ConnectGen Montgomery County LLC

Mill Point Solar I Project

Matter No. 23-00034

§ 900-2.8 Exhibit 7

Noise and Vibration

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Glossary Terms

Applicant:	ConnectGen Montgomery County LLC (ConnectGen), a direct subsidiary of ConnectGen LLC, is the entity seeking a siting permit for the Facility from the Office of Renewable Energy Siting (ORES) under Section 94-c of the New York State (NYS) Executive Law.
Facility:	The proposed components to be constructed for the generation, collection and distribution of energy for the Project will include: photovoltaic (PV) solar modules and their rack/support systems; direct current (DC) and communications cables connecting the panels to inverters; the inverters, with their support platforms, control electronics, and step-up transformers; buried alternate current (AC) medium voltage collector circuits; fencing and gates around each array of modules; access roads; temporary laydown/construction support areas; a medium voltage-to-transmission voltage substation with associated equipment and fenced areas; a new 3-breaker ring bus point of interconnection switchyard (POI switchyard); two adjacent approximately 305 foot-long 345 kV transmission line segments to interconnect the new POI switchyard to the existing National Grid Marcy – New Scotland 345-kilovolt transmission line; and an operations and maintenance (O&M) building with parking/storage areas as well as any other improvements subject to ORES jurisdiction.
Facility Site:	The tax parcels proposed to host the Facility, which collectively totals 2,665.59 acres.
Point of Interconnection (POI) or POI Switchyard:	A new 3-breaker ring bus point of interconnection switchyard will be constructed adjacent to the existing National Grid Marcy – New Scotland 345-kilovolt transmission line; the substation will tie into the new POI switchyard via an overhead span and deliver power produced from the Facility onto the electric grid through two overhead spans tapping the National Grid-owned Marcy – New Scotland 345-kV transmission line. The POI switchyard is located off Ingersoll Road in the northeastern portion of the Facility Site.

Limits of Disturbance (LOD):	The proposed limits of clearing and disturbance for construction of all Facility components and ancillary features are mapped as the LOD. The LOD encompasses the outer bounds of where construction may occur for the Facility, including all areas of clearing, grading, and temporary or permanent ground disturbance. This boundary includes the footprint of all major Facility components, defined work corridors, security fencing, and proposed planting modules, and incorporates areas utilized by construction vehicles and/or personnel to construct the Facility.
Project or Mill Point Solar I	Collectively refers to permitting, construction, and operation of the Facility, as well as proposed environmental protection measures and other efforts proposed by the Applicant.
Study Area:	In accordance with the Section 94-c Regulations, the Study Area for the Facility includes a radius of five miles around the Facility Site boundary, unless otherwise noted for a specific resource study or Exhibit. The 5-mile Study Area encompasses 96,784.84 acres, inclusive of the 2,665.59-acre Facility Site.

Acronym List

AC	Alternating current
ANSI	American National Standards Institute
ASA	Acoustical Society of America
ATV	all-terrain vehicle
BIL	Basic Insulation Level
BMP	best management practice
Cmet	meteorological correction
dB	Decibel
dBA	A-weighted decibel
DC	Direct current
Epsilon	Epsilon Associates, Inc.
FHWA	Federal Highway Administration
G	ground absorption factor
GIS	Geographic Information System
kV	Kilovolt
HDD	horizontal directional drilling
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
INCE	Institute of Noise Control Engineering
ISO	International Organization for Standardization
Leq	equivalent continuous sound level
M	meters
LOD	Limits of disturbance
MVA	megavolt-ampere
MW	Megawatt
NED	National Elevation Dataset
NEMA	National Electrical Manufacturers Association
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
O&M	Operations and maintenance
ORES	Office of Renewable Energy Siting
OSHA	Occupational Safety and Health Administration
POI	Point of Interconnection
PV	Photovoltaic
RCNM	Roadway Construction Noise Model
ROW	right-of-way
SAE	Standard Automotive Engineering
SRIS	System Reliability Impact Study
USGS	United States Geological Survey
WHO	World Health Organization

EXHIBIT 7 NOISE AND VIBRATION

7(a) Name of Preparer

This Exhibit includes a detailed analysis of the potential sound impacts associated with the construction and operation of the Mill Point Solar I Project (Project or Facility). Exhibit 7 was prepared by Mr. Christopher Hoyt of Epsilon Associates, Inc. (Epsilon). Mr. Hoyt has over ten years of experience in the areas of community noise impacts, meteorological and sound level data collection, and analyses. He is a full member of the Institute of Noise Control Engineering (INCE). The modeling performed by Epsilon for the Facility is sufficiently conservative in predicting sound impacts and includes all proposed inverters and the substation operating at their maximum capacities.

7(b) Noise Design Goals for the Facility

The design goals for the Facility are described below.

i) A maximum noise limit of forty-five (45) A-weighted decibels (dBA) equivalent continuous sound level (L_{eq}) (8-hour), at the outside of any existing non-participating residence, and fifty-five (55) dBA L_{eq} (8-hour) at the outside of any existing participating residence. The Facility meets these limits as discussed in Section 7(l).

ii) A maximum noise limit of forty (40) dBA L_{eq} (1-hour) at the outside of any existing non-participating residence from the substation equipment. The Facility meets these limits as discussed in Section 7(l).

iii) A prohibition on producing any audible prominent tones, as defined by using the constant level differences listed under American National Standards Institute (ANSI) S12.9-2005/Part 4 Annex C (sounds with tonal content), at the outside of any existing non-participating residence. Should a prominent tone occur, the broadband overall (dBA) noise level at the evaluated non-participating position shall be increased by 5 dBA for evaluation of compliance with subparagraph (i) and (ii) of this paragraph. The inverter and substation transformer currently under consideration for this Project are assumed to be tonal, thus accept the 5 dBA tonal penalty for compliance. Even with the 5 dBA penalty, the Facility meets these limits as discussed in Section 7(e).

iv) A maximum noise limit of fifty-five (55) dBA L_{eq} (8-hour), short-term equivalent continuous average sound level from the Facility across any portion of a non-participating property except for portions delineated as New York State (NYS) regulated wetlands pursuant to 19 New York Codes, Rules and Regulations (NYCRR) Section 900-1.3(e) and utility right-of-way (ROW) to be demonstrated with modeled sound contours drawings and discrete sound levels at worst-case locations. No penalties for prominent tones will be added in this assessment. The Facility meets these limits as discussed in Sections 7(k) and 7(l).

