Notification No. 1705261 of the Air Environment Division
May 26, 2017

Prefectural governors
Mayors of cities and special wards

Director General, Environmental Management Bureau, Ministry of the Environment

Notice of Guideline for the Wind Turbine Noise

Acceleration of the introduction of renewable energy is crucial for the environmental policy in Japan, and wind power generation is one of the important energy sources which does not emit air pollutants nor greenhouse gas and may contribute to energy security as it can be produced domestically. While the number of wind power facilities is steeply increasing both in Japan and abroad, the noise generated from them is pointed out as a cause of annoyance and to have a possibility of adverse health effects. Therefore, the Ministry of the Environment has established the "Expert Committee on Evaluation Method for the Wind Turbine Noise" in FY 2013 at the request of the Director General of the Environmental Management Bureau to investigate the solution to evaluate the wind turbine noise properly and the Committee published a final report "Investigation, Prediction and Evaluation Methods of the Wind Turbine Noise in Japan" in November 2016. Based on the report, the Ministry of the Environment has announced the guideline for the wind turbine noise as shown in the attached document. It is preferable that you refer to the aim of establishment of the guideline mentioned below, the guideline itself in the attached document and, as for the measurement method of the wind turbine noise, the separately provided "The Wind Turbine Noise Measurement Manual" in order to take measures to prevent noise problems and to preserve the living environment, and also to give special consideration to make it public to the related business operators. Prefectures are asked to make it public to the municipalities under their own jurisdictions.
This notification is a technical advice pursuant to the Local Autonomy Act, Article 245-4, paragraph 1.

Note

1. The important findings confirmed at the Committee and purpose of establishment of the guideline
(1) The important findings confirmed at the Committee
Wind power facilities are usually located in quiet areas due to the necessity to select areas with suitable climate conditions such as wind direction and speed. Therefore, though the level of the wind turbine noise is usually not significantly higher than the road traffic noise and other environmental noise at the residences in the neighborhood of the facilities, it may be more noticeable because of the low

background noise level. Moreover, in addition to the fact that the noise generated from the rotating blades of wind turbines is amplitude modulation (swish sound) of which the noise level fluctuates periodically, some of the wind turbines generate a sound with a concentration of acoustic energy into a very narrow frequency range (tonal component) from the inner accelerator or the cooling equipment, which is of a low noise level but can be more noticeable and cause annoyance.

From the survey results on the wind turbine noise all over Japan, infrasound of which frequency is less than 20 Hz is lower than the human perception threshold and, in comparison with the other environmental noises, no dominant noise of the low-frequency component is observed.

Based on the peer reviewed research results around the world, it has been concluded that the wind turbine noise is unlikely to have negative effects on human health directly. Moreover, no clear association is seen between infrasound or the low-frequency component of the wind turbine noise and human health.

However, the amplitude-modulation and tonal component included in the wind turbine noise tend to increase annoyance. In a quiet environment, it is suggested that the wind turbine noise over 35 - 40 dB raises annoyance and that the risk of sleep disturbance may increase accordingly. On the other hand, as a result of the experiment including infrasound, the A-weighted sound pressure level is found to be suitable to evaluate the sound loudness.

Research on the noise index in various countries revealed that the A-weighted sound pressure level is adopted by many countries. Moreover, several countries set a limit of the wind turbine noise by adding a certain value to the environmental background noise level.

(2) Purpose of establishment of the guideline

Based on the findings described in (1), the Committee has suggested to treat the wind turbine noise as noise in the audible frequency range and to consider it appropriate to evaluate, focusing on the annoyance and the sleep disturbance, the outdoor noise during daytime and nighttime respectively to preserve the indoor living environment, and proposed the evaluation criteria for the wind turbine noise.

Based on the report, the Ministry of the Environment established the guideline to prevent effects of the wind turbine noise on the living environment as shown in the attached documents.

Moreover, since the wind turbine noise occurs while wind is blowing, a different measurement method from the usual environment noise measurement, which avoids strong wind in order to reduce wind noise generated by wind hitting a sound level meter's microphone, is required, therefore a manual on the measurement was prepared and is to be provided separately.

The guideline and the manual are prepared in expectation of contributing to the implementation of the concrete measures by providers, operators and so on of wind power facilities, and of being the reference for local municipalities in discussing with the concerned operators and promoting understanding by local residents. To prevent effects of the wind turbine noise, it is preferable to make use of the guideline and the manual.

