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July 13, 2023

VIA ELECTRONIC MAIL

Melanie Bachman
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: PETITION NO. 1426 – DG Connecticut Solar, III, LLC petition for a declaratory ruling, pursuant to Connecticut General Statutes §4-176 and §16-50k, for the proposed construction, maintenance and operation of a 4.9-megawatt AC solar photovoltaic electric generating facility located west of the Ellington town boundary at 341 East Road, East Windsor, Connecticut and associated electrical interconnection.

Dear Ms. Bachman:

I am writing on behalf of DG Connecticut Solar III, LLC ("DGCS"), successor in interest of the above-referenced project (the "Project"),[1] to request that the Connecticut Siting Council (the "Council") approve a revision to the Project's Development & Management Plan ("D&M") for the reasons more particularly set forth below.

As you know, the Project has been the source of several complaints by neighbors regarding noise emissions.[2] In response, DGCS retained Brooks Acoustics Corporation ("BAC") to evaluate existing emissions. Regulations of Connecticut State Agencies §22a-69 sets a limit on noise emissions at 61dBA at residential property lines during daytime hours. According to BAC, the current resulting sound level limit for the Project is 56dBA at the nearest residential property line, which is below the maximum level set by the regulation.

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[1] *See*, M. Maragh ltr. to M. Bachman, January 10, 2022.

[2] *See, e.g.*, M. Bachman ltr. to L. Hoffman and T. Garcia (January 18, 2022); Ltr. M. Bachman ltr. to M. Bachman (March 29, 2022; L. Hoffman ltr. to M. Bachman (April 1, 2022); and L. Hoffman ltr. to M. Bachman (March 6, 2023).

Notwithstanding compliance with the regulation, DGCS has investigated several options in an effort to address the neighbors' concerns. After many months of analysis and meetings with representatives of the Town of East Windsor, DGCS and BAC have developed a sound control design that will materially reduce the noise emanating from the Project.

The sound control design will consist of a sound barrier block constructed of 16 inch cinder blocks, laid in courses 16 inches thick. The wall will be 12 feet high, and located 5 feet to the north of the power inverter banks, between those power inverter banks and the nearby residences. A more detailed description of the proposed sound control design is contained in BAC's report, attached as "Exhibit A."

BAC estimates that the barrier wall will reduce the sound level of the power inverters to approximately 28 dBA at the nearest residential property line. This will reduce the sound at the nearby residences to below ambient background levels, due to distant traffic and natural sound sources. This should make the Project virtually inaudible to the residences.

Accordingly, DGCS respectfully requests that the Council approve the revised plan. Please feel free to contact me should you have any questions or desire additional information.

Very truly yours,

David W. Bogan

Enclosure

Copy to: Service List

BAC
Brooks Acoustics Corporation
35 Talcottville Road Suite 31 Vernon, CT 06066 (860) 896-1081

Mr. Timothy Garcia
DG Connecticut Solar III LLC
700 Universe Boulevard
Juno Beach, FL 33408

5 June 2023

Subject: Solar One East Windsor – Sound control - Acoustical engineering design study

Dear Mr. Garcia:

As requested, Brooks Acoustics Corporation (BAC) has conducted an acoustical engineering and design study to evaluate the sound emissions from the existing Solar One facility on Middle Road in East Windsor, Connecticut, and any impact that those sounds may have on the surrounding neighborhood. As part of this study, sound survey tests were conducted to determine if the facility is operating in compliance with the Regulations of Connecticut State Agencies (RCSA) Section 22a-69-1 et seq. ("Sound Regulations").

Measurements were made of the sound levels and tonal spectra attributable to the facility at the nearest residential property line during daytime (sunlight) hours.

Based on these sound survey test data, it was determined that the current Solar One facility *meets the CT State sound level limit regulations.*

<u>Sound Control Design Summary</u>

Although the facility was found to be in compliance with CT Sound Regulations, a sound control design was developed that will further reduce the emitted sound levels which may reach residences in the vicinity.

Based on the sound tests conducted on-site it was determined that some of the power inverters operating at the facility are the dominant sound source there. The sound control design is intended to reduce the sound emitted by the power inverters which may be received at the residences. The sound reduction design features a sound barrier block wall located to the north of the subject solar power equipment, between that equipment and nearby residences.