There are no applicable sound level requirements in the Town of Glen.

7(c) Radius of Evaluation

All sensitive receptors within at least a three thousand (3,000) foot radius from any noise source (e.g., substation transformer(s), inverters) proposed for the Facility or within the thirty (30) dBA noise contour, whichever is greater, were included in the analysis. Each of these sensitive receptors are visible in Figure 7-1.

A cumulative analysis requires noise modeling to include any solar facility and substation existing and proposed by the time of filing the application, and any existing sensitive receptors within a 3,000-foot radius from any noise source proposed for this Facility, or within the 30 dBA noise contour, whichever is greater (Study Area). The Applicant, ConnectGen Montgomery County LLC (ConnectGen), is proposing to permit and construct the Mill Point Solar I Project, an up to 250 megawatts (MW), utility-scale alternating current (AC) photovoltaic (PV) solar facility in the Town of Glen, Montgomery County, New York. ConnectGen is working on the early-stage development of a separate project referred to as the Mill Point Solar II Project, an up to 100 MW, AC PV solar facility that would also be located in the Town of Glen, Montgomery County, New York. At the time of filing the 94-c permit application for the Mill Point Solar I Project, ConnectGen does not have a final boundary for the Mill Point Solar II Project and has not committed to the location of any facilities for Mill Point Solar II. It is anticipated though, that the distance between Mill Point Solar I and Mill Point Solar II will be approximately 3,300 feet at the narrowest point. The System Reliability Impact Study (SRIS) for Mill Point Solar II is reviewing the capacity of the National Grid Marcy – New Scotland 345 kilovolt (kV) line to handle the new Project, but the Point of Interconnection (POI) switchyard and substation location(s) have not been selected or finalized. The potential does exist for the Mill Point Solar II substation to be collocated with the Mill Point Solar I substation. If that option is deemed suitable, the Mill Point Solar I substation's sound mitigation has been designed to address a second transformer of equal (263 megavolt-amperes (MVA), (ONAF2)) or smaller size adjacent to the Mill Point Solar I transformer. For further information see Section 7(d) and Section 7(o).

To the northeast of the proposed Mill Point Solar I Project along Van Epps Road two community solar farms are currently under construction. These are the Van Epps & Mohawk View community solar farms that are being developed by Eden Renewables and will be operated by DG New York CS, LLC. These are two adjacent sites, each with a capacity of approximately 5 MW. The Applicant was unable to obtain any publicly available information with regards to these two community solar farms design layouts or proposed equipment and associated sound levels. Information was requested for the two solar projects on Van Epps Road from the Town of Glen Town Clerk through email on September 12, 2023, and checked in on status of the request on September 27, 2023. A response was not received. As a result, the Applicant acknowledges the existence of the Van Epps & Mohawk View community solar farms, along with the proposed Mill Point Solar II Project within the Town of Glen. At this time though, due to the lack of a formalized design layout and equipment, Epsilon was unable to perform a cumulative analysis for the Mill Point Solar I Project.

7(d) Modeling Standards, Input Parameters, and Assumptions

An estimate of the noise level to be produced by the Facility was made using the following assumptions.

(1) Future sound levels associated with the Facility were predicted using the CadnaA noise calculation software developed by DataKustik GmbH. This software implements the International Organization for Standardization (ISO) 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation) for full octave bands from 31.5 Hertz (Hz) to 8000 Hz. As per ISO 9613-2, all calculations assumed favorable conditions for sound propagation, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night or equivalently downwind propagation. In addition, the ISO 9613-2 standard assumes all receptors are downwind of every sound source simultaneously. No meteorological correction (Cmet) was added to the results, pursuant to 19 NYCRR Section 900-2.8(d).

Elevation contours for the modeling domain were directly imported into CadnaA which allowed for consideration of terrain shielding where appropriate. The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the United States Geological Survey (USGS).

In addition to modeling at discrete points, sound levels were also modeled throughout a large grid of receptor points, each spaced 10 meters apart to allow for the generation of sound level isolines. Tabular results and sound level isolines were calculated and generated for the entire Study Area.

i) All sound sources were assumed to be operating simultaneously at maximum sound power levels. The substation was also modeled by itself operating at maximum sound power level.

The sound power levels for each source used in the modeling are discussed below.

Inverters

The sound level analysis includes sixty (60) inverters as provided to Epsilon by the Applicant. The source location coordinates, ground elevations, and heights above ground are summarized in Appendix 7-1. One inverter manufacturer (Sungrow) was evaluated for this analysis. All 60 of the proposed inverters will be Sungrow inverters with identical specifications. The inverter manufacturer, power ratings, and dimensions examined for this assessment are presented below in Table 7-1.