2. Relationship with the Environmental Quality Standards for Noise

The wind turbine noise varies depending on the size of the wind power facilities, wind condition at the location and so on, and the perception of the noise is affected by the distance from the wind power facilities, geographical features, surface ground cover condition such as vegetation and pavement and land-use condition of the area. The index value of this guideline (hereinafter, “Guideline value”) is established based on such characteristics of the wind turbine noise, not as a uniform value for the whole country, so that it would contribute to concrete measures taken by providers, operators and so on of wind power facilities in accordance with the local conditions, which is different in nature and the legal status from the environmental quality standards for noise (Notification No. 64 of Environment Agency, September 30, 1998, latest amendment: Notification No. 54 of Ministry of the Environment, March 30, 2012) which was established as a policy goal of the government for general noises and as standards of which maintenance is desirable for the preservation of the living environment and the protection of human health. Therefore, in the area to which a category of the environmental quality standards for noise is zoned and a wind power facilities is located, while taking continuous measures for general noises to preserve the living environment and to protect human health based on the environmental quality standards, it is preferable to take concrete measures for the wind turbine noise based on this guideline from a preventive point of view and in accordance with the local conditions.

End of document

(Attachment)

Guideline for the Wind Turbine Noise

Since wind power facilities are usually located in quiet areas, even though the level of the noise generated by them is relatively low, it may be more noticeable in the surrounding area. Moreover, wind power facilities sometimes generate amplitude modulation (swish sound) from the rotating blades and some of the facilities generate tonal component from the inner accelerator or the cooling equipment, and it is suggested that such noises possibly increase annoyance and the risk of sleep disturbance. On the other hand, infrasound generated from wind power facilities is lower than the human perception threshold and, in comparison with the other environmental noises, no dominant noise of the low-frequency component is observed, in addition, no clear association is seen between infrasound generated from wind power facilities and human health.

Based on such findings, a guideline to serve as a reference to prevent noise problems with regard to the wind turbine noise at the time of establishment or modification involving new construction of wind power facilities is established as follows.

1. Subject

The noise generated from the operation of wind power facilities over a certain scale which is used mainly for a commercial purpose is subject to this guideline.

2. Glossary

Meanings of the terms in this guideline are as follows.

- residual noise: The remaining noise after all specific noises are excluded from the total noise
- wind turbine noise: The noise generated from wind power facilities in addition to the local residual noise

3. Guideline value for the Wind Turbine Noise

Wind power facilities are usually located in quiet areas such as mountainous areas, where the noise level of the area changes significantly depending on the transient noise such as noise of infrequent passing traffic. On the other hand, the wind turbine noise varies depending on the size of the wind power facilities, wind condition at the location and so on, and the perception of noise is affected by the distance from the wind power facilities, geographical features, surface ground cover condition and land-use condition of the area.

Based on such characteristics, the Guideline value for the wind turbine noise is established in accordance with the local conditions instead of making it a uniform value for the whole country, by adding 5 dB to the residual noise (Fig. 1 and Fig. 2). However, some areas may have an extremely

quiet environment with residual noise under 30 dB. In such areas, an evaluation only by the increment from the residual noise might lead to the requirement of noise reduction which is more than necessary level for the preservation of the living environment. Therefore, a lower limit of the Guideline value is set in accordance with the local conditions and considering the level which would not interfere with the living environment (Fig. 2). Specifically, 35 dB is to be set as the lower limit value for the areas where the residual noise is lower than 30 dB, where the presence of facilities such as a school, a hospital and so on requires particular quietness, or where a soundscape to be preserved exists in the area (where, in addition to the requirement of the preservation of living environment, particular quietness is required to preserve a local soundscape designated by the national or local municipalities as e.g. “100 Soundscapes of Japan: Preserving Our Heritage” by the Ministry of the Environment), and 40 dB should be the lower limit value for the other areas.