Acoustical engineering calculations were made for the expected sound levels at the nearest residential property line with the sound control barrier wall in place. The preferred wall height for this design is 12 feet.

It is the opinion of BAC that with a reasonable degree of engineering certainty the sound barrier wall design, when implemented, will reduce the sound level of the Solar One facility by nearly 20 dBA. This will reduce the sound received at the nearby residences to below expected ambient background levels. This would make the facility essentially inaudible at the residences.

<u>Sound Level Standards</u>

The Regulations of Connecticut State Agencies (RCSA Section 22a – 69) require that noise emitted by an industrial land use to a residential land use shall not exceed 61 dBA (A-weighted decibels) during daytime hours, which are defined as 7:00 a.m. to 10:00 p.m. [see Sec. 22a-69-3.5. Noise zone standards (a)].

If the emitted sound possesses what is defined as an audible prominent discrete tone [see Sec. 22a-69-1.2. Acoustic terminology and definitions (r)], then the sound level which is otherwise not to be exceeded is reduced by 5 decibels [Sec. 22a-69-3.3. Prominent discrete tones]. Therefore, in the case of sound emissions which contain a prominent discrete tone, the noise emitted by an industrial land use to a residential land use ***shall not exceed 56 dBA during daytime hours***.

According to the CT sound regulations, the emitter's zone includes all public rights-of-way [see Sec. 22a-69-1.1 (o)]. Therefore, the sound level which applies to the nearest residential receiver would be measured at the nearest residential property line, which is directly to the north across Middle Road from the facility.

Sound impact evaluation

Measured sound test survey data show that the sound level for the Solar One facility due to the power inverters operating at the nearest residential property boundary to the North was **47 dBA** with the presence of a prominent discrete tone.

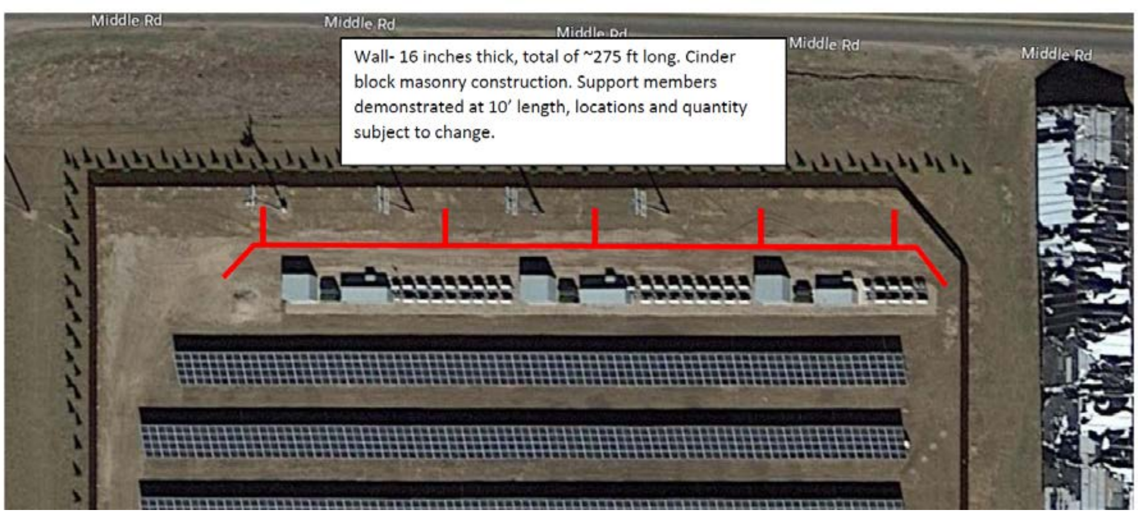
The Regulations of Connecticut State Agencies (RCSA Section 22a-69) place a limit on noise emissions of 61 dBA at residential property lines during daytime hours. There is a penalty of 5 dB for sounds which include the presence of a prominent discrete tone. The resulting **sound level limit** for the Solar One operation is **56 dBA** at the nearest residential property line.

The measured sound level attributable to the facility (47 dBA) is substantially below that limit. Therefore, the Solar One facility is ***in compliance*** with the sound level limit requirement of the RCSA.

