility characterization of the DC side in a low power photovoltaic plant," in *Proc. IEEE Int. Conf. Ind. Tech.*, pp. 672-6.

CONTACT INFORMATION

For more information, contact Chris Deline, Sr. Engineer, chris.deline@nrel.gov, 303-384-6359 or Steven Phillips, Project Manager, steven.l.phillips@navy.mil, 757-322-4029.

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APR 09 2018

CHAMPAIGN CO P & Z DEPARTMENT



National Renewable Energy Laboratory
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Golden, CO 80401
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NREL/FS-5J00-67440 • www.navy.mil • April 2017

Susan Burgstrom

From: John Hall
Sent: Monday, April 09, 2018 12:12 PM
To: Susan Burgstrom
Subject: FW: Solar Ordinance Materials
Attachments: StudyAcousticEMFLevelsSolarPhotovoltaicProjects.pdf; propertyvalueimpact_cohnreznick.pdf; Grundy Solar Text Amendment Dec 28 2017 CB.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

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From: Nick Mento [<mailto:nmento@communitypowergroup.com>]
Sent: Monday, April 9, 2018 11:10 AM
To: John Hall <jjhall@co.champaign.il.us>
Subject: Solar Ordinance Materials

APR 09 2018

CHAMPAIGN CO. P & Z DEPARTMENT

John,

Per our conversation, attached is the Cohn Reznick property value impact report done for the Grand Ridge Solar Farm in Grundy County, which was the initial solar farm the county members got very upset about last year. Also attached is a report done by the Massachusetts Clean Energy Center that looked at sound and electromagnetic levels of solar farms. The conclusion basically was the majority of sound is only audible when you're right up against a fence line. Also mentions electromagnetic fields which are basically negligible. Finally I have attached what I believe to be the most up to date ordinance Grundy County has but should be available online.

One thing I just thought of that we are running into in other counties are the fences required for solar farms. It may be different for a 1200+ acre solar farm, but we have found that one complaint neighbors have been having is the fence that surrounds a solar garden. They seem to not like the look of a chain link fence and we have suggested an alternative fence such as a game fence that blends in with the surroundings a little better. It's typically cheaper than a steel fence and more aesthetically pleasing. Just something to think about if that has ever come up in your meetings.

Let me know that you got this, these files are relatively large and may or may not send.

Best regards,
Nick

Nick Mento
Project Manager
Community Power Group
(o) 202-844-6423
(c) 443-878-8296
nmento@communitypowergroup.com
www.communitypowergroup.com

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:21 AM
To: Susan Burgstrom
Subject: FW: [Sierra Club Prairie Group - Illinois Chapter] Support Solar Development in Champaign County!

----- Forwarded message -----

From: Alice Englebretsen <notification+kjdp1mjp37_d@facebookmail.com>
Date: Tue, Apr 10, 2018 at 12:57 PM
Subject: [Sierra Club Prairie Group - Illinois Chapter] Support Solar Development in Champaign County!
To: Sierra Club Prairie Group - Illinois Chapter <SierraClubILPrairieGroup@groups.facebook.com>

FACEBOOK

Alice Englebretsen posted in Sierra Club Prairie Group - Illinois Chapter.



Alice Englebretsen
April 10 at 10:49am

Support Solar Development in Champaign County!

Champaign County may not benefit from solar development as other Counties in Illinois will!

There is a grassroots movement in Champaign County to limit solar installations to rooftop only. This would mean that County residents will not have the opportunity to participate in Community Solar Projects and that business and homeowners will not enjoy the economic and environmental benefits of clean energy.

County residents, students and community leaders are encouraged to attend the County Zoning Board of Appeals meeting this Thursday April 12th at 6.30 pm. Attendees may register onsite prior to the meeting to express their support for solar development in the County.

Support comments may also be sent prior to the meeting to John Hall at jhall@co.champaign.il.us.
Subject Line: Comments on the Solar Ordinance for the Record, please include your name, mailing address and phone number.

Champaign County Zoning Board of Appeals Meeting
[1776 E Washington St, Urbana, IL](http://1776EWashingtonSt.Urbana.IL)
Thursday April 12th 6:30pm

--

Pattsi Petrie, PhD, FAICP
P2 Consulting
Champaign County Board, Past Chair , district 6,
Retired, Department of Urban and Regional Planning/DURP
University of Illinois at Urbana-Champaign/UIUC
<<mailto:pattsi@uiuc.edu>>
College of Fellows, American Institute of Certified Planners
Professional Education and Outreach Programs
Past Chair APA Planning Women Division

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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

Susan Burgstrom

From: John Hall
Sent: Tuesday, April 10, 2018 1:19 PM
To: Susan Burgstrom
Subject: FW: Solar Ordinance comments

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APR 10 2018

CHAMPAIGN CO. P & Z DEPARTMENT

From: Willenbrock, Scott S [<mailto:willen@illinois.edu>]
Sent: Tuesday, April 10, 2018 12:41 PM
To: John Hall <jjhall@co.champaign.il.us>
Cc: Patti Petrie <pattsi2@gmail.com>
Subject: Solar Ordinance comments

Mr. Hall,

I wanted to send some thoughts on the Solar Ordinance being developed by the County. Solar electricity is vital to moving away from an electricity system based on fossil fuels. Since it is prohibitive to transport electricity over large distances, solar electricity needs to be generated at locations scattered throughout the nation. With the large population of Champaign County, it is a natural place for utility-scale solar electricity production.

It is important to ensure that the vegetation beneath the solar panels consist of native grasses (short, not tall) to protect against erosion and to add organic material to the soil, thereby improving it over the years. These grasses can also serve as habitat for beneficial insects and, if flowering plants are added, as habitat for bees and butterflies.

A solar farm is a new and different use of the land, and it will look foreign at first. Nevertheless, I do not see any need to screen or require large setbacks for a solar farm from roads and farm land. Care should be taken near residences, however. It is important to place the solar farm far enough away that it is not a nuisance. I happened across the solar ordinance for a county in Minnesota that requires a minimum setback of 200 feet from a residential dwelling (Sec. 6.52.2G). It also requires screening from a residential dwelling (Sec. 6.52.2F). It is not obvious to me that everyone would desire screening, however, so I would like to suggest that the residents have choice in the matter.

<https://co.stearns.mn.us/Portals/0/docs/Ordinances/ord439.pdf?ver=2017-08-18-133145-417>

Large solar farms are now common throughout much of the US. This is Champaign County's opportunity to contribute to the move away from fossil fuels towards renewable energy.

Sincerely,

Scott Willenbrock

1017 W. White St.

Champaign, IL 61821

217 398 1857

Susan Burgstrom

From: John Hall
Sent: Tuesday, April 10, 2018 2:06 PM
To: Susan Burgstrom
Subject: FW: Hello Pius

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APR 10 2018

From: C. Pius Weibel [mailto:cpiusweibel@hotmail.com]
Sent: Tuesday, April 10, 2018 1:30 PM
To: John Hall <jhall@co.champaign.il.us>
Subject: Fwd: Hello Pius

CHAMPAIGN CO. P & Z DEPARTMENT

FYI.

Sent from [TypeApp](#)

On Apr 10, 2018, at 12:34 PM, "Hannon, Bruce M" <bhannon@illinois.edu> wrote:

I hope the county board and you can do every thing in their/your power to get an ordinance that doesn't discourage solar power. This county has refused to locate a landfill for its own solid waste and has wind turbine ordinance that has eliminated wind power within its borders. So are we a county the gets electricity from outside sources and sends its to poorer communities like Danville and Clinton.
Bruce Hannon

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:21 AM
To: Susan Burgstrom
Subject: FW: Solar farm example layout with setbacks

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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

From: Andy Robinson [<mailto:andrew.robinson.1980@gmail.com>]
Sent: Tuesday, April 10, 2018 5:47 PM
To: John Hall <jjhall@co.champaign.il.us>
Cc: Susan Burgstrom <sburgstrom@co.champaign.il.us>
Subject: Re: Solar farm example layout with setbacks

Dear Mr Hall,

Yes, I was very happy to see that attachment with pollinator information. I have been speaking with with Prairie Rivers network about that topic state-wide, but I don't want to disadvantage champaign county, or I would love for the solar developers to offer that as a way to benefit the area.

I've been working on example map doodles to try to get a better feel for the impacts, but I'm finding it difficult to get the nuance and I just realized that it's now 200' from home property lines, not just 250' from structures. I think a very helpful thing to show the board and public would be an updated version of your property map and add acres lost. Then zooming out to the 1200 acres helps show that there are really only 8-10 homes typically affected by a farm of this size. Once I realized that, I felt better about the scope of the project.

My rough estimates show that a 200' setback from all the property lines of a sub-5 acre property would take about 10 acres out of production each. A sample area south of Sydney looks like it would neighbor about 10 homes and result in about 77 acres out of production or 6.4% of , and this doesn't include the details of the road setbacks. Going to a 500' setback takes something like 20% more out of production and would seem like a huge burden.

I would also like to emphasize that these setbacks could completely cover a small 10 acre solar farm. Maybe not the adjacent properties as much, but perhaps the road setbacks.

Is there something from this discussion that I can add to the input for this week's meeting? I would really like to be a reasonable voice for positive change on this topic.

Two resources I found interesting talk about the possible price of land leases, and the implication for local tax benefits. <http://www.chicagotribune.com/suburbs/daily-southtown/news/ct-sta-will-solar-farms-st-0903-20170901-story.html>

"With offers of \$800 per acre, compared to \$160 to \$180 for a really good crop yield, some older farmers are considering this as a steady cash flow as they head into retirement, Schneidewind said."

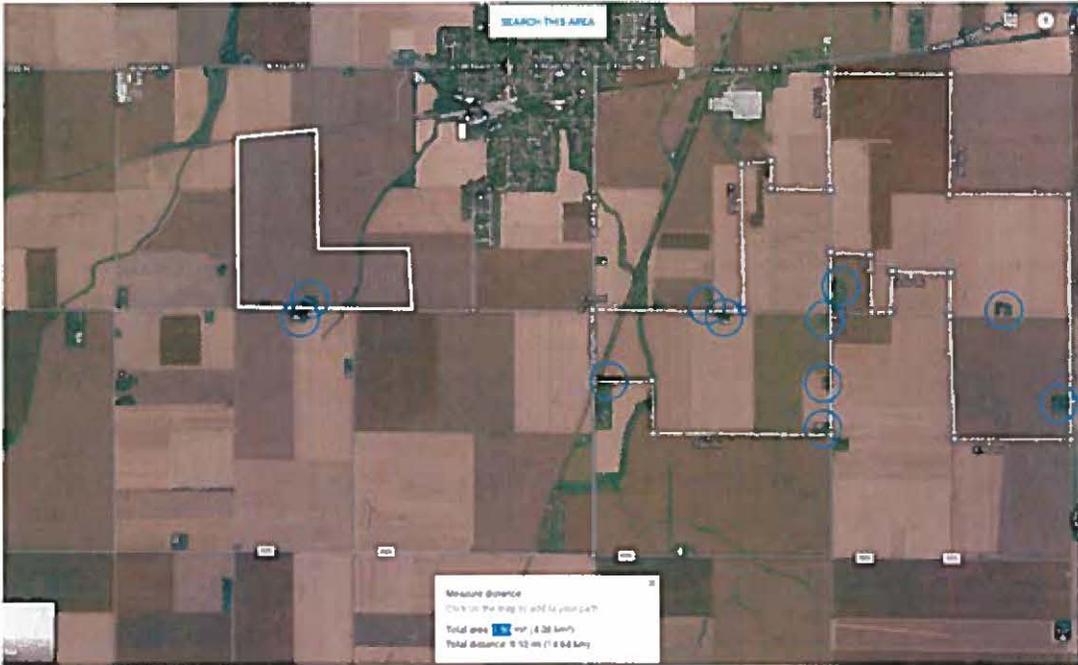
These farms also are expected to generate more revenue for local schools and communities since solar companies would pay property taxes on land they lease — likely at a higher rate than agricultural land, Klein said. But Illinois is still working on that, and may establish a uniform tax code for solar farms, he said."