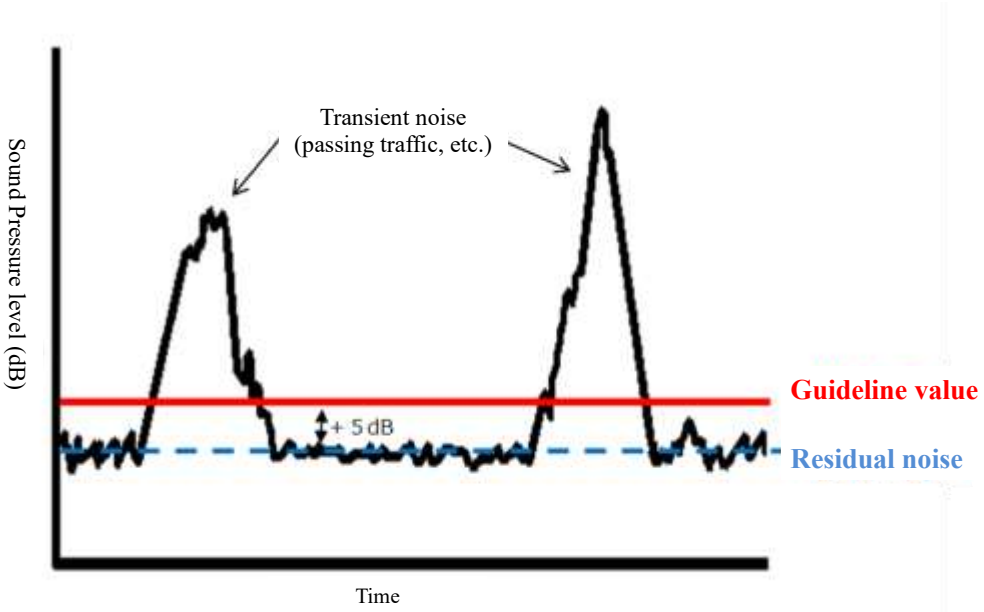

Fig. 1 Image of the Guideline value and the residual noise

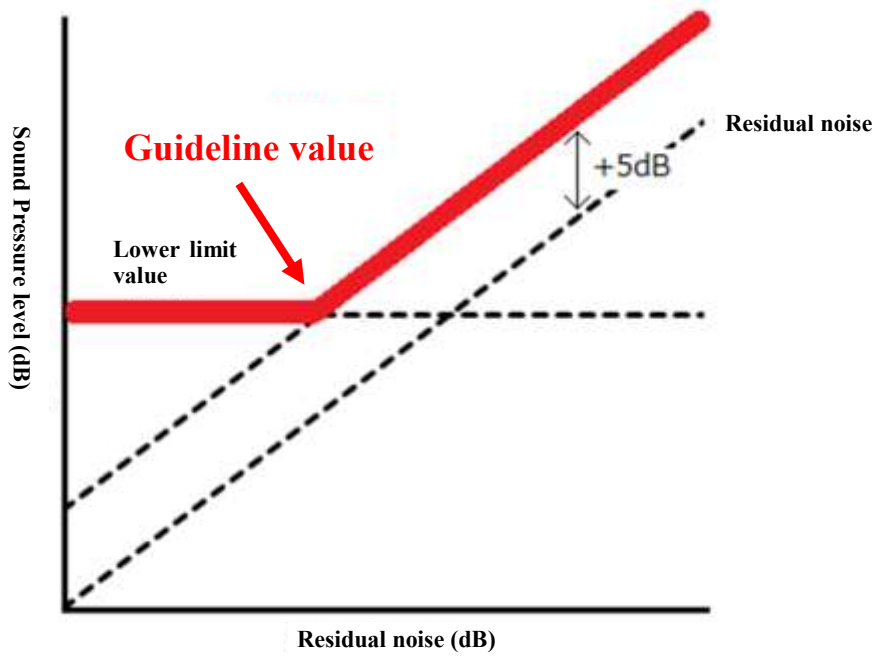

Fig. 2 Image of the Guideline value

4. Measurement method of the residual noise and the wind turbine noise and the approach to the comparison between these noises and the Guideline value

As the measure of evaluation of both noises, an A-weighted sound pressure level is adopted. Although strong wind is to be avoided to reduce wind noise generated by wind hitting a sound level meter's microphone in the usual environment noise measurement, since the residual noise and the wind turbine noise in this guideline need to be measured under the condition with wind which makes the wind power facilities operate, the measurement should be properly conducted following the method specified in the separately provided “The Wind Turbine Noise Measurement Manual” in principle and based on the actual condition such as the wind condition of the area.

The values of the residual noise and the wind turbine noise are to be derived in the area where the human living environment should be preserved, in the manner to preserve the indoor living environment and under the typical outdoor wind condition in which the wind turbine operates, for daytime (6 a.m. to 10 p.m.) and nighttime (10 p.m. to 6 a.m. of the next day) respectively. The Guideline value is established by adding 5 dB to the derived value of the residual noise. However, if the residual noise is lower than 30 dB (refer to the above “3. Guideline value for the Wind Turbine Noise”), the lower limit value (35 dB or 40 dB depending on the area) is set as the Guideline value. Thereupon, the derived wind turbine noise is to be compared to the Guideline value.

5. Notes

For the purpose of this guideline, the following points shall be taken into consideration.

- This guideline differs from the environmental quality standards, permissible limit or tolerable limit for noise.
- Results of different measurement methods cannot be simply compared.
- Since this guideline was established on the basis of the review with regard to the wind turbine noise, it cannot be used as an evaluation index for other kinds of noise.

6. Review of the guideline

This guideline will be revised as necessary by reevaluating the basic materials for the establishment accordingly.

7. Others

Because there are individual differences in perception of the noise, and also because the location environment of wind power facilities, lifestyles and living environment vary between regions, it is desirable to consider the preservation of the local soundscape by minimizing the effect of the wind turbine noise even when it does not exceed the Guideline value.