Sound control design details

Although the current existing Solar One facility was found to be in compliance with CT Sound Regulations, a sound control design was developed which will further reduce the emitted sound levels which may reach residences in the vicinity.

The sound control design features a sound barrier block wall, 12 feet high and located 5 feet to the north of the power inverter banks, between those power inverter banks and the nearby residences. The barrier wall shall be sized appropriately to comfortably intervene between the inverter bank at the facility and the neighbor residences to the north, allowing room for routine maintenance and for cooling air to circulate. A conceptual sketch of the wall in position to the north of the solar power inverter banks is shown below.



Specifications proposed for the barrier wall detail design are as follows. A licensed structural engineer should be consulted to confirm these specifications.

The sound barrier wall shall be constructed of 16 inch cinder blocks, of standard dimensions (16x8x8 inch), which have a weight of at least 28 pounds per piece. The wall shall be laid in courses 16 inches thick. This yields a face weight for the wall of about 63 pounds per square foot.

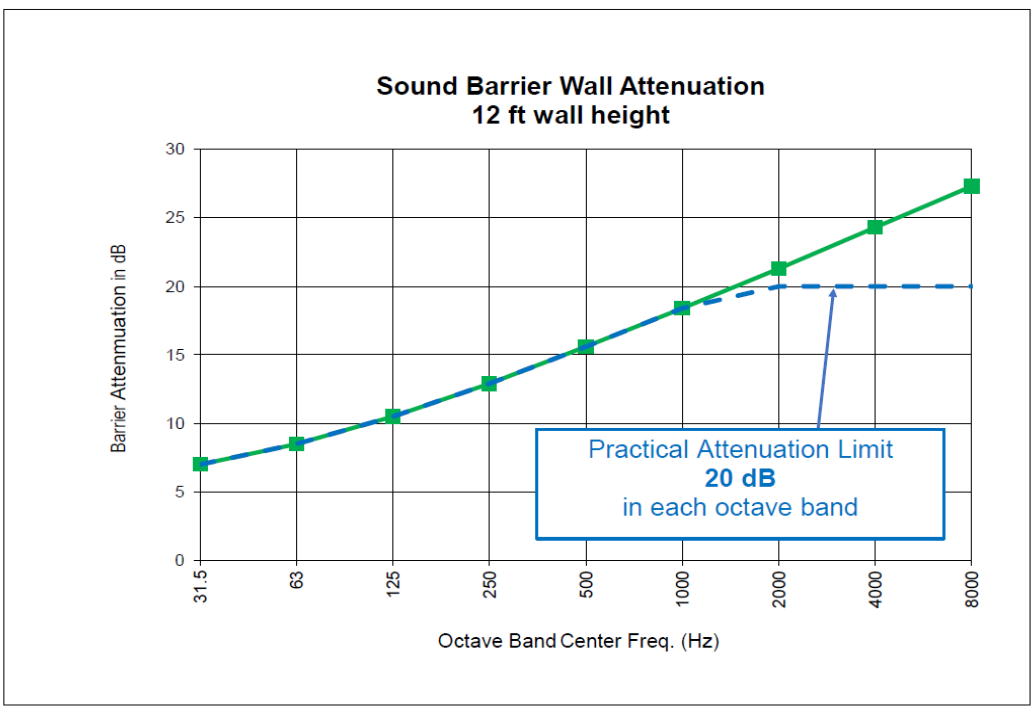
The barrier wall design shall be compatible with structural engineering best practices for sustaining wind loads, and frost heaves for the existing soil conditions. The wall shall be set on proper footings prepared in accordance with the State of CT Building code. Vertical and horizontal steel reinforcement bars shall be placed in accordance with the State of CT Building Code and best practices. Support buttresses shall extend northward from the wall at regular intervals. The sound barrier wall and buttresses shall be grouted or filled with sand as needed to support the reinforcement bars, per best practices, and shall be capped with weather resistant capstone blocks.

The barrier wall and buttresses shall be sealed with a weatherproof latex and acrylic paint to prolong the life of the block elements.

No holes, penetrations or gaps shall be allowed in the sound barrier wall which allow sound to escape through the wall to the north side of the wall. Gravel shall be installed in the footing trench around the barrier wall to allow for drainage, per structural engineering best practices.