<http://harvestpublicmedia.org/post/illinois-touted-property-tax-model-wind-farms>

Thank you for your time and assistance.
Andy Robinson

Here is my updated map draft:

<https://drive.google.com/open?id=1wGmib3FYPMLEFYCR80MO3VRnsy60Gm5E>



On Tue, Apr 10, 2018 at 2:26 PM, John Hall <jjhall@co.champaign.il.us> wrote:

Mr. Robinson, I forgot to point out that the Supplemental Memorandum #7 dated 4/5/18 included a set of views of the UI solar farm from set distances (50 feet, 90 feet, 200 feet, 250 feet, 500 feet) to illustrate the visual effect of different separations. Those views are at the last six pages of this link http://www.co.champaign.il.us/CountyBoard/ZBA/2018/180405_Special%20Meeting/180405_895-AT-18%20Supplemental%20Memo%207.pdf

That memorandum also has an attachment regarding the use of pollinator/native plantings in the solar farm.

Sincerely,

John Hall

From: John Hall
Sent: Monday, April 9, 2018 5:13 PM
To: 'andrew.robinson.1980@gmail.com' <andrew.robinson.1980@gmail.com>
Cc: Susan Burgstrom <sburgstrom@co.champaign.il.us>
Subject: RE: Solar farm example layout with setbacks

Mr. Robinson, see my replies below.

Sincerely,

John Hall
Director

Champaign County Department of Planning and Zoning

Brookens Administrative Center
[1776 East Washington Street](http://www.co.champaign.il.us/1776-East-Washington-Street)
[Urbana IL 61802](http://www.co.champaign.il.us/Urba-na-IL-61802)
Tel (217) 384-3708
Fax (217) (819-4021)

From: Andy Robinson [<mailto:andrew.robinson.1980@gmail.com>]
Sent: Monday, April 9, 2018 1:07 PM
To: zoningdept <zoningdept@co.champaign.il.us>
Cc: Cindy Shepherd <cindy@faithinplace.org>; Timothy Montague <tim@montaguebrands.com>
Subject: Solar farm example layout with setbacks

Dear Mr Hall,

Hello. I have attended a couple of the recent solar zoning meetings but missed this week's session. I find that there seems to be some general confusion about what example small and large solar farms might look like on a map and what setbacks are being discussed.

I am very interested in how different setbacks from homes would look on a map. I was considering taking a screenprint of the UI solar farm and making some very simple circles from example imaginary homes (see attached draft). But then i realized I have some questions:

1. Is the 100' setback from a road/property line or just a house? Is there a link to the map you made two weeks ago?
REPLY: The 100 feet minimum separation was from any existing dwelling (house) and there was a related minimum separation of 50 feet from the property line. Those separations were changed in the Supplemental Memorandum #7 dated April 5, 2018, which can be found at

http://www.co.champaign.il.us/CountyBoard/ZBA/2018/180405_Special%20Meeting/180405_895-AT-18%20Supplemental%20Memo%207.pdf

REPLY: The link to the example maps that were handed out at the March 15, 2018, public hearing as an attachment to Supplemental Memorandum #4 is the following (the maps are the last three pages on the link):

http://www.co.champaign.il.us/CountyBoard/ZBA/2018/180315_Meeting/180315_895-AT-18%20Supplemental%20Memo%204.pdf

2. How does 100' from a home vs 500' impact the usable area of the solar farm?

REPLY: For a one-acre lot the 500 feet separation results in a "solar farm no-build area" of about 18.7 acres as compared to a "solar farm no-build area" of about 1.92 acres using a 100 feet separation. However, the 500 feet separation would be easier to farm than the 100 feet separation.

3. Can the county encourage pollinator plantings under the panels, or can it encourage pollinator/native plantings in the buffer areas?

REPLY: The County could require such plantings if there is sufficient support for that on the Zoning Board of Appeals and the County Board.

4. Can staff make a zoomed-out example map showing a 10 acre solar farm near 1-2 homes, and a larger 1000 acre farm near 10-16 homes? (I doodled in word art and google earth, but I'm not an expert.)

REPLY: We have thought about attempting that but I'm not sure that illustration would provide any better information than the comparison of the separations in your question #2 above).

Thank you,
Andy Robinson

Background: My church and my house roof have solar but it's not enough to offset our carbon footprint. I am a Building Energy Efficiency Engineer with UI Facilities. Organizations: GreenUU Chair UUCUC (member with Faith in Place of a community solar farm plan), Co-organizer of Champaign County Sustainable Networking (CCNet), Solar Educator with SolarUC2.0 (Midwest Renewable Energy Association), Eagle Scout (Prairie planting project at Meadowbrook), Father of two children who like to raise Monarchs and like solar,

My word art doodle:

<https://drive.google.com/open?id=1TirhSLtG1zpdVinsPGtu9Zt4fIY7eepw>

Anzly Robinson rough estimate of US solar farm and setbacks.

100', 250', 500' radius from example homes.



<http://www.falcons.edu/services/activities/energy/production/solar-farm>

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:19 AM
To: Susan Burgstrom
Subject: FW: Comments on the Solar Ordinance for the Record

From: Amanda Pankau [<mailto:apankau@prairierivers.org>]
Sent: Tuesday, April 10, 2018 6:57 PM
To: John Hall <jhall@co.champaign.il.us>
Cc: Carol Hays <chays@prairierivers.org>
Subject: Comments on the Solar Ordinance for the Record

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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

Dear County Board Members:

Prairie Rivers Network (PRN), Illinois' advocate for healthy rivers and clean drinking water, is concerned about the adoption of a prohibitive solar ordinance for Champaign County, IL. We urge the Champaign County Board to adopt an ordinance with reasonable offsets (<250ft) and other measures that will bring solar projects to our area to benefit our environment and our economy.

PRN is based in Champaign, IL with a 50 year history of championing for the water and environment in East Central Illinois. We have over 1000 members statewide, including 600 in Champaign County. Much of our work statewide addresses pollution related to our energy system and we recognize a path to clean water can be advanced with a clean energy economy. We are a member and leader of the Illinois' 'State Climate Table' with a goal to advance the Future Energy Jobs Act (FEJA) and Illinois' renewable energy portfolio.

FEJA's opportunities have the potential to reshape our energy system and position Illinois as a leader in our country's inevitable transition to a renewable energy economy. Community and utility scale solar farms are an important piece of this transition and Champaign County residents deserve the opportunity to benefit from the jobs, tax revenue, state and federal tax incentives, and environmental benefits from solar farms.

Prohibitive county ordinances have the potential to keep these benefits from your constituents. In particular, a setback any greater than 250ft has the potential to increase costs significantly, making it too expensive to attract investors and subscribers. Decommissioning arrangements should be reasonable and not burdensome, recognizing that panels can be removed with no impact to the land and allowing farmland to rest can improve soil fertility and decrease soil erosion.

Sincerely,

Prairie Rivers Network
[1605 South State Street, Suite 1](#)
[Champaign, IL 61820-7231](#)
217-344-2371

--
Amanda Pankau
Coal Campaign Coordinator
Prairie Rivers Network
Illinois Affiliate of the National Wildlife Federation
1605 South State Street, Suite 1
Champaign IL 61820-7231.

tel: (217) 344-2371 x 214 | cell: (217) 840-3057

Prairie Rivers Network is Illinois' advocate for clean water and healthy rivers.

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:17 AM
To: Susan Burgstrom
Subject: FW: 120 picture with slats Site Design
Attachments: IMG_0660.jpg; IMG_0659.jpg

Follow Up Flag: Flag for follow up
Flag Status: Flagged

From: Patrick Brown [<mailto:Patrick.Brown@baywa-re.com>]
Sent: Tuesday, April 10, 2018 7:03 PM
To: John Hall <jjhall@co.champaign.il.us>
Subject: 120 picture with slats Site Design

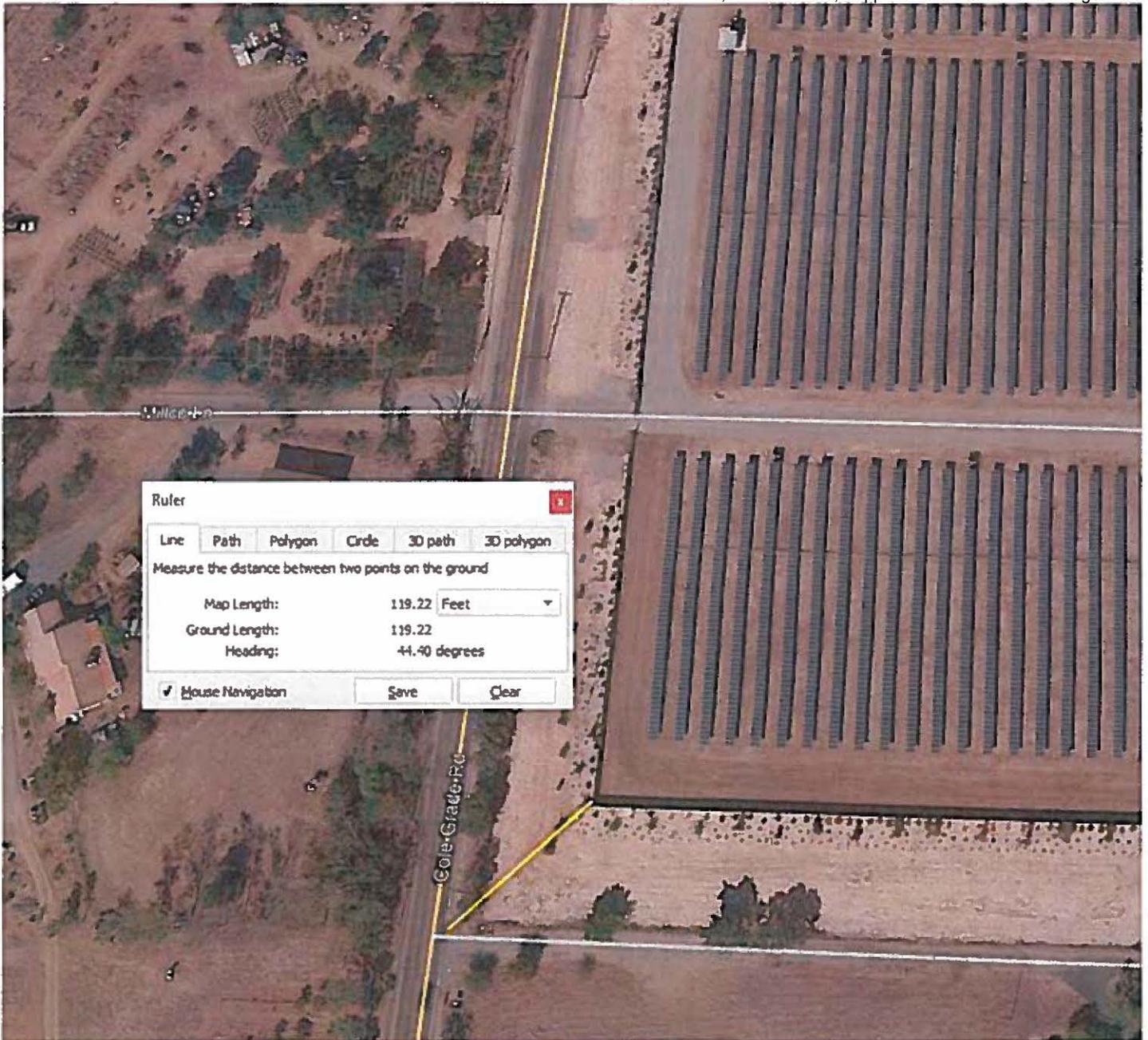
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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

John,

Please see the attached photos. I built this project last year in a small community. There are houses up on a hill next to it. These photos are taken as shown in the image below at 120 feet away. You can't barley see the solar farm. This is taken at 120 feet. See the image below from google earth. I propose using 90% slats and landscaping where its wanted by the land owner. I propose a 250 foot setback at a max to the property line. Any thoughts?