Table 7-1. Power Inverter Analyzed for Sound Level Assessment

Manufacturer	Inverter Model	Maximum Electrical Output [kVA]	Dimensions [WxHxD] [m]
Sungrow	SG4400UD-MV	5,060	6.058 x 2.896 x 2.438

Broadband and whole octave band sound pressure level measurements for the Sungrow inverter operating under typical (daylight) conditions were provided by the Applicant[1]. A technical measurement report of the Sungrow inverter is located in Appendix 7-8. Sound power level calculations were then carried out using ANSI S12.56 (ISO 3746) – Enveloping surface (parallelepiped) method. Under peak sound level producing conditions (daylight), the inverter has a sound power level of 101 dBA. The octave band sound power levels are presented in Table 7-2 for the inverter.

1 Noise Test Report for Sungrow SG4400UD-MV PV Inverter, provided August 18, 2023.

Table 7-2. Inverter Octave Band Sound Power Levels

Inverter Type	Broadband Sound Power Level [dBA]	Sound Power Levels per Octave-Band Center Frequency [Hz]								
		31.5	63	125	250	500	1k	2k	4k	8k
		dB	dB	dB	dB	dB	dB	dB	dB	dB
Sungrow SG4400UD-MV	101	107	97	94	92	97	96	94	91	81

Substation

Along with the inverters, there will be a substation located within the Facility Site. One step-up transformer is proposed for the substation. The maximum sound level is determined in reference to the National Electrical Manufacturer's Association (NEMA) standard NEMA TR-1-2013, Transformers, Step Voltage Regulators and Reactors. The proposed transformer is rated at 158/210/263 MVA and 1175 kV Basic Insulation Level (BIL). Based on Table 1 of this standard, the transformer's maximum sound pressure level will be 88 dBA with fan cooling (ONAF2). Epsilon has conservatively estimated the sound emissions for the 263 MVA transformer using the techniques in the Electric Power Plant Environmental Noise Guide (Edison Electric Institute). The substation transformer is modeled with a sound power level of 98 dBA with the cooling fans on, which includes 10 decibels (dB) of attenuation relative to the NEMA TR-1 standard. The 10 dB reduction will be specified as part of the transformer, when securing the transformer for the substation. A design review plan of the expected substation transformer has been supplied by the Applicant and is provided in Appendix 7-7.

In addition to the transformer, one heating, ventilation, and air conditioning (HVAC) unit has been incorporated into the acoustic model of the substation. This HVAC unit will be located on the exterior of the control house within the substation. The manufacturer for the wall mounted HVAC unit has not been selected by the Applicant, therefore Epsilon assumed this unit to be a Bard (W72AA) unit or similar. The modeling inputs of the transformer and HVAC units (coordinates, ground elevation, and height above ground) are summarized in Appendix 7-1. Table 7-3 summarizes the sound power level data used in the modeling.

Table 7-3. Substation— Sound Power Levels

Sound Source	Broadband Sound Power Level [dBA]	Sound Power Levels per Octave-Band Center Frequency [Hz]								
		31.5	63	125	250	500	1k	2k	4k	8k
		dB	dB	dB	dB	dB	dB	dB	dB	dB
263 MVA Transformer	98[1,2]	95	101	103	98	98	92	87	82	75
Bard W72AA HVAC Unit[3]	78[4]	-	-	-	-	-	-	-	-	-

Notes:
[1]Sound levels (w/ 10 dB reduction) estimated for a 263 MVA transformer, using techniques in EEI guide.
[2] Octave-band sound levels estimated, using techniques in the EEI guide.
[3] Bard W72AA unit directly mounted with a standard supply air duct and a return air grille treatment.
[4] Octave-band sound levels not assumed, since the manufacturer did not provide octave band sound power levels.

Tracking Motors

Single axis trackers with small electric tracking motors are anticipated across the Facility Site. Manufacturer sound level data for the proposed tracking motors are not available; however, based on Epsilon's experience, the sound power levels of tracking motors are typically in the range of 65 to 70 dBA. Additionally, according to the Applicant, the tracking motors for the Mill Point Solar I Project will on average operate sixteen (16) minutes per day. This operational time is spread out throughout the entire day (i.e., the motors only cycle for a few seconds at a time). The sound level design goal presented in Section 7(b) applicable to operational sound from the Facility are based on an 8-hour Leq. Sixteen (16) minutes represents 3.3% of an 8-hour time period. A 3.3% usage factor results in a 15 dBA correction based on the following equation:

10 x LOG (0.033) = -15.

Therefore, based on a 70 dBA sound power level, the total corrected 8-hour Leq sound power level of a tracking motor, accounting for their small amount of operational time, is approximately 55 dBA (70 dBA – 15 dBA = 55 dBA). The shortest distance from a non-participating residential receptor to a Facility component is 294 feet (90 meters). Based on the corrected sound power level and this distance, the 8-hour Leq of a tracking motor would be approximately 5 dBA at the closest receptor. For these reasons, the tracking motors are a negligible sound source and they have not been included in the acoustic modeling for the Project.

i) For all modeling scenarios, the ground absorption factor (G) was set to 0.5 for the ground and 0 for water bodies.

ii) A temperature of 10 degrees Celsius and 70% relative humidity was used to calculate atmospheric absorption for the ISO 9613-2 model. These parameters were selected to minimize atmospheric attenuation in the 500 Hz and 1000 Hz octave bands where the human ear is most sensitive, and thus provide conservative results.

iii) The maximum A-weighted dBA L_{eq} (1-hour or 8-hour) sound pressure levels and the maximum linear/unweighted/Z dB (L_{eq} 1-hour) sound pressure levels from the thirty-one and a half (31.5) Hz up to the eight thousand (8,000) Hz full-octave band at all sensitive sound receptors within the radius of evaluation are discussed and presented in Section 7(l).

iv) The maximum A-weighted dBA L_{eq} sound pressure levels (L_{eq} (8-hour)) at the most critically impacted external property boundary lines of the Facility Site (e.g., non-participating boundary lines) are shown in Figure 7-4.1.

v) A summary of the number of receptors exposed to sound levels greater than thirty-five (35) dBA are shown in Table 7-4 (Unmitigated) and Table 7-5 (Mitigated) grouped in one (1)-dBA bins.

vi) Sound level contours as specified in 19 NYCRR Section 900-2.8(k) are shown in Figure 7-4.1.