Acoustical engineering calculations were made for the expected sound levels at the nearest residential property line with the sound control barrier wall in place. Barriers walls of 10, 12, and 15 feet in height were analyzed. The estimated barrier effects of these walls are shown on the attached calculation sheets.

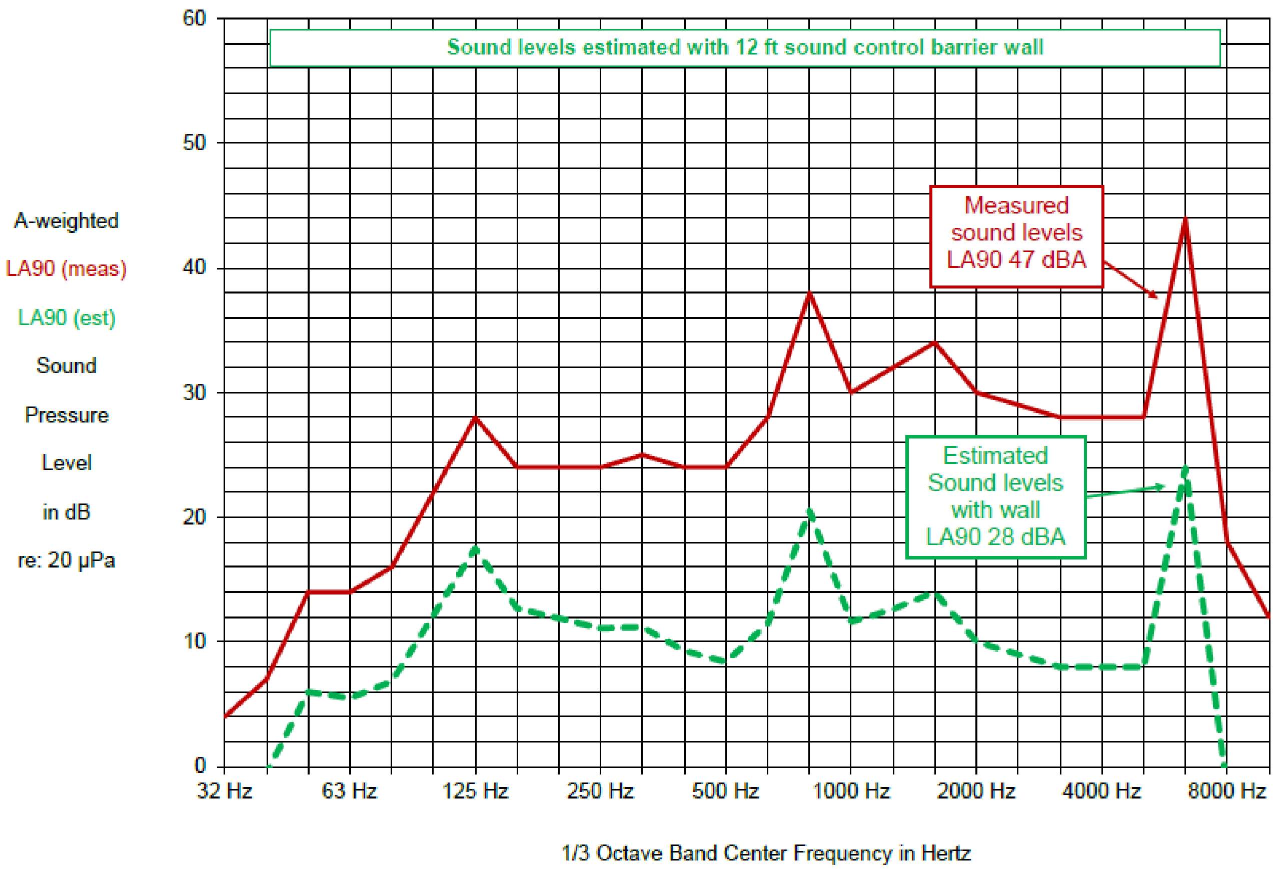
It was determined that a 12 foot wall would provide the best sound attenuation for a realistic wall. A graph which shows the calculated sound attenuation for the 12 foot high wall is shown below. Note that the practical limit for sound attenuation provided by a wall that is open to the sky is 20 dB in each octave band.