Patrick Brown | +1 619 733 2649 | patrick.brown@baywa-re.com

From: Tannie Justus [<mailto:jojustus@yahoo.com>]
Sent: Tuesday, April 10, 2018 4:29 PM
To: Patrick Brown <Patrick.Brown@baywa-re.com>
Subject: Re: Site Design

Looks great around property but how wide will screen be across road? Does not show one.

[Sent from Yahoo Mail on Android](#)

On Tue, Apr 10, 2018 at 6:22 PM, Patrick Brown <Patrick.Brown@baywa-re.com> wrote:





Hello Tannie,

Please take a look at this version. This is with a 250 foot setback from your property line with a 50 foot landscape buffer. Let me know what you think.

Patrick Brown
Director of Development



BayWa r.e. Solar Projects LLC
17901 Von Karman Avenue Suite 1050 | Irvine | CA 92614, USA

C +1 619 733 2649
patrick.brown@baywa-re.com
www.baywa-re.us

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Please consider the environment before printing this email.

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:16 AM
To: Susan Burgstrom
Subject: FW: Comments on the Solar Ordinance for the Record

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Flag Status: Flagged

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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

From: Nancy Holm [<mailto:nlholm@comcast.net>]
Sent: Tuesday, April 10, 2018 8:17 PM
To: John Hall <jjhall@co.champaign.il.us>
Subject: Comments on the Solar Ordinance for the Record

Dear Mr. Hall:

I am writing to you in regard to the ordinances for solar development that will be discussed at a Champaign Co. Zoning Board of Appeals meeting on April 12. I will not be able to attend that meeting so I wanted to let you know that I strongly support solar development in Champaign Co. and **I am against ordinances** that will curtail and limit that development in the way these proposed ordinances will. We need to encourage homeowners and businesses to adopt solar energy which can save them money on their power bills and contribute to the push for renewable energy which adds to the resiliency of our county. I recently attended a discussion on solar energy in McClean Co. and they are seeing the advantage to solar development while taking reasonable actions to be sure the developers are following set guidelines. Let's use solar to help our homeowners and businesses and add to the economic growth of our county. I think Champaign Co. **should be sure not to pass ordinances that will unnecessarily impede solar development.** There are lands that a company may wish to use for solar on their property. There are lands that solar can be put on in the county that do not take away good farmland. Also panels can be put in high enough in some cases on farmland so that low growing plants can grown under them and still be harvested. Or prairie plants can be put in by solar installations to encourage pollinators which add value. Solar is not noisy and does not cause environmental problems. I would ask the zoning board of appeals to consider that encouraging solar development can be positive development for the county.

Sincerely,
Nancy Holm
2404 Peppertree Place
Champaign, IL 61822
217-778-9270

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:16 AM
To: Susan Burgstrom
Subject: FW: Comments on Solar Ordinance for the Record

Follow Up Flag: Flag for follow up
Flag Status: Flagged

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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

From: Eileen Borgia [mailto:eborgia@gmail.com]
Sent: Wednesday, April 11, 2018 6:49 AM
To: John Hall <jhall@co.champaign.il.us>
Subject: Comments on Solar Ordinance for the Record

My Son works for a national solar company. One co-worker presented the TED talk on the benefits for pollinators and bees and solar installations.

Please include this TED talk* for the record, and encourage County Board members to look to science rather than to hysteria, when making long term decisions regarding the environment in Champaign County.

**Using 1960s Space technology to save the bees* by Rob Davis

<https://www.youtube.com/watch?v=t-o9HaUAV4I>

Thank you,

Eileen T. Borgia PhD
2007 B Eagle Ridge Ct.
Urbana, IL 61802
217 766 8562

iLean Borgia

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:15 AM
To: Susan Burgstrom
Subject: FW: Comments on the Solar Ordinance for the Record

Follow Up Flag: Flag for follow up
Flag Status: Flagged

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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

From: Rebecca McBride [<mailto:rebeccamcbride77@me.com>]
Sent: Wednesday, April 11, 2018 8:50 AM
To: John Hall <jjhall@co.champaign.il.us>
Subject: Comments on the Solar Ordinance for the Record

Dear Mr. Hall,

I have serious concerns about the zoning ordinances currently being discussed regarding solar installations. Solar is part of the future of energy and as such represents a significant economic, health and quality of life opportunities for our county, and those government entities that realize this will have a very bright future. Our micro-urban community deserves and should be a leader in alternative energy, and creating ridiculously restrictive ordinances will eliminate our opportunities. Now is the time to act; only innovative and smart communities, counties, and regional areas will be well positioned in the future.

I highly recommend including a less than 250 ft setback requirement because anything great than that will certainly kill solar in Champaign County. Modeling set-backs based on wind turbines is ill-advised; solar is not wind and is completely unique, not requiring this level of regulation.

Thank you so much for your thoughtful consideration.

Rebecca McBride

Executive Director and Founder
Ecofluent | 4 Osprey
ecofluent.org

Director
Community Solutions Incubator

Consultant
Marketing | Strategic Planning | Communications

Susan Burgstrom

From: Lori Busboom
Sent: Wednesday, April 11, 2018 9:13 AM
To: John Hall; Susan Burgstrom
Subject: FW: Letter regarding solar zoning ordinance
Attachments: Sinkes zoning board letter.docx; TE6905723ENC_-_Noise_in_figures.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

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CHAMPAIGN CO. P & Z DEPARTMENT

From: Rebecca Sinkes <r.sinkes.2@gmail.com>
Sent: Wednesday, April 11, 2018 9:12 AM
To: zoningdept <zoningdept@co.champaign.il.us>
Subject: Letter regarding solar zoning ordinance

Hello,

Please read this letter and include it in the next zoning meeting agenda. Thank you!
Becky Sinkes

Dear Champaign County Zoning Board Members,

I am writing you out of concern for the solar farm proposals in Champaign County. I know that this proposed ordinance is not regarding a specific proposed farm, so I will keep this as broad and generic as I can. I would first like to say that I live right off of Bryan st in Sidney II, also known as Longview road. I can see this project through multiple lenses. I have always believed in climate change and global warming, and also believe in the energy and food crises that currently plague the world. I know that the proposed ordinances would touch on both of those issues. I also can see this project from the lens of a resident who will live with this field near them and possibly across the street, if the propose project expands. I have only lived in Sidney one year and have found my fellow residents to be smart and caring; the opposite of what we seem to be portrayed as. It is my fear that our opposition will be seen as one from ignorant people who don't understand the world around them. This is the farthest statement from the truth. My fellow residents and I have valid concerns that should be addressed. The truth is that the concerns voiced from the Sidney residents are the same as those from all over Champaign County, including the cities of Champaign and Urbana if those residents were to have such a large solar farm proposed in their backyards. My main concerns regarding the solar farm ordinance arise from noise pollution, the lack of incorporated township protection, and removing valuable farmland from production.

I would first like to address the noise pollution that any proposed solar farm would create. I will keep this short and sweet as I know that you all have heard this issue before. I am including a snapshot of the email that Baywa R.E. sent your board for an amendment last meeting (Image 1). This image includes a table that the manufacturer of the inverter has created. This includes the number of METERS that you would have to be from the inverter to get to a certain level of dB(A). This states that for all three of the inverters you would have to be 100 METERS away from the proposed inverter. When I first read this chart, it was not clear that it was in METERS and NOT FEET. According to google, 100 meters is 328.08 feet. Your proposed ordinance is 250 feet from the property line/ dwelling. Not even enough to get to 44-46 dB(A) from the inverter. This is NOT acceptable. I would also like to point out that if you look at the attached pamphlet regarding European work noise levels, the WHO requires 35 dB(A) to sleep comfortably. I have also looked up Champaign city noise ordinances. These ordinances PROHIBIT noisy equipment from running between the hours of 10pm and 7am. This includes lawn mowers and other noisy equipment from working. I ask you, why should the residents of any town be required to live next to something at a noise limit that would not be acceptable in the city of Champaign? If someone in Champaign cannot be bothered with loud noises before 7am why should this be in effect for residents anywhere in Champaign County?

Secondly, I want to point out the lack of protection for incorporated townships. I realize that this zoning permit is not the same one issued to windfarms. You have chosen this type of zoning permit so that you would not have to offer the same type of protection to townships from solar farms. Our town, and towns all over Champaign County need the same type of protection offered from wind farms with solar farms. Our town needs to have a 1.5 mile limit around the town, so that we can decide what goes in the town limit. If our town wants the solar farm within the town limits, we should be able to choose to let them build. We should not have this thrust upon our residents without being able to control what happens in our town.

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CHAMPAIGN CO. P & Z DEPARTMENT

Lastly, there is the issue of taking valuable farmland out of production. From the recommendations that I have read of solar farms, it is generally recommended to use "brown land" for these types of projects. This is land that has been graveled over and can no longer be used for agricultural reasons. This is the land that we should be considering. Not land that can aid in the global food crisis that will also come in the future. From my understanding, projections indicate that we will no longer be able to feed everyone in the world in the future. It is also my understanding that the current ordinance only requires a percentage BOND held from the company for putting the farmland back into commission. This is unacceptable. Many solar companies are going bankrupt. While I have researched BAYWA R.E. and they seem like a good and stable company, we cannot guarantee that of the person that their LLC is sold to after they build the proposed solar farm. This is true of all solar companies building in Champaign County, I just use this as an example. If the LLC were to go bankrupt, there would be NO money to put the land back into farmland, and we would have a large solar field rotting next to our town. This needs to be changed to allow for at least 50% of the money needed set aside for changing the land back into farmland.

I thank the Champaign County Zoning Members for allowing me to voice my opinions. Your job is not easy and I appreciate all of the work that you are putting into it. I know that there are many aspects to consider, and my points hit on just a few. These concerns are important, and It is my hope that you will change the ordinance to allow for a 1.5 mile protection for incorporated townships, a 35 dB(A) noise limit AT the property line of all properties next to solar farms, and the protection of our farmland through either not taking it out of commission, and/or demanding that these companies set aside enough money to take down the solar farm and bring the land back into useable farmland.

Thank you,

Rebecca Sinkes

Sidney II 61877



Result of Measurements

The following rating levels can be determined from the sound power measurements performed:

Inverter type	Sound power level mean value
SC 1850-US	94
SC 2200 & SC 2200-US	94
SC 2500-EV & SC 2500-EV-US	92

The following tables show the selected distances from the inverter and their corresponding sound pressure level L_p in dB(A) at nominal AC power.

Distance	SC 1850-US	SC 2200 (-US)	SC 2500-EV (-US)
1 m	79	79	77
10 m	66	66	64
20 m	60	60	58
30 m	56	56	55
40 m	54	54	52
50 m	52	52	50
60 m	50	50	49
70 m	49	49	47
80 m	48	48	46
90 m	47	47	45
100 m	46	46	44

Information:

The detailed test report may be requested from SMA Solar Technology AG if necessary.

