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Subject: *Hartmann 2 Farm Solar - Noise Assessment
Kane County, Illinois*

Executive Summary

The purpose of this technical memorandum is to evaluate potential noise levels associated with the operational equipment to be located at the proposed Hartmann 2 Farm Solar Site in Kane County, IL. The proposed solar photovoltaic project site is located approximately half a mile west of Lily Lake, approximately 1 mile east of Virgil, approximately 3.5 miles southeast of Burlington, and approximately 3.5 miles northwest of Elburn.

The proposed Hartmann 2 Farm Solar Site will be developed on nearly 10 acres of an approximately 27-acre parcel of agricultural land in an unincorporated portion of Kane County, IL, with Read Road to the south, IL-47 to the east, and Lees Road/County Road 14 to the north. The site will consist of solar arrays throughout the project area, ten (10) string inverters and one (1) transformer located on an equipment pad towards the eastern portion of the site, and one (1) battery storage cabinet located just west of the equipment pad.

Noise Regulations

Chapter 25, Article V, Section 25-5-4-9 of the Kane County, IL Code of Ordinance states that “Noise levels from Commercial Solar Energy Facilities shall be in compliance with applicable Illinois Pollution Control Board (IPCB) regulations.”

The IPCB noise regulations are based on allowable octave band sound pressure levels during daytime and nighttime hours. According to Title 35 (Environmental Protection), Subtitle H (Noise), Chapter I (Pollution Control Board), Part 901 (Sound Emission Standards and Limitations for Property Line-Noise Sources), a facility operating in an agricultural field (Class C Land) cannot cause an exceedance of sound levels at any point within a residential land use (Class A Land) during daytime hours as shown in **Table 1**.

Table 1: Maximum Allowable Sound Emitted to Class A Land During Daytime Hours

Octave Band Center Frequency (Hertz)	Allowable Octave Band Sound Pressure Levels (dB) of Sound Emitted to any Receiving Class A Land from		
	Class C Land	Class B Land	Class A Land
31.5	75	72	72
63	74	71	71
125	69	65	65
250	64	57	57
500	58	51	51
1000	52	45	45
2000	47	39	39
4000	43	34	34
8000	40	32	32

The IPCB has also established the allowable octave band sound pressure levels for nighttime hours shown in **Table 2**. Since the solar array does not generate power at night, the equipment will not operate at night and will comply with the IPCB nighttime hour limits; however, the BESS operations were analyzed against the nighttime hour limits as a conservative measure.

Table 2: Maximum Allowable Sound Emitted to Class A Land During Nighttime Hours

Octave Band Center Frequency (Hertz)	Allowable Octave Band Sound Pressure Levels (dB) of Sound Emitted to any Receiving Class A Land from		
	Class C Land	Class B Land	Class A Land
31.5	69	63	63
63	67	61	61
125	62	55	55
250	54	47	47
500	47	40	40
1000	41	35	35
2000	36	30	30
4000	32	25	25
8000	32	25	25

Noise Assessment

Noise levels from anticipated operational equipment likely to be installed at the proposed Hartmann 2 Farm Solar Site were evaluated to assist with determining a conservative distance that the equipment should be located from the closest Class A land use.

Inverters

Photovoltaic (PV) inverter equipment can generate steady, unvarying noise that may create issues when located near noise-sensitive uses. It was assumed that ten (10) string inverters would be located on an equipment pad in the eastern portion of the proposed solar site. Based on noise emission levels for CPS SCH100/125KTL-DO/US-600 string inverter equipment, a reference sound level of approximately 65 dB(A) at 1 meter (i.e., 3 feet) for a string inverter was used. Additionally, it is

to be noted that the inverters would only be operational during daytime hours. **Table 3** shows the octave band emission levels for the CPS SCH100/125KTL-DO/US-600 string inverter used for reference. The sound emissions from the operation of the string inverters were calculated using SoundPLAN.

Table 3: Sound Emissions for String Inverter

Octave Band Center Frequency	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Frequency Sound Level	28	46	65	70	72	72	71	72	63

Transformers

Transformer equipment can also generate steady, unvarying noise that may create issues when located near noise-sensitive uses. It was assumed that one (1) 1,500 kilo-volt-ampere (kVA) transformer would be located on an equipment pad in the eastern portion of the proposed solar site. Based on the National Electrical Manufacturers Association (NEMA) average decibel ratings for a 1,500 kVA transformer, a reference sound pressure level of 60 dB(A) at 1 meter for the transformer was used. Additionally, it is to be noted that the transformer would be operational during daytime and nighttime hours. **Table 4** shows the octave band emission levels for the proposed transformer. The sound from the operation of the transformer was calculated using SoundPLAN.

Table 4: Sound Emissions for a 1,500 kVA Transformer

Octave Band Center Frequency	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Frequency Sound Level	17	37	49	51	57	54	50	45	36

Sound generated by the transformers is not anticipated to significantly contribute to the existing environmental sound levels surrounding the site.

Battery Storage Cabinet

Battery storage cabinets can also generate steady, unvarying sound that may create issues when located near noise-sensitive areas. According to the current site layout, one (1) battery storage cabinet will be located just west of the equipment pad in the eastern portion of the site. Noise emission data was not available for review for the Gotion GRID 5015 battery storage cabinet. However, based on noise emission data provided for similar equipment, a reference sound power level of approximately 83 dBA was used. Additionally, it is to be noted that the battery storage cabinet

would only be operational during nighttime hours. **Table 5** shows the octave band sound power levels for a single battery storage cabinet used for reference.