(1) This subsection is applicable to wind projects and the subject Project is a solar facility.

(2) The CadnaA model used a one and a half (1.5) meter assessment point above the ground. No uncertainty factor was added to the modeled results.

Table 7-4. Receptors Modeled at 35 dBA or Greater – Unmitigated Total Sound Leq (8-hour)

Modeled Leq Sound Level [dBA]	# of Receptors					
	Amish Community/Residential		Barn/Cemetery/Farm/Historic Site/Park/Public Trail		Business/Church/Fire Department/Government Building/Police Station/Public	
	Participating	Non-Participating	Participating	Non-Participating	Participating	Non-Participating
47	2	1	0	0	0	0
46	0	3	0	0	1	0
45	0	8	1	0	0	0
44	2	8	2	0	0	0
43	3	4	1	0	0	0
42	0	7	0	0	0	0
41	2	15	0	0	0	0
40	0	8	0	0	0	0
39	0	11	0	1	0	1
38	2	10	0	0	0	0
37	0	12	0	1	0	0
36	0	11	0	1	0	0
35	1	8	0	0	0	0

Table 7-5. Receptors Modeled at 35 dBA or Greater – Mitigated Total Sound Leq (8-hour)

Modeled Leq Sound Level [dBA]	# of Receptors					
	Amish Community/Residential		Barn/Cemetery/Farm/Historic Site/Park/Public Trail		Business/Church/Fire Department/Government Building/Police Station/Public	
	Participating	Non-Participating	Participating	Non-Participating	Participating	Non-Participating
47	0	0	0	0	0	0
46	0	0	0	0	0	0
45	3	0	0	0	0	0
44	1	0	2	0	1	0
43	3	0	0	0	0	0
42	0	0	0	0	0	0
41	0	0	0	0	0	0
40	0	18	1	0	0	0
39	0	20	1	0	0	0
38	2	18	0	0	0	0
37	2	8	0	0	0	0
36	0	16	0	1	0	0
35	1	11	0	2	0	1

7(e) Prominent Tones

ANSI/Acoustical Society of America (ASA) S12.9-2013 Part 3, Annex B, section B.1 (informative) presents a procedure for testing for the presence of a prominent discrete tone. According to the standard, a prominent discrete tone is identified as present if the time-average sound pressure level in the one-third octave band of interest exceeds the arithmetic average of the time-average sound pressure level for the two adjacent one-third octave bands by any of the following constant level differences:

- 15 dB in low-frequency one-third-octave bands (from 25 up to 125 Hz);
- 8 dB in middle-frequency one-third-octave bands (from 160 up to 400 Hz); or
- 5 dB in high-frequency one-third-octave bands (from 500 up to 10,000 Hz).

(1) Sound pressure level calculations using the CadnaA modeling software which incorporates the ISO 9613-2:1996 propagation standard is limited to octave band sound levels; therefore, a quantitative evaluation of one-third octave band sound levels using the modeling software was not possible. One-third octave band sound power levels for the Facility inverters were not available from the Applicant; therefore, a quantitative evaluation of one-third octave band sound using a spreadsheet modeling approach was not possible. For this reason, the inverters were assumed to be tonal and prominent by default. Due to this prominent tone, a 5 dBA penalty is being applied on a short-term broadband basis to non-participating residential receptors. With the observed prominent tone and subsequent broadband penalty, short term broadband sound pressure levels exceeded 40 dBA (45 dBA w/ 5 dBA penalty) at multiple non-participating residences. As a result, mitigation measures were needed, in order to achieve compliance.

(2) One-third octave band sound power levels for the substation equipment (transformer or HVAC unit) were not supplied by the Applicant; therefore, a quantitative evaluation of one-third octave band sound using a spreadsheet modeling approach was not possible. For this reason, the substation transformer was assumed to be tonal and prominent by default. Due to this prominent tone, a 5 dBA penalty is being applied on a short-term broadband basis for the substation only sound levels at non-participating residential receptors. With the observed prominent tone and subsequent broadband penalty, short term broadband sound pressure levels exceeded 35 dBA (40 dBA w/ 5 dBA penalty) at multiple non-participating residences.

As a result, mitigation measures were needed at the substation, in order to achieve compliance.

7(f) Low Frequency Noise for Wind Facilities

This subsection is not applicable to this Project.

7(g) Infrasound for Wind Facilities

This subsection is not applicable to this Project.

7(h) Sound Study Area

Figure 7-1 is a map of the sound study area showing the location of sensitive sound receptors in relation to the Facility (including the substation and the POI switchyard).

(1) In total, 520 discrete receptors were analyzed. These include 468 residential (amish community/residence) receptors, twenty-five (25) barn/cemetery/farm/historic site/park/public trail school receptors, and twenty-seven (27) business/church/fire department/government building/police station/public building/restaurant receptors. Of the 520 receptors, twenty-three (23) were participating and 497 were non-participating, as defined in Section 7(h)(3) below. Of the 468 residential receptors, eighteen (18) were participating and 450 were non-participating. A detailed listing of all receptors including receptor ID, latitude/longitude, elevation, participation status, and receptor category is included as Appendix 7-2.

(2) All residences were included as sensitive sound receptors regardless of participation in the Project (e.g., participating, potentially participating, and non-participating residences) or occupancy (e.g., year-round, seasonal use).