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APR 02 2018

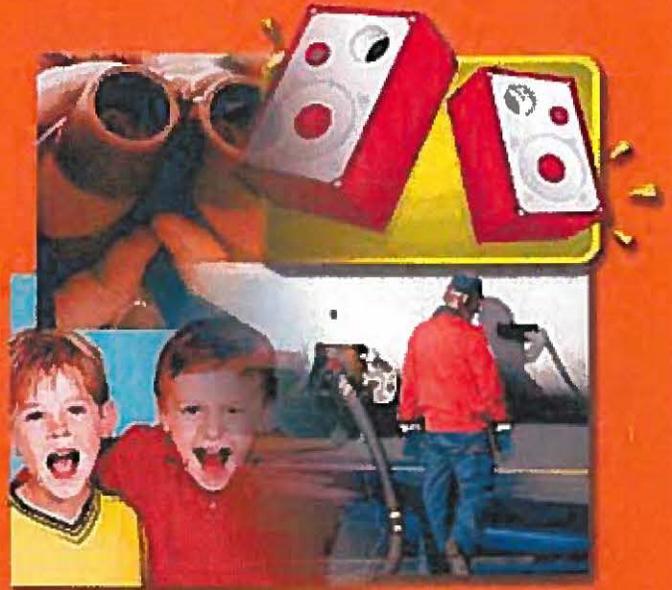
CHAMPAIGN CO. P & Z DEPARTMENT

Image 1

RISK OBSERVATORY

THEMATIC REPORT

EN **2**



Noise in figures

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CHAMPAIGN CO. P & Z DEPARTMENT



European Agency
for Safety and Health
at Work

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:15 AM
To: Susan Burgstrom
Subject: FW: Comments on the Solar Ordinance for the Record

Follow Up Flag: Flag for follow up
Flag Status: Flagged

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CHAMPAIGN CO. P & Z DEPARTMENT

From: Dave.Thornton [<mailto:Dave.Thornton@carle.com>]
Sent: Wednesday, April 11, 2018 9:13 AM
To: John Hall <jjhall@co.champaign.il.us>
Subject: Comments on the Solar Ordinance for the Record

This message was sent securely using Zix®

To: Zoning board of appeals

I support the future of Solar energy and feel it should not be limited to just rooftops.
This proposed limit might make some sense in Cities and Towns, but they can draft their own ordinances.

On a County-Wide scale this idea to limit solar is ridiculous.
It infringes on property owner rights.
With proper set-backs, there is "no" noticeable noise from the inverters.
Typically at 150 feet, there is only background noise.
Several studies and papers have been written on this.

If action is need, it is to establish setbacks for Solar farms.

I personally lived with Solar and Wind power 20 years ago.

It is part of the future for energy in this Country.

Please use common sense and do not stifle the economic and environmental benefits for Solar power in Champaign County.

Thank you.

Dave Thornton
Mechanical Lead
Carle Foundation Hospital
217.954.8490
204 S. Urbana Ave, Urbana.

This message was secured by [Zix®](#).

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 9:16 AM
To: Susan Burgstrom
Subject: FW: Support for Solar

Follow Up Flag: Flag for follow up
Flag Status: Flagged

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CHAMPAIGN CO. P & Z DEPARTMENT

From: elizabeth kirby [mailto:ekirby28@gmail.com]
Sent: Wednesday, April 11, 2018 6:58 AM
To: John Hall <jhall@co.champaign.il.us>
Subject: Support for Solar

I wanted to write to express my support for the development of solar energy within our community.

As a senior citizen, I have had an interest in alternative energy for many years. It represents a big step forward for mankind not only in terms of the protection of the earth, but the ability of people to find constructive solutions for the multitude of problems we face today.

As a community, the search for ecologically sound solutions should be our number one priority. I highly support the development of solar energy!

Elizabeth

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 12:14 PM
To: Susan Burgstrom
Subject: FW: Solar Ordinance

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CHAMPAIGN CO. P & Z DEPARTMENT

From: Mark Ballard [mailto:mballard34a@gmail.com]
Sent: Wednesday, April 11, 2018 11:00 AM
To: John Hall <jhall@co.champaign.il.us>
Subject: Solar Ordinance

Hi John,

I am writing to express my personal support of a less than 250 foot setback in the coming Solar Ordinance. I cannot see any valid reason that solar would be treated more harshly than a meat packing plant in terms of setback. A setback greater than 250 feet will effectively kill our county having a solar farm,

Solar farms can be a positive for Champaign County in terms of economic impact - they bring in jobs, provide income to farmers, and tax revenues to the county.

Thank you,

--Mark Ballard

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 12:14 PM
To: Susan Burgstrom
Subject: FW: Comments on the Solar Ordinance for the Record

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CHAMPAIGN COUNTY P & Z DEPARTMENT

From: steve errede [<mailto:errede@gmail.com>]
Sent: Wednesday, April 11, 2018 11:31 AM
To: John Hall <jhall@co.champaign.il.us>
Cc: Errede, Steven Michael <errede@illinois.edu>; steve errede <errede@gmail.com>
Subject: Comments on the Solar Ordinance for the Record

Dear John,

I am a UIUC Emeritus Professor of Physics, I live at 2706 Cherry Hills Drive, Champaign, IL 61822, my home phone # is 217-398-8598.

I am sending you this email to strongly encourage Champaign County to aggressively endorse, support and facilitate the growth of green power in our area. As a physicist, it is absolutely clear to me that anthropologically-induced climate change has been operative at an increasingly rapid, and alarming pace since the industrial revolution. Carrying on with the use of fossil fuels is unsustainable in the future, if life as we know it on this planet is to survive. The climate-deniers, in my opinion are solely concerned with making money - at any/all costs - in the fossil fuels business. I regard this as a form of insanity, because of what we-all *will* be facing in the future, if we-all collectively do not change our ways to minimize our impact on the natural processes extant/operative on this planet.

In the past decade, there have been many dramatic technological improvements in the efficiency of power generation associated with both solar cells and wind-turbine technology (e.g. modern wind turbines now 20x more efficient than originals), as well as dramatic improvements in battery storage technology. Costs for green energy have also dropped dramatically over this same period of time, and job growth in this industry has also soared, with significant economic benefit(s) to local and state economies.

There are now many examples of countries around the world that are leading the way on green energy, they have explicitly demonstrated that the transition to green forms of power generation *is* viable, for all such reasons - countries such as Scotland, Costa Rica, Portugal, Australia and China. I personally cringe with embarrassment and am much saddened that the US is not taking a leadership role on this issue. There are no reasons for us not to do the same!

While it makes sense to restrict residential/commercial solar installations here in town to rooftop-only, this does not make sense to me in rural areas of Champaign County. For example, my brother, Mark, who is a master electrician, lives on a 40-acre farm north of Taylor's Falls, MN - he built and has operated an array of solar *heating* panels (hot water) on his property for more than 10 years, it is connected into heating his house. Their solar heating array has dramatically cut their winter electrical power bill. It is an array of panels deployed on the ground by one of his out-buildings on their property.

UIUC as you know, has installed and operates a ground array of solar cells on the south side of Windsor Ave, ~ 1/2 mi. east of Neil St. Last summer, my wife and I drove out to WA area, we saw many such ground-based solar cell arrays e.g. in small communities along the way.

Again, I urge you and Champaign County officials to do all that you possibly can to encourage/advocate for transitioning our entire county to run on 100% green energy at the earliest possible date. We should lead in this - to set an example for other communities in the US!

Sincerely,

Steven Errede

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 12:46 PM
To: Susan Burgstrom
Subject: FW: Comments on the solar ordinance for the record

-----Original Message-----

From: Huhman, Marian [mailto:mhuhman@illinois.edu]
Sent: Wednesday, April 11, 2018 12:42 PM
To: John Hall <jhall@co.champaign.il.us>
Subject: Comments on the solar ordinance for the record

I am writing to strongly oppose the proposed solar ordinance that would create setback lines that are beyond what would allow for community farms.

Marian Huhman
606 Silver Lake Ct
Savoy, IL 61874

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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

Susan Burgstrom

From: Connie Berry
Sent: Wednesday, April 11, 2018 1:32 PM
To: John Hall; Susan Burgstrom
Subject: FW: Proposed Sidney solar farm

From: Staci Bromley [<mailto:sbromley04@hotmail.com>]
Sent: Wednesday, April 11, 2018 1:31 PM
To: zoningdept <zoningdept@co.champaign.il.us>
Subject: Proposed Sidney solar farm

My name is Staci Bromley, and I reside in Sidney, Illinois. The proposed solar farm acreage will be extremely close to my home. As a resident and parent of 3 young children, I am strongly opposed to the location of said solar farm. One of the huge aspects of living in a small town is the quiet nature and the open field views. This will drastically change for the worse if you allow the solar panel farm to be located where it is proposed. I fear for the health and well being of our children. The decibels this solar farm will produce constantly are well above what is deemed as quality living. The landscape will also be destroyed by the chain link fence and wires. The proposed prairie grass will only make the appearance worse and the safety concerns for the country roads and accidents weigh heavily on our minds. Please take our valid concerns into consideration when you make your vote. Thank you for your time.

Staci Bromley
201 Austin Drive
Sidney, IL 61877

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CHAMPAIGN CO. P & Z DEPARTMENT

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 3:48 PM
To: Susan Burgstrom
Subject: FW: Comments on the Solar Ordinance for the Record from Shannon R. Kurtenbach, 623 CR 2100 E., Sidney, IL 61877, 217-202-8708

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APR 11 2018

From: Shannon Kurtenbach [<mailto:kurtenbachshannon@yahoo.com>]

Sent: Wednesday, April 11, 2018 1:59 PM

To: John Hall <jhall@co.champaign.il.us>

Subject: Comments on the Solar Ordinance for the Record from Shannon R. Kurtenbach, 623 CR 2100 E., Sidney, IL 61877, 217-202-8708

CHAMPAIGN COUNTY ZONING DEPARTMENT

I am greatly concerned about the general impact of large solar installations have on property values of homes and land next to them, what affects the panels of on their residents health, safety and well being, as well as what affect occupying prime farm land for their installation will have. The purpose of the county zoning board is to enact ordinances to direct solar developments where the residents of the county want them to go and prohibit them in areas where the residents of the county don't want them to go. It is clear, that the residence of Sidney, also speaking on behalf of the residence of most small rural towns in Champaign County if a solar farm was presented to be built right next to the village, do not want solar farms built right next to the community, occupying valuable farmland, and close to any kind of residential structures, be it within village limits or outside of village limits.

The position of the Board to potentially exclude the 1.5 mile radius around villages/towns/municipalities from the direct control of the village/town/municipality when it comes to solar farms, takes the decision out of the hands of the local residences and the local governing body that is directly affected by the installation of a solar farm and places it within the general boiler plate control of a larger, less connected and personally invested governing body that has no personal stake in the impact of such decision. The 1.5 mile area surrounding a village/town/municipality should also be under the direct control of the village/town/municipality to zone the land as its local residents see fit to best meet individual needs of the village/town/municipality at the specific time. Why is it necessary for the building of solar farms within this 1.5 to be regulated any differently? The area where the proposed solar farm is being recommended to be built is on land that is immediately surrounding the village and such land is more valuable to the village and the surrounding residents as agriculture, commercial, industrial or as a residential development than it is as a solar farm. It is also very important to note that the village, as well the county, will not benefit from the solar farm from a tax basis purpose. The village, as well as the county will get a far better return on almost any other development that would occur on the land.

I also find it noteworthy to mention that the company who wants to install this solar farm next to Sidney in prime farmland, first started installing their solar farms on land that was no longer "good" land. Nine out of their first thirteen solar farm developments were built on capped landfill ground and one was built on retired animal research ground. **Only three of these first thirteen were built on "greenfield" land.** However, in it's thirty-four latest projects which are still in the "development" stage, are **all thirty-four** proposed to be built on "greenfield" land. This demonstrates that the company is no longer in the business of building these solar farms as a form of renewable energy on land that otherwise would be of limited purpose to help protect the environment, but merely as a way to make a significant amount of money without caring about what land is being used and who is affected. Champaign County should not allow this company to continue down this path at the detriment of it's citizens by implementing regulations that permit this company to continue down this pathway. There are many other locations within Champaign County of land that is not "greenfield" land that could house such solar farm without occupying land that is prime farmland adjacent to a village. The most beneficial thing for Champaign County is to implement a solar ordinance to only allow them to be installed on the worst land (non-prime land) within the county, such as brownfields or former gravel operations.