Table 5: Sound Power Levels for a Battery Storage Cabinet

Octave Band Center Frequency	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
Frequency Sound Level	45.2	48.1	50.7	52.9	59.9	58.6	59.7	67.0	66.7	69.3
Center Frequency	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz
Sound Level	68.1	69.0	70.0	71.5	72.6	73.1	73.0	72.7	71.3	70.1
Center Frequency	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Sound Level	69.2	67.9	65.0	63.1	61.4	58.6	54.1	48.8	47.8	34.2

The anticipated noise level contours from the operation of inverter, transformer, and battery storage cabinet equipment are shown in **Figure 1** and **Figure 2**.

Figure 1: Anticipated Noise Level Contours During Daytime Hours

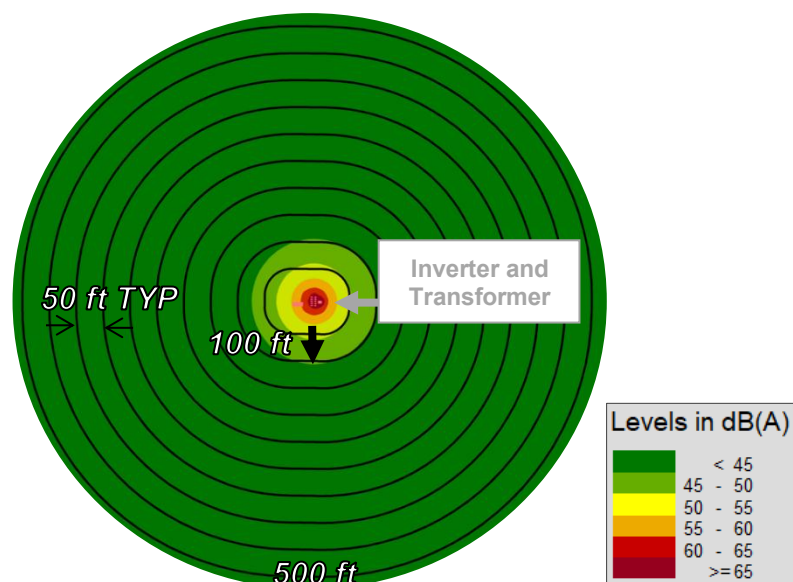
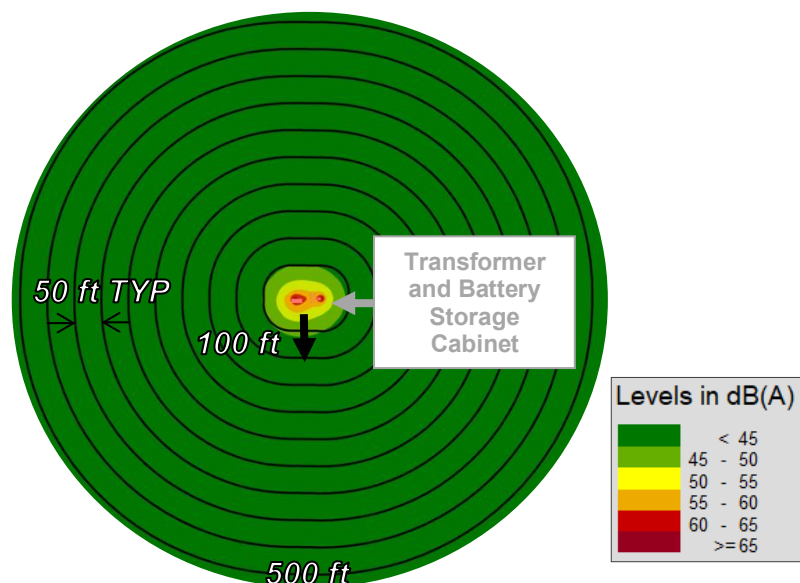


Figure 2: Anticipated Noise Level Contours During Nighttime Hours



Recommendations and Conclusion

Based on the analysis of this memo, if the inverter, transformer, and battery storage cabinet equipment are located approximately 100 feet or greater from the closest Class A land use, then operational noise levels are anticipated to be in compliance with the IPCB noise regulations. See **Table 6** and **Table 7** below for the SoundPLAN-predicted octave band noise levels at a distance of approximately 100 feet from the inverter, transformer, and battery storage cabinet equipment during daytime and nighttime hours, respectively.

Table 6: Predicted Octave Band Sound Emissions for Inverter and Transformer Operations at 100 feet During Daytime Hours

Octave Band Center Frequency	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Maximum Octave Band SPLs from Inverters	1.7	20.2	33.7	31.5	35.4	39.5	39.1	39.8	27.4

Table 7: Predicted Octave Band Sound Emissions for Transformer and Battery Storage Cabinet Operations at 100 feet During Nighttime Hours

Octave Band Center Frequency	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Maximum Octave Band SPLs from Inverters	14.4	24.2	29.0	26.1	30.6	35.8	33.6	28.1	17.7

The inverter, transformer, and battery storage cabinet equipment at the Hartmann 2 Farm Solar Site are located approximately 575 feet from the closest Class A land use; therefore, noise emission levels from the inverter, transformer, and battery storage cabinet equipment are anticipated to comply with the applicable IPCB allowable octave band sound pressure level limits shown in **Table 1** and **Table 2** at the Class A land uses surrounding the site. Noise mitigation measures are not recommended at this time.