As seen in the barrier acoustical calculations (above), the amount of sound reduction provided by the sound barrier wall increases with increasing frequency, until it reaches a practical maximum of about 20 dB in the higher frequency bands.

The calculated practical limit sound attenuation values for the 12 foot wall were applied to the measured sound spectrum at the nearest residential property line to the solar power inverters.

A sound spectral graph for the residential property line position, with and without the 12 foot high sound barrier wall in place, is shown below.



Note that the dominant amount of sound from the solar power inverters is in the higher frequency bands. Therefore, the total reduction of the barrier wall is estimated to be about 19 dBA. The sound level that is attributable to the power inverters is expected to drop from 47 dBA which was measured at the residence property line, to the resulting 28 dBA level that is estimated at the property line.

So, the barrier wall is expected to reduce the sound level of the power inverters to about **28 dBA** at the nearest residential property line. This level is likely to be below the lowest ambient background level in that area of East Windsor, due to distant traffic and natural sound sources. Therefore, with the sound barrier wall treatment it is likely that the Solar One facility *will be inaudible* at the nearest residential property line.

Further, as exterior walls and windows typically provide at least another 25 dBA sound reduction from the outside to the inside, it is *highly unlikely* that any sound from the power inverters will be audible indoors. It is expected that the operation of the Solar One facility with sound control will not disturb the comfort and repose of any person in the vicinity.

Please contact me if you have any questions concerning these findings.

Very truly yours,
BROOKS ACOUSTICS CORPORATION

Bennett M. Brooks, PE, FASA, INCE
President

Attachments

SOUND BARRIER WALL ATTENUATION CALCULATION

Solar One - East Windsor

Source: Inverters -- Receiver: Residence Property Line

* Indicates values to be input in feet -- sound from source up and over wall to receiver behind wall
Wall 10 ft high
Baseline elev. 205 ft

$h_b := 10$ *Height of barrier

$h_s := 5$ *Height of source

$h_r := 5$ *Height of Receiver

$d_{sb} := 5$ *Distance from source to barrier

$d_{br} := 118$ *Distance from barrier to receiver

$c := 344$ Speed of sound (m/s) $n := 0..8$

$f_n := 31.25 \cdot 2^n$ Frequency of peak (Hz)

$\lambda_n := \frac{c}{f_n}$ Wavelength of peak (meters)

$D_{br} := d_{br} \cdot .3048$ $D_{br} = 35.966$

$D_{sb} := d_{sb} \cdot .3048$ $D_{sb} = 1.524$

$H_{sb} := (h_b - h_s) \cdot .3048$ $H_{sb} = 1.524$

$H_{br} := (h_b - h_r) \cdot .3048$ $H_{br} = 1.524$

The path distances specific to the geometry of the installation -- in meters

$R_{sb} := \sqrt{(D_{sb})^2 + (H_{sb})^2}$ $R_{sb} = 2.155$

$R_{br} := \sqrt{D_{br}^2 + H_{br}^2}$ $R_{br} = 35.999$

Fresnel Number

$$N_n := \frac{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}{\lambda_n}$$

$C := 10$

C=10 for receiver over reflecting plane (close to ground)