It is also important to consider that there are plenty of other solar farm companies out there that take greater good approach and refuse to take up prime farmland or any form of prime land for the installation of these solar farms, knowing what great value and benefit that this land provides to not only the local communities where it is located, but to the state and to the country as well. Basing the Champaign County solar regulations to benefit these companies and permit them to cash in on opportunities would be a better thing for the county to focus on when writing the solar farm regulation. Without any direct benefit to the village of Sidney, or even to the county of Champaign, using farmland that is

adjacent to the village will be used to house this solar farm, the solar farm regulation limiting the building of such solar farms to non-prime land would be the most beneficial thing for not only the residents of Sidney and this county, but for the residents of this state and country as well.

The residence who live in and around Sidney live here because of its rural nature and location. When the residence of Sidney and the surrounding area bought their houses, seeing this solar farm, whether it be the actual panels themselves, or the fencing, or the other landscaping placed in an attempt to hide the farm, was not what they bargained for. It is not what any person who is looking to live in the rural area of Champaign County want to see when they are at home or on their way home. Implementing regulations that will permit this solar farm to built in the proposed location immediately adjacent to the Sidney will cause many residence to leave the area and not look back and prevent many people from even considering Sidney as a place to call home.

I guess, with all that being said, the most important question I ask of you, is what are the goals and priorities for Champaign County when it comes to solar energy use and permitting the installation of these solar farms? That is truly the ultimate question. If Champaign County and its residents, clearly other than those receiving some kind of kick back/payment directly or those friends/relatives of someone receiving the same from the company, do not receive any or a very minimal benefit from these solar farm, then what is really the point of permitting these solar farms to occupy prime land within Champaign County and adjacent to a village or encroaching upon personal residences?!?

Thank you for your time and consideration in this matter,

Sincerely,

Shannon R. Kurtenbach

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APR 11 2018

CHAMPAIGN CO. P & Z DEPARTMENT

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 3:48 PM
To: Susan Burgstrom
Subject: FW: Comments on the Solar Ordinance for the Record

From: George Cruickshank [<mailto:geoguy91@gmail.com>]
Sent: Wednesday, April 11, 2018 3:18 PM
To: John Hall <jhall@co.champaign.il.us>
Subject: Comments on the Solar Ordinance for the Record

Hello! My name is George Cruickshank, I am a constituent of Champaign County who lives at 2514A Leeper Dr., Champaign, IL, 61822. My phone number is 217-417-4974.

I was alerted via a Sierra Club e-mail about the Zoning Board's hearing tomorrow, but will unfortunately be unable to attend due to my work schedule. I was saddened to hear, however, that a new solar project near Sidney is in jeopardy due to perceived "noise issues". I have never heard of people complaining about the noise level of solar plants before, but if it does prove to be a problem, I implore you and the board to find a new, more secluded site for the plant. We as a society cannot rely on coal and oil forever. The Clinton Power Station is a step in the right direction, provided it continues to be properly funded and maintained, but moving towards less harmful energies which do not create pollutant runoff is a crucial step in securing a future for our children, and the future of humanity.

I eagerly await a response, and hope that my comment has been taken into consideration for the record. Thank you for reading.

~Peace~

George Cruickshank

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CHAMPAIGN CO. P & Z DEPARTMENT

Susan Burgstrom

From: John Hall
Sent: Wednesday, April 11, 2018 3:48 PM
To: Susan Burgstrom
Subject: FW: solar farms

From: raymond norton [<mailto:xraynorton@yahoo.com>]
Sent: Wednesday, April 11, 2018 3:19 PM
To: John Hall <jhall@co.champaign.il.us>
Subject: solar farms

My church is currently investigating a small solar farm(15 acres) on a farm we own in Champaign county. This is part of a project of Faith in Place to provide solar electricity for a group of churches in Urbana-Champaign. We certainly do not want to see the restriction of solar farms in this county. Non profit groups certainly want to keep our costs down and be earth friendly in the process.

A solar farm as we have been shown would improve the the farm soil by planting native plants between the rows of the farm. All the structures would be removable when the solar farm was no longer useful and the ground returned to farming. Please keep this in mind in your deliberations.

Sincerely,
Raymond Norton
member of the Property committee
Wesley Foundation
2103 W. Green, Urbana, IL 61801
C. 217-722-2293

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CHAMPAIGN CO. P & Z DEPARTMENT

Susan Burgstrom

From: Connie Berry
Sent: Wednesday, April 11, 2018 4:18 PM
To: John Hall; Susan Burgstrom
Subject: FW: solar regulations

FYI

Connie Berry
Zoning Technician
Champaign County Department of Planning and Zoning
1776 E. Washington St.
Urbana, IL 61802
Phone: 217-384-3708
Fax: 217-819-4021

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APR 11 2018

CHAMPAIGN COUNTY Z DEPARTMENT

"People may not remember exactly what you did, or what you said, but they will always remember how you made them feel." Maya Angelou

From: valerie bernard [mailto:vhbernard7@gmail.com]
Sent: Wednesday, April 11, 2018 4:16 PM
To: zoningdept <zoningdept@co.champaign.il.us>
Subject: solar regulations

To the members of the Zoning Board,

As a concerned property owner in Champaign county, I want to urge to you to learn the importance of allowing 1.5 mile setbacks for all municipalities AND private residences from any major solar projects in our county. (Urban and personal solar panels would be an exception if they dont interfere with nearby residents' health and comfort.)

These large scale, commercial wind farms have no place near where people live! They will negatively effect the health of humans, animals and the entire ecosystem, destroy property values, and have very little, if any benefit to our county

Our most valuable long term resource in this county will always our fertile farm ground- I strongly urge you to disallow any large scale developments proposed on agricultural land.

Thank you for your consideration.

--
Valerie Hopkins Bernard
Philo, IL

Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States

David M. Hessler^{a)} and George F. Hessler Jr.^{b)}

(Received: 2 April 2010; Revised: 21 June 2010; Accepted: 21 June 2010)

Potential impacts from operational noise produced by wind turbines is a major issue during the project planning and permitting process, particularly for projects east of the Mississippi River in fairly populous areas. While still an issue farther west, more buffer space and lower population densities sometimes make noise less of a factor. In general, however, noise may be the principal obstacle, from an environmental impact standpoint, to the more rapid growth of this renewable energy source in the United States. Proposed projects are frequently opposed on noise concerns, if not outright fear, usually aroused by the highly biased misinformation found on numerous anti-wind websites. While significant noise problems have certainly been experienced at some newly operational projects, they are usually attributable to poor design (siting units too close to houses without any real awareness of the likely impact) or to unexpected mechanical noises, such as chattering yaw brakes or noisy ventilation fans. A common theme at sites with legitimate complaints is that no one—not the developer, their consultants or the regulatory authority—really understood the import and meaning of the sound levels predicted at adjacent homes in project environmental impact statement (EIS) noise modeling. This paper seeks to address this lack of knowledge with suggested design goals and regulatory limits for new wind projects based on experience with the design of nearly 60 large wind projects and field testing at a number of completed installations where the apparent reaction of the community can be compared to model predictions and measurements at complainant’s homes. © 2011 Institute of Noise Control Engineering.

Primary subject classification: 69.3; Secondary subject classification: 14.5.4

1 INTRODUCTION

Typical wind turbine generators (WTG) used today are generally in the 1.5 to 3 MW range of electrical generation capacity and all of them produce a moderate amount of generally mid-frequency aerodynamic noise. All are three-bladed with the rotor forward, or upwind, of the supporting tower so that the blades do not pass through the tower wake avoiding the low frequency noise issues observed in the eighties¹ by downwind blades. This experience appears to have initiated the persistent but incorrect idea that wind turbines are substantial sources of low frequency noise, which, extensive field testing clearly

shows, is not at all the case with modern units.

Subjectively, fairly close to a typical wind turbine, one can observe a “whoosh” or “swish” sound with periodicity of about 1 second generated by the down-coming blade. While the “frequency” of this sound is low at about 1 Hz this sound is not low frequency or infrasonic noise, but rather a repeating, mid-frequency sound (with its peak generally around 500 Hz).

This periodic sound becomes less distinct with distance and, usually together with neighboring units, blends into a more continuous low magnitude “churning” sound that is often likened to a plane flying over at fairly high altitude; particularly since the sound tends to fluctuate or fade in and out randomly in the same way that aircraft noise is usually perturbed by the intervening atmosphere. Wind turbine sound emissions sometimes contain minor tones associated with mechanical components (usually ventilation fans) but almost never produce prominent “pure tones” per the commonly used EPA definition².

^{a)} Hessler Associates, Inc., 3862 Clifton Manor Place, Suite B, Haymarket, VA, 20169, USA, email: David@HesslerAssociates.com.

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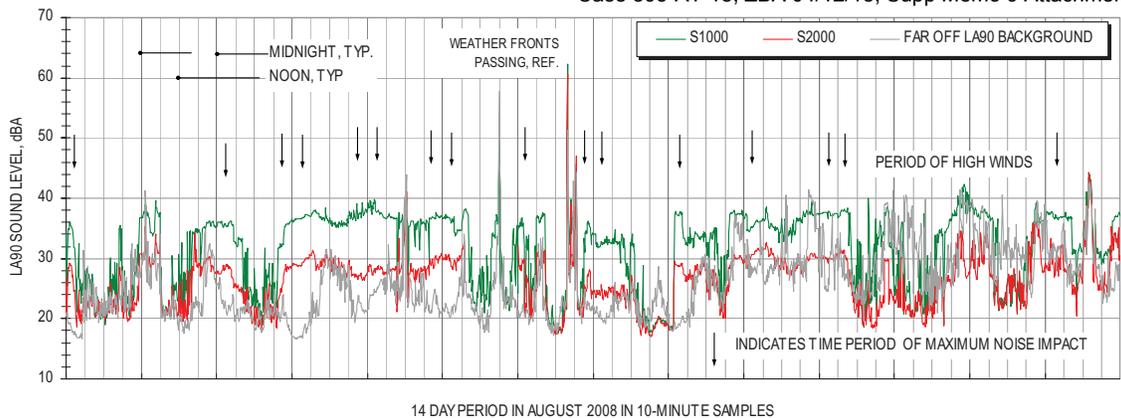


Fig. 1—Operational measurements over a 14-day period at two distances (1000 and 2000 feet south, 300 and 600 meters) from a single wind turbine compared to the prevailing macro area ambient sound level at the same locations for determining noise impact.

2 POTENTIAL FOR ADVERSE NOISE ANNOYANCE

Adverse impact in the form of annoyance and complaints can occur if facility noise emissions significantly exceed the prevailing environmental background sound level, as with any power project. Because wind turbine sites are typically in rural areas the existing background sound level is often very low, even when its dependence on wind speed and wind-induced sounds is taken into consideration.

As an example, Fig. 1 shows over 2000 ten minute residual measurements (LA₉₀ Level exceeded 90% of the time) over a 14 day survey at distances of 300 and 600 meters from an operating single wind turbine compared to the average concurrent background level measured at several off-site locations. Hypothetical noise impacts exist wherever the turbine sound level significantly exceeds the background level. In Fig. 1, the maximum differential between the measured sound level and the background level often occurs at night on nights when the winds are fairly light. When it’s windy the differential and the perceptibility of the project is usually less irrespective of time of day as wind generated sources of environmental sound become more dominant.

This time-of-day dependency can be explained by examining the typical wind speed gradient with elevation as a function of time of day. Figure 2 shows the shear exponent, a term that corresponds to the curvature of the gradient, measured empirically over a two year period at a planned wind project site in the Midwest. The shear exponent is low during the day time hours due to atmospheric mixing resulting in a more vertical gradient, as shown in Fig. 3, while the exponent is significantly higher at night due to thermal layering; a phenomenon that is more pronounced during lower wind conditions. As described and reported by van den Berg³, at night the upper elevation

wind speed can be high enough to operate the turbine while at ground level it is quite low, which can lead to relatively low sound levels, such as those observed most nights in Fig. 1.

It can be concluded from these data that the potential for annoyance is most likely during the evening and nighttime and less likely during the day implying that any design goal or regulatory limit should focus on the nighttime sound level.