(3) Only properties that have a signed contract with the Applicant prior to the date of filing the application were identified as “participating.” Other properties were designated as “non-participating.”

7(i) Evaluation of Ambient Pre-Construction Baseline Noise Conditions

An evaluation of ambient pre-construction baseline noise conditions was conducted for nine (9) days by using the L_{90} statistical and the L_{eq} energy based noise descriptors, and by following the recommendations included in ANSI/ASA S3/SC 1.100 -2014-ANSI/ASA S12.100-2014 American National Standard entitled Methods to Define and Measure the Residual Sound in Protected

Natural and Quiet Residential Areas. The full details of the ambient pre-construction sound level measurement program are found in Appendix 7-3.

7(j) Evaluation of Future Noise Levels during Construction

(1) Future construction noise modeling was performed for the main phases of construction and from activities at the closest solar arrays and horizontal directional drilling (HDD) entry point using the ISO 9613-2:1996 sound propagation standard as implemented in the CadnaA software package. Reference sound source information was obtained from either Epsilon's consulting files or the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM).

(2) The majority of the construction activity will occur around each of the inverter locations, at the substation, at each of the solar arrays, and at the locations where HDD will occur. By its very nature, construction activity moves around the Facility Site. Full construction activity will generally occur at one location at a time, although there will be some overlap at adjacent construction locations for maximum efficiency. For modeling conservatism, it was assumed that full activity was occurring at the closest locations to their surrounding receptors. There are generally five phases of construction for a solar energy project – site preparation and grading, trenching and road construction, HDD, equipment installation, and commissioning. Table 7-6 presents the equipment sound levels for the louder pieces of construction equipment expected to be used at this site along with their phase of construction.

Table 7-6. Sound Levels for Noise Sources Included in Construction Modeling

Phase	Equipment	Sound Level at 50 feet [dBA]
Site Preparation & Grading	Grader (174 hp)	85
Site Preparation & Grading	Rubber Tired Loader (164 hp)	85
Site Preparation & Grading	Scraper (313 hp)	89
Site Preparation & Grading	Water Truck (189 hp)	80
Site Preparation & Grading	Generator Set	81
Trenching & Road Construction	(2) Excavator (168 hp)	85

Phase	Equipment	Sound Level at 50 feet [dBA]
Trenching & Road Construction	Bar Trencher (600 hp)	89
Trenching & Road Construction	Grader (174 hp)	85
Trenching & Road Construction	Water Truck (189 hp)	80
Trenching & Road Construction	Trencher (63 hp)	83
Trenching & Road Construction	Rubber Tired Loader (164 hp)	85
Trenching & Road Construction	Generator Set	81
Equipment Installation	Crane (399 hp)	83
Equipment Installation	Crane (165 hp)	83
Equipment Installation	(2) Forklift (145 hp)	85
Equipment Installation	(2) Vermeer PD10 Pile Driver	84
Equipment Installation	(6) Pickup Truck/All-Terrain Vehicle (ATV)	55
Equipment Installation	(2) Water Truck (189 hp)	80
Equipment Installation	(2) Generator Set	81
HDD Entry	Excavator (168 hp)	85
HDD Entry	Auger Drill Rig	85
HDD Entry	Pickup Truck/ATV	55
Commissioning	(2) Pickup Truck/ATV	55

(3) The operational modeling requirements included Sections 7(d)(1)(i) through 7(d)(1)(iii), and 7(d)(3) of this Exhibit were also used for modeling of construction noise.

(4) Worst-case sound levels from construction activity are shown using sound level contours in Figure 7-j.1 (Area 1) and Figure 7-j.2 (Area 2), along with sound levels at the most critically impacted receptors are shown in Tables 7-7a and 7-7b.

Two areas within the Facility Site were chosen to calculate worst case construction sound levels. The areas and assumed locations of simultaneous construction are:

- Area 1 – This area includes the closest receptors to a solar array panel. Modeling assumed simultaneous construction activity at this location, along with an additional nine select solar array panels across the Facility Site. Site preparation and grading, trenching and road construction, equipment installation, and commissioning activities were modeled.
- Area 2 – This area includes all receptors in the vicinity of the closest HDD entry point to a receptor. Modeling assumed simultaneous construction activity at this HDD entry point. HDD work and commissioning work was modeled at this HDD entry point.

For each of the areas, construction sound levels at the ten closest receptors have been calculated. These receptors included both non-participants and participants. The results are shown as maximum 1-second L_{eq} sound levels with all pieces of equipment for each phase operating at the locations. These results overstate expected real-world results, because under actual construction conditions, not all pieces of equipment will be operating at the same exact time and the highest sound levels from every piece of equipment do not usually occur at the same time as assumed in the modeling. At other areas of construction (i.e., substation, laydown yards, inverters), sound levels due to construction would be lower, as those locations are further from receptors than the two areas that were analyzed.

Area 1 Modeling Results

The cumulative impacts from site preparation and grading, trenching and road construction, equipment installation, and commissioning activities was calculated with the CadnaA model for the ten closest receptors to construction activity. The loudest phase of construction within this area will be trenching and road construction work. A sound contour figure detailing simultaneous trenching and road construction activity at Area 1 is presented in Figure 7-j.1.

The highest sound level at a non-participating receptor within Area 1 is 60 dBA during site preparation and grading (Receptor #447), 62 dBA during trenching and road construction (Receptor #447), 61 dBA during equipment installation (Receptor #445), and 26 dBA during commissioning (Receptor #445). Modeling results of construction sound levels within Area 1 are summarized in Table 7-7a, including worst-case simultaneous construction sound levels. Additionally, modeling results of construction sound levels for all receptors are found in Appendix 7-6.