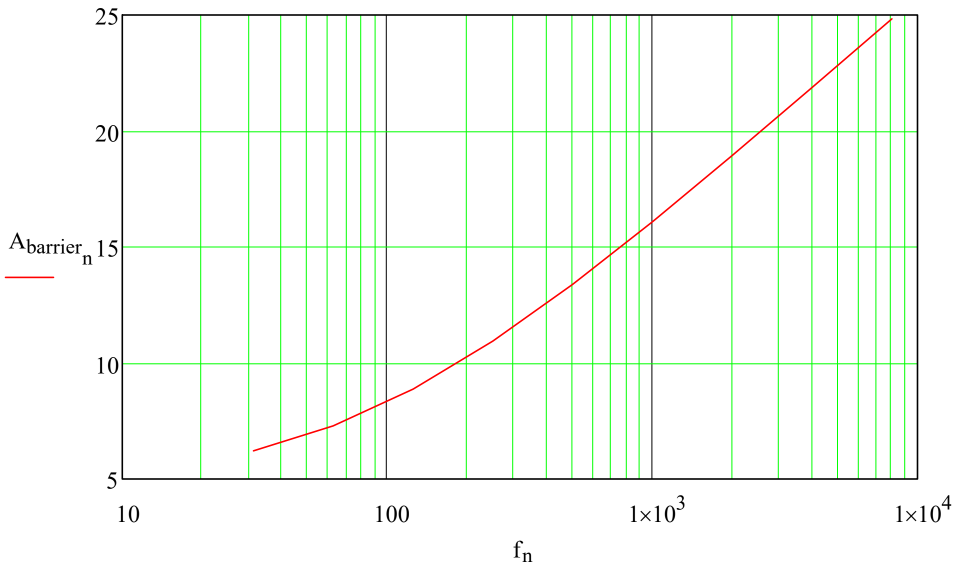
$$A_{barrier_n} := 10 \cdot \log\left[3 + C \cdot N_n \cdot \exp\left[-\frac{1}{2000} \cdot \sqrt{\frac{R_{sb} \cdot R_{br} \cdot (D_{sb} + D_{br})}{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}}\right]\right]$$

Barrier Attenuation

$A_{barrier}$	Frequency
6.2	31.5
7.3	63
8.9	125
10.9	250
13.4	500
16.1	1000
18.9	2000
21.9	4000
24.8	8000

Note: Practical limit for barrier attenuation is 20 dB

BAC Project PJ2023-1410 calculation 1 - Pg 2



SOUND BARRIER WALL ATTENUATION CALCULATION

Solar One - East Windsor

Source: Inverters -- Receiver: Residence Property Line

* Indicates values to be input in feet -- sound from source up and over wall to receiver behind wall
Wall 12 ft high
Baseline elev. 205 ft

$h_b := 12$ *Height of barrier

$h_s := 5$ *Height of source

$h_r := 5$ *Height of Receiver

$d_{sb} := 5$ *Distance from source to barrier

$d_{br} := 118$ *Distance from barrier to receiver

$c := 344$ Speed of sound (m/s)

$n := 0..8$

$f_n := 31.25 \cdot 2^n$ Frequency of peak (Hz)

$\lambda_n := \frac{c}{f_n}$ Wavelength of peak (meters)

$D_{br} := d_{br} \cdot .3048$ $\quad D_{br} = 35.966$

$D_{sb} := d_{sb} \cdot .3048$ $\quad D_{sb} = 1.524$

$H_{sb} := (h_b - h_s) \cdot .3048$ $\quad H_{sb} = 2.134$

$H_{br} := (h_b - h_r) \cdot .3048$ $\quad H_{br} = 2.134$

The path distances specific to the geometry of the installation -- in meters

$R_{sb} := \sqrt{(D_{sb})^2 + (H_{sb})^2}$ $\quad R_{sb} = 2.622$

$R_{br} := \sqrt{D_{br}^2 + H_{br}^2}$ $\quad R_{br} = 36.03$

Fresnel Number

$$N_n := \frac{2 \cdot \left[(R_{sb} + R_{br}) - (D_{sb} + D_{br}) \right]}{\lambda_n}$$

$C := 10$

C=10 for receiver over reflecting plane (close to ground)

$$A_{barrier_n} := 10 \cdot \log\left[3 + C \cdot N_n \cdot \exp\left[-\frac{1}{2000} \cdot \sqrt{\frac{R_{sb} \cdot R_{br} \cdot (D_{sb} + D_{br})}{2 \cdot \left[(R_{sb} + R_{br}) - (D_{sb} + D_{br}) \right]}} \right] \right]$$