As a final note on background levels, Fig. 4 shows a typical set of natural background sound levels (without any turbine noise) measured in a quiet rural environment plotted as a function of wind speed at a typical hub height elevation of 80 m. Modern wind turbines begin to produce power at a cut-in speed of roughly 3 m/s. The red lines on this graphic show an analytical model by Donovan⁴ where the background sound has two components: the residual level (shown here at 38 dBA) and the wind generated level plotted as the 6th power of wind speed, which would be expected from a flow-induced acoustic source. The logarithmic summation

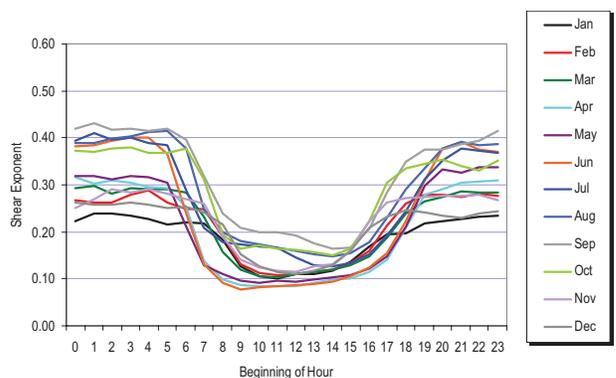


Fig. 2—Wind Shear Exponent, α , as defined by $V1/V2 = (H1/H2)^\alpha$ where V and H stand for velocity and height above grade.

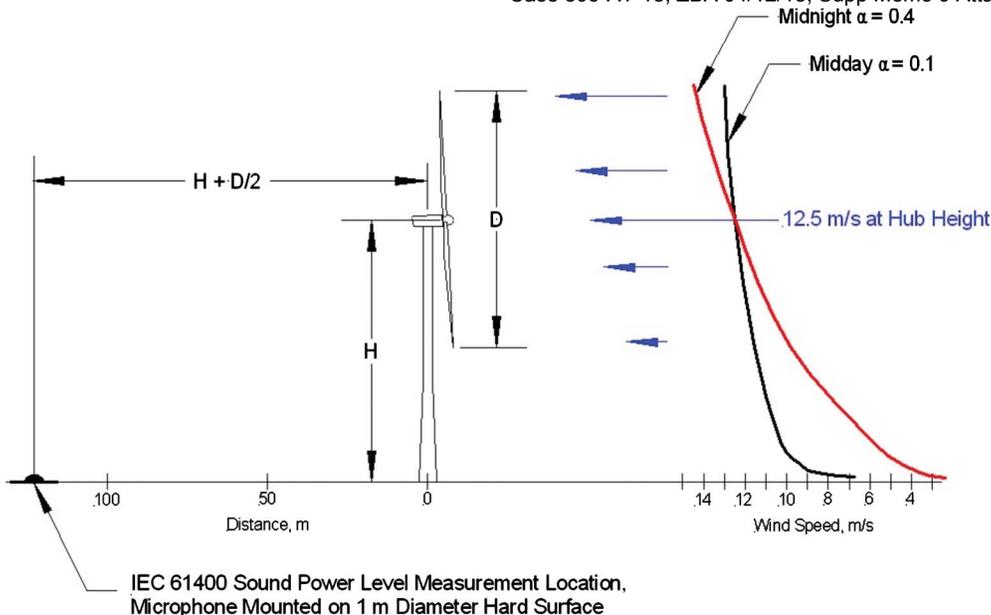


Fig. 3—Typical wind profiles for day and night periods. The figure also shows the measurement location for IEC 61400.

of these two components would closely track the mean linear trend of the measured data (black line).

3 NOISE LIMITS FROM THE LITERATURE

3.1 World Standards and Guidelines

The World Health Organization (WHO) published the following 1999 guidelines⁵ for community noise in residential environments:

55 dBA Leq Daytime Levels: “Serious Annoyance, daytime and evening”

50 dBA Leq Daytime Levels: “Moderate Annoyance, daytime and evening”

45 dBA Exterior/30 dBA Interior Leq Nighttime Levels: To avoid sleep disturbance issues.

The nighttime sleep disturbance threshold has recently been reexamined by the WHO (2009)⁶ and has been lowered from 45 dBA to 40 dBA outside of residences. No inside value is specified. The level is expressed as a design target to protect the public. Considering this guideline, nighttime sound levels from wind developments outside of residences should be generally targeted at 40 dBA as an ideal design goal to avoid sleep disturbance issues.

3.2 World Wind Turbine Noise Limits

Wind turbine development in European countries and in other parts of the world has been proceeding for

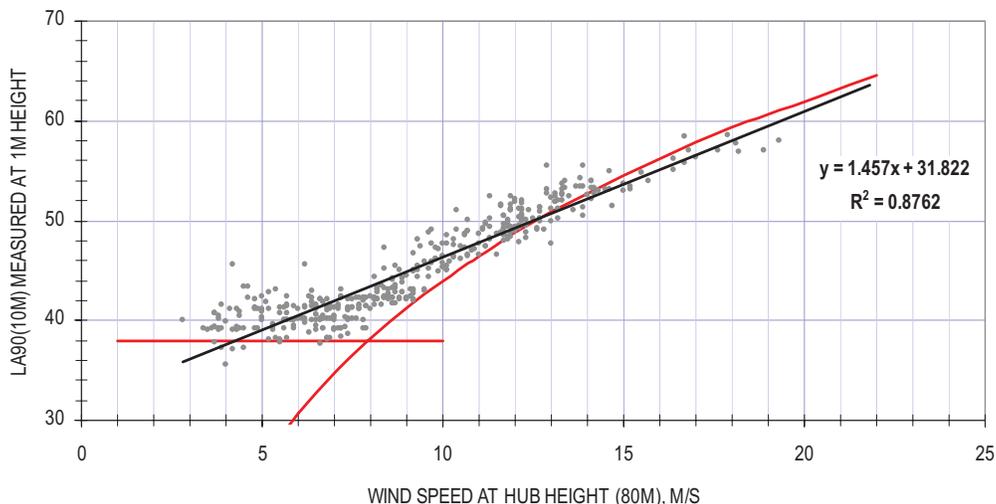


Fig. 4—Typical LA90 measurements as a function of wind speed at hub height.

Table 1—Typical worldwide wind turbine noise limits.

LOCATION	CRITERIA VALUE(S)	METRIC	FEATURES
ALBERTA, CANADA	50D/40N	dBA	
QUEBEC, CANADA	45D/40N	dBA	
ONTARIO, CANADA	45D/40N	dBA	
MANITOBA, CANADA	60D/50N	MAX dBA	MAX ACCEPTABLE
MANITOBA, CANADA	55D/45N	MAX dBA	MAX DESIRABLE
DENMARK	40	L _{eq} dBA	DAY AND NIGHT
GERMANY	60D/45N	dBA	MIXED RESIDENTIAL/COMMERCIAL
	55D/40N	dBA	GENRAL LIVING AREAS
	50D/35N	dBA	PURE LIVING AREAS (1)
NETHERLANDS	40D/30N	L _{eq} dBA	
NEW ZEALAND	40	L90 dBA	PRIMARY, WHICHEVER
NEW ZEALAND	AMBIENT+5	L90 dBA	IS GREATER
UK	43N	dBA	
UK	35–40 (37.5 FOR AVERAGING)	dBA	FOR LOW NOISE ENVIRONMENTS
UK	AMBIENT+5	dBA	DAY AND NIGHT
UK	35	dBA	AVOIDS AMBIENT STUDY
ARITHMETIC AVERAGE	45D/40N		(1)-USE FOR AVERAGING

some time now while widespread development has only really started in the United States within the last 5 years or so. Thus, the question of allowable limits specifically for wind turbines has already been addressed by a number of other countries. Storm⁷ presents a summary of world standards in Tables 3 and 4 of his paper, the core of which is reproduced here in Table 1.

3.3 U.S. Federal Standards

The U.S. federal government issues no standards for industrial noise but does promulgate noise regulations for major transportation systems. These regulations by the Federal Aviation Authority (FAA) and the Federal Highway Administration (FHWA) are fundamentally predicated on the idea that some noise annoyance is justified or offset by the public good provided by the systems. Generally, acceptable regulatory levels in the 60 to 65 DNL (day night sound level) range have been shown to “highly annoy” approximately 10 to 20% of affected residential receptors. However, these published standards are not particularly useful for wind turbine noise emissions, since the public good of a new power plant or industrial facility is not obvious to its immediate neighbors, and conscientious owners would ideally want no annoyed neighbors.

The U.S. EPA Office of Noise Abatement was unfunded in the late seventies but did issue a landmark report suggesting guidelines for environmental noise in residential communities from all environmental sources. The report⁸ is often referred to as the “Levels” document for short and has become a de facto standard

for such organizations as the World Bank and others. Unfortunately, this report is often misused and the cited recommended level of DNL=55 dBA for residential land use is commonly interpreted as an acceptable criterion level for new noise sources in any type of residential environment—whereas the intent was to provide a guideline, or national goal for total environmental noise (ambient noise including all industrial and transportation sources). The report acknowledges that no cost-benefit analysis was performed.

In addition, the report clearly indicates that the level of DNL=55 dBA is applicable to an urban residential background and must be normalized to the specific environments under consideration to obtain an acceptable level of correlation between DNL and community response. Without background normalization, correlation is very poor based on the analysis presented in the levels document and elsewhere. This is no surprise since a level of DNL=55 dBA cannot be expected to be satisfactory at the same time in both a very quiet rural and noisy urban residential setting. Schomer⁹ suggests that an adjustment of 10 dBA should be subtracted for quiet rural environments and perhaps another 5 dBA if the project is newly introduced into such a long-standing quiet setting.

For a steady source, which a wind turbine could be broadly considered, a level of 39 dBA would be equivalent to DNL=55 dBA if reduced by 10 dBA; or 34 dBA if reduced by 15 dBA to compensate for a very quiet rural setting.

The EPA did conclude in the levels document that an outside sound level of 45 dBA at night (10 p.m. to 7

Table 2—Tabulation of state nighttime noise regulations and siting standards.

STATE	NOISE LIMIT AT RESIDENTIAL RECEPTORS “A” WTD. EMISSION LEVEL	COMMENTS
MARYLAND	55	EMISSION LIMIT, ANY AMBIENT
DISTRICT OF COLUMBIA	55	EMISSION LIMIT, ANY AMBIENT
DELAWARE	55	EMISSION LIMIT, ANY AMBIENT
ILLINOIS	51	EMISSION LIMIT, ANY AMBIENT-EQUIVALENT A-WTD LEVEL FROM SPECIFIED OCTAVE BANDS
CONNECTICUT	51	EMISSION LIMIT, ANY AMBIENT
MINNESOTA	51	EMISSION LIMIT, ANY AMBIENT
NEW JERSEY	50	EMISSION LIMIT, ANY AMBIENT
OREGON	50	L50 IN ANY ONE HOUR IN “QUIET” ENVIRONMENTS
COLORADO	50	EMISSION LIMIT, ANY AMBIENT
MAINE	45	50 dBA WHEN AMBIENT LEQ > 35 dBA, 45 dBA BELOW (USE $L_{eq} = 33$ dBA)
MASSACHUSETTS	40	MAXIMUM OF 5 TO 10 dBA ABOVE LOWEST L90 AMBIENT (USE MIN L90 = 33 + 7 dBA)
WASHINGTON	39	EMISSION LIMIT DEPENDING ON RURAL (39) OR RESIDENTIAL (42) ZONING
CALIFORNIA	38	MAXIMUM OF 5 dBA ABOVE L90 AMBIENT (FOUR QUIETEST CONSECUTIVE HOURS, USE MIN L90 = 33 dBA)
NEW YORK	38	MAXIMUM OF 5 dBA ABOVE UNDEFINED AMBIENT (USE MIN L90 OR $L_{eq} = 33$ dBA)
MEAN STATE NIGHTTIME LIMIT:	50	
AVERAGE STATE NIGHTTIME LIMIT	47.7	

a.m.) is adequate to preclude sleep-interference issues. This was based on a typical noise reduction of 10 dBA with open windows that would result in an interior bedroom level of 35 dBA. The much later work by the WHO mentioned above now recommends an exterior background level of 40 dBA to avoid sleep issues.