Table 7-7a. Construction Noise Modeling Results - Area 1 (Leq (1-sec)) [dBA]

Receptor ID	Distance [m]	Participation Status	Site Preparation & Grading	Trenching & Road Construction	Equipment Installation	Commissioning	Worst-Case Total
101	5	Participating	97	92	92	62	99
384	297	Non-Participating	40	42	41	6	46
383	317	Non-Participating	45	47	47	11	51
382	324	Non-Participating	47	50	49	14	54
502	349	Non-Participating	52	54	53	19	58
500	357	Participating	58	59	59	24	63
501	366	Participating	52	55	53	19	58
498	486	Non-Participating	55	56	56	21	61
497	543	Non-Participating	54	56	55	20	60
499	565	Participating	54	55	55	20	59

Area 2 Modeling Results

Cumulative impacts from HDD work and commissioning activities were calculated with the Cadna model for the ten closest receptors to construction activity within Area 2. The loudest phase of construction within Area 2 will be HDD work. A sound contour figure detailing HDD activity occurring at the HDD entry point within Area 2 is presented in Figure 7-j.2.

The highest sound level at a non-participating receptor within Area 2 is 67 dBA during HDD (Receptor #491) and 26 dBA during commissioning (Receptor #447). Modeling results of construction sound levels within Area 2 are summarized in Table 7-7b, including worst-case simultaneous construction sound levels. Additionally, modeling results of construction sound levels for all receptors are found in Appendix 7-6.

Table 7-7b. Construction Noise Modeling Results - Area 2 (Leq (1-sec)) [dBA]

Receptor ID	Distance [m]	Participation Status	HDD	Commissioning	Worst-Case Total
492	30	Participating	78	18	78
491	75	Non-Participating	67	19	67
490	185	Non-Participating	59	19	59
145	260	Non-Participating	56	20	56
493	264	Participating	56	14	56
494	344	Participating	54	14	54
143	404	Non-Participating	52	21	52
144	406	Non-Participating	52	21	52
495	429	Participating	52	18	52
496	513	Participating	50	19	50

Construction Noise Conclusions

Noise due to construction is an unavoidable outcome of construction. The five major construction phases for this are: site preparation and grading, trenching and road construction, HDD, equipment installation, and commissioning. Most of the construction will occur at significant distances to sensitive receptors, and therefore noise from most phases of construction is not expected to result in impacts to sensitive receptors. There are a few instances where construction will be fairly close to residences (receptors #445, #446, #447, and #448) and coordination with these neighbors may be warranted. Construction noise will be minimized through the use of Best Management Practices (BMPs).

7(k) Sound Levels in Graphical Format

(1) Figure 7-4.1 presents future mitigated L_{eq} (8-hour) sound contour lines showing expected sound levels during worst-case operation of the Facility’s inverters plus the substation using the methodology described above. Figure 7-5.1 presents future mitigated L_{eq} (1-hour) sound contour drawings showing expected sound levels during worst-case operation of the Facility’s substation-only using the methodology described above.

(2) The sound contour maps include all sensitive sound receptors, boundary lines (differentiating participating and non-participating), and all Facility noise sources.

(3) Sound contours are rendered until the thirty (30) dBA noise contour is reached, in one (1)-dBA steps, with sound contour multiples of five (5) dBA differentiated.

(4) Full-size hard copy maps (22" x 34") of these figures in 1:12,000 scale will be submitted to the Office of Renewable Energy Siting (ORES).

7(l) Sound Levels in Tabular Format

A tabular comparison between the maximum sound impacts and any design goals, noise limits, local requirements, and the degree of compliance at all sensitive sound receptors and at the most impacted non-participating boundary lines within the Study Area is presented below.

All sources operating—inverters plus the substation

Future L_{eq} (8-hour) sound levels during worst-case operation of Facility inverters plus the substation have been calculated using the methodology described above. Appendix 7-4 provides the predicted unmitigated and mitigated A-weighted (dBA) and full octave band frequency (31.5 Hz to 8,000 Hz) sound pressure levels at all sensitive receptors. The results are sorted by receptor ID and sorted by A-weighted sound level high to low, and then broken down by three separate receptor types and participation status (Non-Participating and Participating). The receptor types are grouped as follows: Amish Community/Residence, Barn/Cemetery/Farm/Historic Site/Park/Public Trail, or Business/Church/Fire Department/Government Building/Police Station/Public Building/Restaurant. In total, there are twenty-four tables for Table 7-4.1a to Table 7-4.1l (Unmitigated) and Table 7-4.2a to Table 7-4.2l (Mitigated) found in Appendix 7-4.

The highest unmitigated sound levels at residential receptors, under this scenario are:

- Non-participating receptor (ID# 465) = 47 dBA
- Participating receptor (ID# 453) = 47 dBA

The highest mitigated sound levels at residential receptors, under this scenario are:

- Non-participating receptor (ID# 436) = 40 dBA
- Participating receptor (ID# 454) = 45 dBA

The unmitigated L_{eq} (8-hour) sound levels are in exceedance of the design goal of 45 dBA for a non-participating residence and meet the design goal of 55 dBA for a participating residence. The unmitigated L_{eq} (8-hour) sound levels continue to be in exceedance for the adjusted design goal at the non-participating residences due to the assumed prominent tone and subsequent 5 dBA penalty (40 dBA). Thus, the Project does not comply with the non-participating residence design goal, while unmitigated.

Through the use of mitigation with the installation of sound barrier walls at the substation and a subset of inverters, along with a quieted substation transformer, the mitigated L_{eq} (8-hour) sound levels for the Project comply with all design goals. The mitigated L_{eq} (8-hour) sound levels meet the design goal of 45 dBA for a non-participating residence and meet the design goal of 55 dBA for a participating residence. The mitigated L_{eq} (8-hour) sound levels continue to comply and meet the adjusted design goal at the non-participating residences due to the assumed prominent tone and subsequent 5 dBA penalty (40 dBA). Thus, the Project complies will all design goals when mitigated.