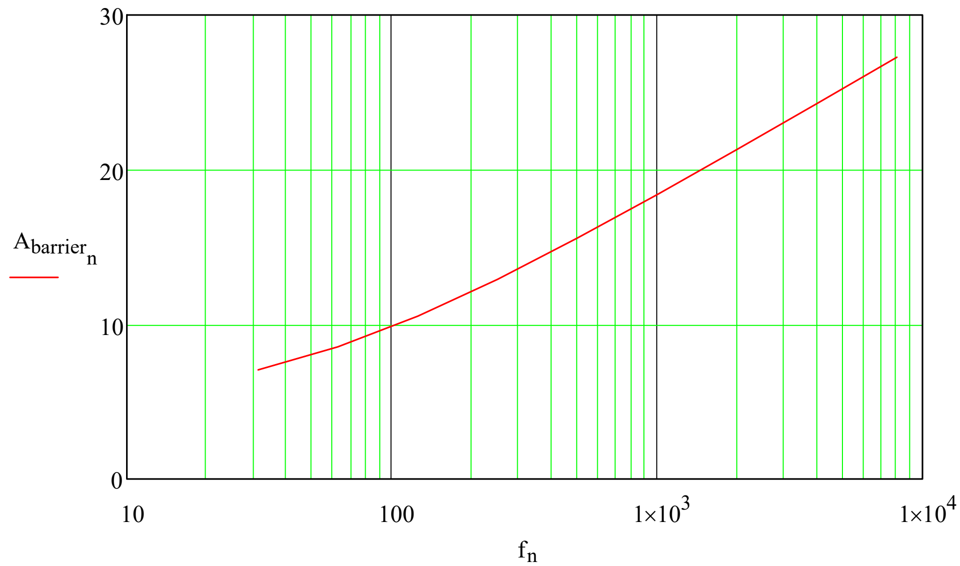
Barrier Attenuation

$$A_{barrier} = \begin{pmatrix} 7 \\ 8.5 \\ 10.5 \\ 12.9 \\ 15.6 \\ 18.4 \\ 21.3 \\ 24.3 \\ 27.3 \end{pmatrix}$$

31.5
63
125
250
500
1000
2000
4000
8000

Note: Practical limit for barrier attenuation is 20 dB

BAC Project PJ2023-1410 calculation 2 - Pg 2



SOUND BARRIER WALL ATTENUATION CALCULATION

Solar One - East Windsor

Source: Inverters -- Receiver: Residence Property Line

* Indicates values to be input in feet -- sound from source up and over wall to receiver behind wall
Wall 15 ft high
Baseline elev. 205 ft

$h_b := 15$ *Height of barrier

$h_s := 5$ *Height of source

$h_r := 5$ *Height of Receiver

$d_{sb} := 5$ *Distance from source to barrier

$d_{br} := 118$ *Distance from barrier to receiver

$c := 344$ Speed of sound (m/s) $n := 0..8$

$f_n := 31.25 \cdot 2^n$ Frequency of peak (Hz)

$\lambda_n := \frac{c}{f_n}$ Wavelength of peak (meters)

$D_{br} := d_{br} \cdot .3048$ $D_{br} = 35.966$

$D_{sb} := d_{sb} \cdot .3048$ $D_{sb} = 1.524$

$H_{sb} := (h_b - h_s) \cdot .3048$ $H_{sb} = 3.048$

$H_{br} := (h_b - h_r) \cdot .3048$ $H_{br} = 3.048$

The path distances specific to the geometry of the installation -- in meters

$R_{sb} := \sqrt{(D_{sb})^2 + (H_{sb})^2}$ $R_{sb} = 3.408$

$R_{br} := \sqrt{D_{br}^2 + H_{br}^2}$ $R_{br} = 36.095$

Fresnel Number

$$N_n := \frac{2 \cdot \left[(R_{sb} + R_{br}) - (D_{sb} + D_{br}) \right]}{\lambda_n}$$

$C := 10$

C=10 for receiver over reflecting plane (close to ground)

$$A_{barrier_n} := 10 \cdot \log \left[3 + C \cdot N_n \cdot \exp \left[-\frac{1}{2000} \cdot \sqrt{\frac{R_{sb} \cdot R_{br} \cdot (D_{sb} + D_{br})}{2 \cdot \left[(R_{sb} + R_{br}) - (D_{sb} + D_{br}) \right]}} \right] \right]$$

Barrier Attenuation

$A_{barrier}$ =	
8.2	31.5
10.1	63
12.4	125
15	250
17.8	500
20.7	1000
23.7	2000
26.7	4000
29.7	8000

Note: Practical limit for barrier attenuation is 20 dB

BAC Project PJ2023-1410 calculation 3 - Pg 2