Considering the EPA guidelines as published in the seventies and later analysis, DNL levels from wind developments outside of residences should ideally be targeted at DNL=45 dB, or preferably 5 dBA less. A DNL level of 45 dBA is equivalent to 45 dBA day/35 dBA night or a steady 24 hour level of 39 dBA. A 45 dBA CNEL (Composite Noise Equivalent Level with a 5 dBA evening weighting) would be even more ideal at 45, 40 and 35 dBA for day, evening and nighttime levels, respectively.

3.4 State Standards

Just over a dozen states have codified regulations, zoning guidance or siting standards, presented in Table 2, that fundamentally have the same result as regulations for industrial noise. Most allow a higher limit for

daytime hours. The *nighttime* limits for industrial noise sources are tabulated in Table 2 for fourteen states. For the three states using an ambient based limit (CA, MA and NY), we use a representative background level of 33 dBA as an approximate, if somewhat conservative, design datum.

Clearly, there is a large variance, ranging from 38 dBA to 55 dBA, in what is considered “acceptable” for nighttime noise emissions at sensitive receptors. Not all can possibly be appropriate.

It should also be mentioned that the units and time periods of measurements for “emission limits” are not always well defined and one must refer to the actual standard for guidance.

Eight states use absolute ‘maximum emission limits’ for daytime and nighttime hours that are applicable at residential receptors regardless of the acoustic environment in those areas. While simple to codify and enforce, it is illogical that the same level could be satisfactory for any residential environment ranging from noisy urban to quiet rural residential locations. The state of Maryland¹⁰ acknowledges this and has found

Table 3—Summary of existing guidelines and standards relevant to typical wind projects.

Source	Effective Limits	Comments
WHO	40 dBA Night	Sleep Disturbance Threshold
Consensus of Int'l Limits Specifically on Wind Turbine Noise	45 dBA Day/40 dBA Night	Arithmetic Average of all Standards
U.S. EPA	45 dBA Day/35 dBA Night	DNL=45 dBA
State Standards	38 to 40 dBA Night	Based on the 3 States using an Ambient-Based Approach

that fully 50% of excessive noise complaints occur in situations where the noise source is in compliance with the State's regulations. Maine and Washington acknowledge differing ambient environments by including a clause that reduces the allowable emission limit for "quiet" areas in Maine and "rural" areas in Washington.

The states of New York, Massachusetts and California use ambient-based emission levels, i.e., the allowable emission level is calculated based on a prescribed increase to the existing ambient, or background sound level. An ambient-based method is based on the *perception* of the new sound in the *specific* residential community. A perception-based method is clearly a better approach than a single absolute limit, and, in fact, many years of experience have shown that this approach is working well in these three states. Based on an assumed generic background level of 33 dBA for rural areas where wind projects are usually sited, the effective design level for a new project would range from 38 to 40 dBA in these three states.

3.5 Local Standards

Finally, it should be mentioned that countless counties and local municipalities have enacted noise laws and ordinances specifically with respect to wind turbine projects—usually in response to a proposed project. Most commonly an absolute limit of 50 dBA is prescribed. Field experience, which is discussed in further detail in Sec. 4, indicates that such a limit is insufficient to avoid annoyance from wind turbine noise if the actual project sound level closely approaches this limit.

3.6 Summary of Existing Guidelines and Standards

Table 3 summarizes the general noise limits and guidelines from all known existing entities domestic and foreign that would be relevant to typical wind turbine projects in rural areas.

4 DIRECT EXPERIENCE AND PREVIOUS ANNOYANCE STUDIES

It is only through field experience testing newly operational wind projects that the actual community reaction can be directly compared to the sound levels produced by a project. Over the last few years we have had the opportunity to conduct sound surveys at 8 new operational wind turbine sites, of which 7 may be considered representative of the typical U.S. domestic project in the sense that a fairly large number of turbines (50 to 100) are sited over a large area within which there is a fairly uniform distribution of farms and homes; i.e., the turbines and residences are thoroughly intermixed. Out of these 7 typical project sites long-term sound monitoring surveys were carried out at 5, usually over a 2 to 3 week period. The principal objective of these surveys was to determine whether the projects were compliant with the applicable regulatory noise limit (usually 50 dBA) but they also afforded important opportunities to quantify the sound levels produced exclusively by the project at a number of the closest homes and to compare these measurements with model predictions. In addition, the community reaction to each project could be generally discerned because monitors were deliberately placed at the homes of all those who were known to have complained or otherwise expressed concern about noise, whether participating in the project or not. Monitoring stations were also set up at other homes where no complaints had been received but where maximum project sound levels were expected based on modeling. Informal discussions about the resident's subjective reaction to project noise occurred at most monitoring positions.

In general, these studies involved continuous monitoring in 10 minute increments over at least a 14 day period at numerous on-site positions supplemented by a number of off-site monitors generally 2 miles beyond the project perimeter recording the likely concurrent background sound level without any project noise. In this way it was possible to reasonably correct the

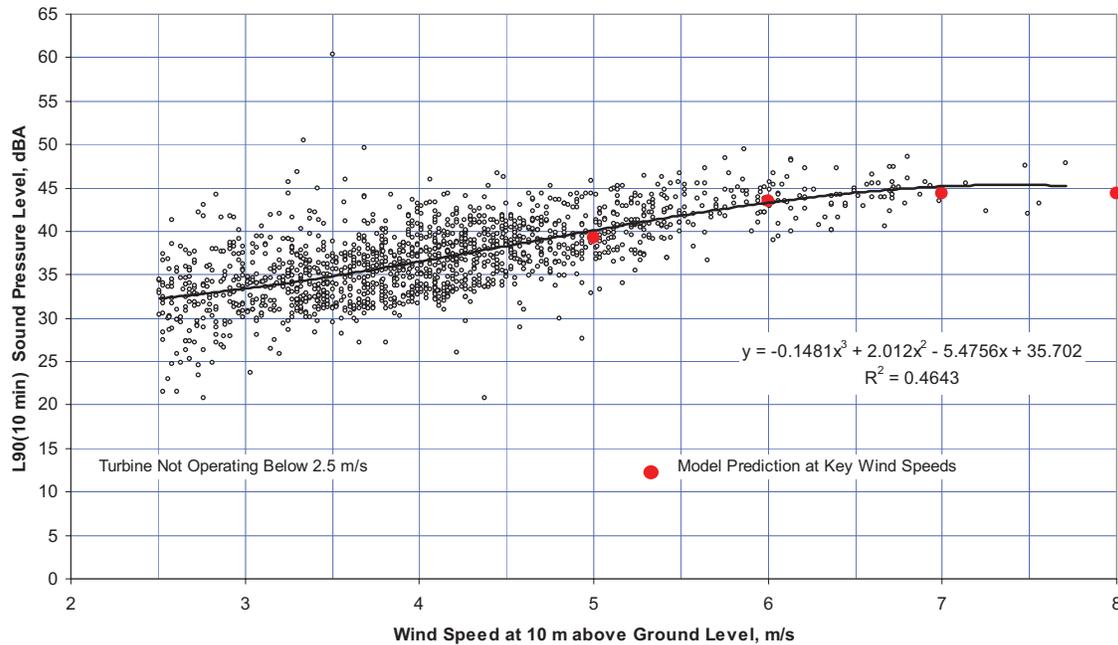


Fig. 5—Measured vs. modeled sound levels at a typical on-site receptor.

on-site sound levels for background noise contamination (which is often very significant during windy conditions) thereby deriving the project-only sound level at each position—the quantity predicted by analytical models. As an example, Fig. 5 is a typical plot that shows the corrected project-only sound level as a function of wind speed rather than time. The scatter in the data, which is typical and expected, is due to fluctuations in the project sound level at the observation point due to variations in atmospheric conditions (path effects) and fluctuations in the aerodynamic noise produced by the rotor due to inevitable inconsistencies in wind speed, gradient or direction (source effects). More importantly, Fig. 5 shows the essentially universal result from all positions in all the surveys that the model predictions at integer wind speeds agree extremely well with the mean trend through the measured performance, thus demonstrating that ISO 9613-2¹¹ (assuming a moderate 0.5 ground absorption coefficient) is a perfectly valid methodology for predicting wind turbine sound levels, recognizing that path and source effects will lead to levels that vary by about ± 5 dBA about the predicted mean.

In terms of noise impact, the results of these studies indicate that the actual degree of adverse impact, defined as the number of serious complaints relative to the total number of households in the project area (within 2000 ft. of the project perimeter), was fairly small at about 4%. The specific numbers associated with each project are tabulated in Table 4.

Just because the total number of complaints is fairly small in each case one should not be dismissive of

these people, because there were usually one or two at each site that were profoundly disturbed by project noise. However, it must also be said that the vast majority of people apparently had no objections to noise, even people who consistently experienced turbine sound levels in the 45 to 50 dBA range. Based on discussions with non-participating and participating residents at more or less randomly selected monitoring positions in close proximity to turbines, the most common reaction was generally that operational noise was certainly audible, particularly during certain wind conditions or times of day, but that it was to be expected and they didn't pay any real attention to it. Of course, this general assessment is not the result of a rigorous scientific study on wind turbine annoyance; that was never the objective of the surveys, but a milder than anticipated reaction was observed at each site.

The low apparent rate of adverse reaction to projects where numerous residences were exposed to relatively high sound levels (up to 55 dBA in some cases) was surprising because it stood in stark contrast to the results of previous annoyance studies; in particular, the extensive work carried out from 2000 to 2007 in Sweden and the Netherlands by Pedersen and Persson Waye¹² and Persson Waye¹³. These studies generally predict an annoyance rate ranging from 10 to 45%, or more, for wind project sound levels in the 40 to 45 dBA range. For example, the earliest study¹², based on questionnaire responses collected in 2000 from residents living in proximity to five small wind projects in Sweden, found the annoyance rate as a function of sound level plotted in Fig. 6.

Table 4—Number of observed complaints relative to the total number of households in close proximity to turbines.