Sound level contours generated from the modeling grid are presented in an overview figure, (Figure 7-4.1), accompanied by a series of inset maps that provide a higher level of detail at all modeled receptors. As these figures show all sound barrier walls needed across the Facility, the mitigated L_{eq} (8-hour) sound levels will be below the design goal of 55 dBA at all non-participating property lines that are not utility ROWs. The highest sound level at a non-participating property line occurs on Parcel ID: 69.-1-26, north of Inverter 28. This property line boundary is predicted to be 58 dBA, but is a utility ROW, which pursuant to 19 NYCRR Section 900-2.8(b), is excluded from the noise limit. This is the only non-participating property line that exceeds 55 dBA.

Substation only

The highest unmitigated sound levels at residential receptors, under this scenario are:

- Non-participating receptor (ID# 465) = 42 dBA
- Participating receptor (ID# 434) = 29 dBA

The highest mitigated sound levels at residential receptors, under this scenario are:

- Non-participating receptor (ID# 465) = 32 dBA
- Participating receptor (ID# 434) = 19 dBA

The unmitigated worst-case L_{eq} (1-hour) substation only sound levels are in exceedance of the design goal of 40 dBA for a non-participating residence. The unmitigated L_{eq} (1-hour) substation only sound levels continue to be in exceedance for the adjusted design goal at the non-participating residences due to the assumed prominent tone and subsequent 5 dBA penalty (35 dBA). Thus, the Facility does not comply with the non-participating residence design goal, while unmitigated.

Through the use of mitigation with the installation of a sound barrier wall at the substation, along with a quieted substation transformer, the mitigated worst-case L_{eq} (1-hour) substation only sound levels for the Facility comply with all design goals. The mitigated L_{eq} (1-hour) substation only sound levels meet the design goal of 40 dBA for a non-participating residence. The mitigated L_{eq} (1-hour) substation only sound levels continue to comply and meet the adjusted design goal at the non-participating residences due to the assumed prominent tone and subsequent 5 dBA penalty (35 dBA). Thus, the substation complies with the design goal when mitigated.

Appendix 7-5 provides the predicted broadband (dBA) and full octave band frequency (31.5 Hz to 8,000 Hz) sound pressure levels at all residences. In total, there are twenty-four tables from Table 7-5.1a to Table 7-5.1l (Unmitigated) and Table 7-5.2a to Table 7-5.2l (Mitigated) found in Appendix 7-5. Sound level contours from the mitigated substation generated from the modeling grid are presented in Figure 7-5.1.

The highest sound level under this mitigated scenario is 32 dBA at a non-participating residence. This sound level meets the design goal of 40 dBA, after applying the 5 dBA tonal penalty, which is assumed for the substation transformer.

Local Requirements

There are no applicable sound level requirements in the Town of Glen.

7(m) Community Noise Impacts

(1) Hearing Loss for the Public

The Facility's potential to result in hearing loss to the public was evaluated against the 1999 "Guidelines for Community Noise" published by the World Health Organization (WHO). According to the WHO Guidelines, the threshold for hearing impairment is 70 dBA L_{eq} (24-hour), 110 dBA (Lmax, fast) or 120/140 dBA (peak at the ear) for children/adults. Operational noise will always be less than 55 dBA L_{eq} (8-hour) at any residence. This is well below the 70 dBA limit. The only construction noise source capable of exceeding the WHO hearing impairment threshold is blasting, but no blasting is anticipated for this Project. All other construction activities will produce noise below the WHO hearing impairment threshold. Therefore, no Project activities have the potential to cause hearing loss to the public.

(2) Potential for Structural Damage

At this time, blasting is not planned as part of construction for the Project. If blasting becomes necessary, a detailed discussion of the potential to cause structural damage on any existing proximal will be provided in Exhibit 10 Geology, Seismology, and Soils.

7(n) Noise Abatement Measures for Construction Activities

(1) Noise Abatement Measures

Noise due to construction is an unavoidable outcome of construction. The Applicant will communicate with the public to notify them of the commencement of construction. Most of the construction will occur at significant distances to sensitive receptors, and therefore noise from most phases of construction is not expected to result in impacts to sensitive receptors. Nonetheless, construction noise will be minimized through the use of BMPs such as those listed below.

- Blasting is not anticipated for the Project. However, if necessary, blasting will be limited to daytime hours and conducted in accordance with an approved Blasting Plan.
- HDD is anticipated at this site. As feasible, post installation and HDD will be limited to daytime hours.
- Pursuant to 19 NYCRR Section 900-6.2(k)(1), the Project will utilize construction equipment fitted with exhaust systems and mufflers that have the lowest associated noise whenever available and maintain functioning mufflers on all transportation and construction machinery.
- Maintain equipment and surface irregularities to prevent unnecessary noise.
- Configuring, to the extent feasible, the construction in a manner that keeps loud equipment and activities as far as possible from noise-sensitive locations.
- Use back-up alarms with a minimum increment above the background noise level to satisfy the performance requirements of the current revisions of Standard Automotive Engineering (SAE) J994 and Occupational Safety and Health Administration (OSHA) requirements.

- Develop a staging plan that establishes equipment and material staging areas away from sensitive receptors when feasible.
- Contractors shall use approved haul routes to minimize noise at residential and other sensitive noise receptors.