Project	Total Households in the Site Area (Approx.)	Number of Complaints as a Function of Project Sound Level (dBA) (1)			Total Number of Complaints	Percentage Relative to Total Households
		<40	40–44	45 or Higher		
Site A	107	0	2	1	3	3%
Site B	147	0	3	3	6	4%
Site C	151	0	3	0	3	2%
Site D	268	0	2	4	6 (2)	2%
Site E	91	1	1	4	6	7%
Overall Average:						4%

(1) Sound levels expressed as long-term, mean values
 (2) There were only 3 reported complaints at this site but others may have existed that we were not made aware of; hence a total number of 6 were assumed

This steeply rising curve apparently indicates that a sound level of 40 dBA, for instance, leads to a 26% annoyance rate, implying that out of the study population of 513, 133 were highly annoyed. However, this is not at all the case. On further analysis it turns out that the response curve percentage is not related to the overall study population—i.e., the total number of households within the project area with a predicted sound level of 30 dBA or more, whether they responded to the survey or not—but rather to the percentage of people exposed to a particular sound level that reported annoyance due to that sound level (see Table 5 of the paper). Now it must be pointed out that only 351 of the 513 individuals forming the study population returned the questionnaire, so the views of the missing 32% are not known, but in the

37.5 to 40 dBA category, for example, 20% of the 40 respondents exposed to that sound level range reported being highly annoyed—which is just 8 people. Viewed in terms of the overall population of 513 that is equivalent to a highly annoyed response of just over 1% for that particular sound level range (37.5 to 40 dBA). In general, across all sound level ranges the total number of people responding that they were highly annoyed was 31, or 6% of the total number of households. In contrast to the alarmingly steep response rate curve in Fig. 6, this 6% figure agrees much more closely with the 4% complaint rate (based on the total number of households) observed during our own field studies of projects in the United States. A further and much larger questionnaire study modeled on the 2000 study was performed in the Nether-

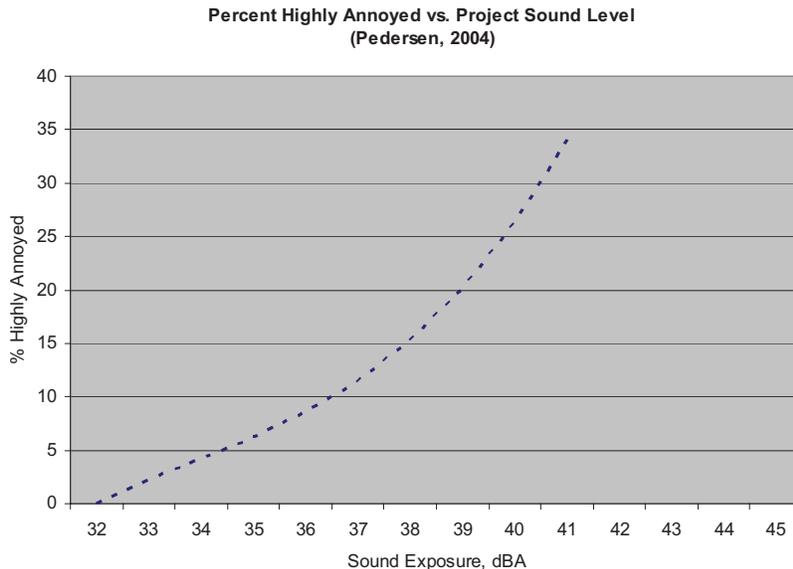


Fig. 6—Response analysis from Pedersen¹⁴.

lands in 2007 and reported in 2009 (Pedersen et al.¹⁴). This study is the most representative of current projects with large turbines and essentially flat topography. In this study out of 1948 queries sent out 708 were received. Across all sound level categories a total of 29 respondents (back-calculated from the results expressed as percentages in Table 2) reported being very annoyed. If only the 708 respondents are assumed to make up the pool of potentially affected residences in the project area (rather than 1948), this equates to a 4% rate of high annoyance.

On the other side of the coin, the number of individuals concerned about or annoyed by noise at each of the sites we studied may not have been definitive, since the number represents those who were troubled enough to call in and complain, as reported by project management, and any others we may have learned of indirectly in discussions with neighbors. The possibility that others were annoyed certainly cannot be ruled out and, in fact, seems likely but it appears that the actual rate of serious annoyance to noise from wind projects may not be nearly as high as previously supposed.

5 LOW FREQUENCY NOISE AND ADVERSE HEALTH EFFECTS

Harmful, or at least disturbing levels of low frequency or infrasonic noise and potential adverse health effects are almost always feared, based largely on internet misinformation, and cited as major reasons why proposed projects should not go forward. However, the fact of the matter is that wind turbines do not produce significant or even remotely problematic levels of low frequency noise and that a link between health complaints and turbine noise has only been asserted based on what is essentially anecdotal evidence without any valid epidemiological studies or scientific proof of any kind. The latter assertions are all the more suspect in that they are often predicated on or directly associated with the assumed existence of high levels of low frequency noise.

It is well outside the scope of this paper to go over the basis for these conclusions but readers are referred to a recent review by a panel of independent doctors on wind turbine health effects¹⁵ and some extensive testimony by the leading experts in the field (now public record) regarding potential low frequency noise impacts recently filed in conjunction with a proposed wind project in Wisconsin¹⁶.

Because low frequency noise from wind turbines, essentially irrespective of distance, is well below the point where it might begin to be audible or initiate perceptible vibrations (windows or dishes rattling, for example) there is no actual need for a design goal or regulatory limit. However, if one desires just to be on

the safe side, so to speak, a limit of 65 dBC might be used. In over 30 years of investigating countless genuine low frequency noise complaints, usually associated with simple cycle combustion turbines, there was only one outlier below 65 dBC. A maximum regulatory limit of 70 dBC is recommended if one must have a low frequency limit.

Having said that, it must be strongly cautioned that C-weighted sound levels do not mix well with wind turbine applications because it is extremely difficult to accurately measure C-weighted sound levels in the presence of any kind of wind¹⁷. Self-generated, false signal noise, which occurs in the low frequencies, from wind blowing through even sophisticated windscreens and over the microphone tip will drastically elevate the apparent C-weighted sound level and, by extension, the *apparent* low frequency sound level. Consequently, it would be a significant technical challenge to accurately field verify the C-weighted performance of a wind turbine project. Any casual measurement in a windy field will ostensibly yield a relatively high C-weighted sound level, possibly in excess of the 65 to 70 dBC levels suggested above, whether a wind turbine is present—or not.

Finally, Fig. 3 also shows the measurement location prescribed in IEC 61400-11 for determining the sound power level from wind turbines. Sound pressure is measured on a reflective ground plane with the microphone on the surface where wind speed is theoretically zero, but a $\frac{1}{2}$ sphere wind screen will blow away unless attached securely. Still another common example is dry leaves blowing along the ground in fall. Even with this test set up, measurement of LFN is problematical.

6 RECOMMENDED DESIGN GOALS AND NOISE LIMITS

Based on the existing guidelines and limits outlined in Sec. 3, combined with our direct experience summarized in Sec. 4, the following design goals and regulatory limits given in Table 5 are recommended.

The nighttime level of 40 dBA is suggested as an ideal design goal rather than a firm regulatory limit because a legal limit must reasonably protect the public from legitimate annoyance and, at the same time, not stand completely in the way of economic development, which 40 dBA would tend to do in some instances. Because the actual number of complaints observed at sites where the project sound level exceeded, or even substantially exceeded, 40 dBA is small at 4%, a sound level of 45 dBA at residences, as an ordinance or legal limit, appears to balance the desire on everyone's part to avoid complaints and annoyance on the one hand with practical constructability on the other. Sound levels of less than

Table 5—Recommended regulatory noise limits and design goals for wind turbine projects.

	Sound Level, dBA (1)	Applicable	Time of Day
Regulatory Limit:	45	Outside Residences	Day and Night
Design Goal:	40	Outside Residences	7 p.m. to 7 a.m.

(1) Long-term, mean project sound level (normally measured in terms of the L90(10 min) statistical sound level)

45 dBA would theoretically lead to a very low complaint rate of 2% based on the data in Table 4.

It is important to note that both of the levels above are mean, long-term values and not instantaneous maxima. Wind turbine sound levels naturally vary above and below their mean or average value due to wind and atmospheric conditions and can significantly exceed the mean value for brief periods. As illustrated in Fig. 5, project sound levels commonly fluctuate by roughly ± 5 dBA about the mean trend line but short-lived (10 to 20 minute) spikes on the order of 15 to 20 dBA above the mean are occasionally observed (less than 1% of the time) that are ostensibly attributable to turbine noise—although the possibility exists that some or all are extraneous noise events. Because it would be completely impractical to design any project so that all such spikes would remain below the 40 and 45 dBA, these values are expressed as long-term mean levels, or the central trend line through the data scatter as shown in Fig. 5.

Some degree of dissatisfaction due to audibility is largely inevitable. The very definition of noise is unwanted (audible) sound. For example, in isolated incidences we are familiar with complaints have been engendered by wind project sound levels as low as 23 and 34 dBA. Therefore an objective of completely eliminating the possibility of any negative response is largely impractical and the imposition of extremely low regulatory noise limits or of vast minimum setbacks—as championed by James and Kamperman¹⁸, for instance—would not necessarily eliminate all adverse impact but would, in fact, make most projects impossible to build, even in sparsely populated areas of the country.

During the design phase of a wind project, particularly for projects where the turbines are interspersed amidst a number of homes, there are several options, outlined below, that are available for mitigating potential project noise and bringing the project, hopefully, into conformance with one or both the recommended noise levels.

6.1 Site Layout Optimization

The most useful and effective method by far is the optimization of the site plan through iterative noise

modeling. This technique, which has been successfully applied to a number of projects, involves developing a baseline model of the project as initially conceived in terms of a sound contour map and then hypothetically relocating or removing certain units in order to *ideally* place all of the potentially sensitive receptors within the site area outside of the 40 dBA contour line.

The baseline layout is usually driven by where participating land parcels are in general and where the wind resource is best on those parcels in particular, rather than by noise concerns. Consequently, some degree of improvement, i.e., a reduction in the predicted sound levels at residences, can almost always be realized—so long as it is early enough in the design process that significant changes can be made. In fact, the best time to start evaluating potential noise impacts is when a project has just begun to coalesce and is considered generally viable, even if only a hypothetical or estimated turbine layout is all that is available for modeling. All too often noise is only considered at the eleventh hour just prior to submittal of the permit application, or even construction, when the flexibility to move turbines has been utterly lost.

Because of the numerous other constraints that always exist on exactly where turbines can be built, it is often necessary to go through several iterations of noise modeling to find the optimal arrangement that minimizes noise and still satisfies all other concerns.

6.2 Low Noise Operating Modes

If physical changes to the turbine site plan cannot be made or are still insufficient to realize the desired performance, further targeted reductions can sometimes be made by operating specific units in low noise operating mode—something that can also be evaluated prior to construction through iterative modeling. While still not universally available as an option on all turbine makes and models, there now appears to be a trend towards incorporating this capability into most new units or retrofitting it on existing models. Noise reductions of up to 5 dB relative to normal performance (it is claimed by some manufacturers) can nominally be achieved primarily through electronic manipulation of the blade pitch. Although this operating mode could theoreti-

cally be employed at all times, it adversely affects power production at higher wind speeds so it not desirable, or in some cases even economically unfeasible, to permanently de-rate the turbines; consequently, this option is more appropriate for use as a temporary measure under certain weather conditions or times of day, most likely during the critical nighttime hours when noise is typically more of an issue.

6.3 Operational Curtailment

Curtailment of operation, or temporarily shutting down specific turbines, is obviously onerous to the economics of a project that clearly involves a large capital investment, but it may be less devastating than first thought. The temporary shutdown of just one unit (overnight, for instance) can sometimes make a dramatic difference in the sound level at a particular point of interest. Depending on the geometry of the situation, model simulations taken from actual projects indicate that noise reductions from 2 to 8 dBA can be achieved by shutting down only the *single nearest* turbine to a particular house.

7 CONCLUSIONS

Measurements of operational wind turbine projects indicate that turbine noise is usually most perceptible relative to the background level at night suggesting that design goals and regulatory limits should either be focused on nighttime conditions or have differing goals for night and day

Existing guidelines and regulatory limits, interpreted within the context of the quiet rural environments in which wind projects are normally sited, generally point to a design goal sound level of 40 dBA at night and 45 dBA during the day.

Experience in measuring the sound levels produced by newly operational wind projects and comparing those levels to actual community reaction indicates that the number of complaints relative to the total number of potentially affected households within a given project area is fairly low at roughly 4% in cases where project sound levels exceed or even substantially exceed 40 dBA at residences. This finding was also found to generally agree with previous European research but only when the number of questionnaire responses reporting high annoyance is similarly viewed relative to the overall number of potentially affected households rather than by exposure levels.

Field surveys of operational projects also generally indicate that complaints engendered by wind turbine sound levels below 40 dBA are very rare therefore

suggesting that new wind projects should use a nighttime sound level of 40 dBA as an ideal design goal at all residences to minimize the probability of annoyance and complaints with a higher level of 45 dBA applicable during the day. However, the low (2%) rate of complaints observed in the studies when the project sound level was below 45 dBA points to this value (45 dBA) as an appropriate regulatory limit, irrespective of time of day, since it appears to strike a balance between the reasonable prevention of annoyance and what is generally achievable in terms of project sound levels at typical project sites.

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