(2) Complaint Management Plan

Complaints due to construction or operation of the Facility have the potential to occur. If complaints do arise, the Complaint Management Plan provides information on how and when the public may file a complaint, as well as an identification of any procedures or protocols that may be unique to each phase of the Project or complaint type. In accordance with 19 NYCRR Section 900-6.2(a), (c) and (d), the Applicant will provide notice of commencement of construction and completion of construction. The notice will include the procedure and contact information for registering a complaint. To minimize noise impacts during construction, the Applicant will comply with 19 NYCRR Section 900-6.2(k)(2), which includes responding to noise and vibration complaints according to the complaint resolution protocol approved by ORES.

(3) Compliance with Local Laws

There are no local regulations for solar projects with respect to noise and vibrations.

7(o) Noise Abatement Measures for Facility Design and Operation

(1) Wind Facilities

This subsection is not applicable to the Project.

(2) Solar Facilities

Adverse noise impacts will be avoided or minimized through careful siting of Project components. The noise emitted by a solar project is limited to daytime periods only for the majority of the components. Mitigation is required for the Project under the current design, in order to comply with all design goals. Proposed mitigation includes a quieted substation transformer with a sound pressure level of NEMA TR-1 minus 10 dB. In addition, sound barrier walls are required at a subset of the central inverters and at the substation. At the substation, a 15-foot sound barrier wall is needed along the fence line perimeter to the southeast and southwest. The sound barrier wall is shown on Figure 7-5.1 and in the substation design layout within Appendix 7-7. For the central inverters, sound barrier walls are needed at 37 of the 60 inverters. All 37 of these sound barrier walls are shown on Figure 7-4.1. Two 14-foot sound barrier walls are needed at Inverter 24 and Inverter 43. Three 13-foot sound barrier walls are needed at Inverter 4, Inverter 19, and Inverter 42. Thirty-two (32) 12-foot sound barrier walls are needed at Inverter 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 26, 29, 30, 31, 32, 46, 47, 49, 50, 51, 52, 58, 59, and 60.

7(p) Software Input Parameters, Assumptions, and Associated Data for Computer Noise Modeling

(1) Geographic Information System (GIS) files used for the computer noise modeling, including noise source and receptor locations and heights, topography, final grading, boundary lines, and participating status have been submitted to ORES by digital means.

(2) The CadnaA computer noise modeling files have been submitted to ORES by digital/electronic means.

(3) Site plan and elevation details of substations, as related to the location of all relevant noise sources are presented in Appendix 7-7.

(4) This subsection is not applicable to the Project, as it is not a proposed wind facility.

(5) (i) The locations of all noise sources identified with GIS coordinates are presented in Appendix 7-1. The digital GIS files with that information have been submitted to ORES.

(ii) Sound information from the manufacturers for all noise sources included in this analysis are presented in Appendix 7-8.

7(q) Miscellaneous

(1) A glossary of terminology, definitions, and abbreviations used throughout this Exhibit is included as Appendix 7-9. The references mentioned in the application are found in Appendix 7-10.

(2) All information has been reported in tabular, spreadsheet compatible, or graphical format as follows:

(i) All data reported in tabular format has been clearly identified to include headers and summary footer rows. Headers include identification of the information contained in each column, such as noise descriptors; weighting; duration of evaluation; time of the day; whether the value is a maximum or average value and the corresponding time frame of evaluation.

(ii) Table titles identify whether the tabular or graphical information corresponds to the "unmitigated" or "mitigated" results, if any mitigation measures are evaluated, and “cumulative” or “non-cumulative” for cumulative noise assessments.

(iii) Columns or rows with results related to a specific design goal, noise limit or local requirement, identify the requirement to which the information relates.

(iv) Tables include rows at the bottom summarizing the results to report maximum and minimum values of the information contained in the columns. Sound receptors are separated in different tables according to their use (e.g., participating residences, non-participating residences, businesses, police station, parks, cemeteries, historic places, etc.).

(v) This Exhibit reports estimates of the absolute number of sensitive sound receptors that will be exposed to noise levels that exceed any design goal or noise limit (in total as well as grouped in one (1)-dBA bins).

7(r) References

American National Standard ANSI/ASA S1.4-1983 (R2006). 1983. Specification for Sound Level Meters.

American National Standard ANSI/ASA S1.11-2004 (R2009). 2004. Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters.

American National Standard ANSI/ASA S1.40-2006 (R2020). 2006. Specifications and Verification Procedures for Sound Calibrators.

American National Standard ANSI/ASA S1.43-1997 (R2007). 1997. Specification for Integrating-Averaging Sound Level Meters.

American National Standard ANSI S12.9-1992/Part 2 (R2018). 1992. Quantities and Procedures for Description and Measurement of Environmental Sound. Part 2: Measurement of long-term, wide-area sound.

American National Standard ANSI S12.9-2013/Part 3 (R2018). 2013. Quantities and Procedures for Description and Measurement of Environmental Sound. Part 3: Short-term Measurement with an Observer Present.

American National Standard ANSI S12.9-2005/Part 4 (R2020). 2005. Quantities and Procedures for Description and Measurement of Environmental Sound. Part 4: Noise Assessment and Prediction of Long-term Community Response.

American National Standard ANSI S12.18-1994 (R2019). 1994. Procedures for Outdoor Measurement of Sound Pressure Level.

American National Standard ANSI/ASA S3/SC1.100-2014 & ANSI/ASA S12.100-2014. 2014. Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas.

Edison Electric Institute. 1984. Electric Power Plant Environmental Noise Guide, 2nd Edition.

International Standard ISO 9613-2. 1996. Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

NEMA Standards Publication TR 1-2013 (R2019). 2013. Transformers, Step Voltage Regulators and Reactors.

U.S. DOT, Federal Highway Administration (FHWA). 2006. FHWA Roadway Construction Noise Model User's Guide.

World Health Organization (WHO). 1999. Guidelines for Community Noise.