



Submitted Notice of Motion

Councillor A. Teskey

I will move at the next Meeting for a variation to the Limerick Development Plan to add the following to Chapter 11 Development Management Standards, 11.7.2.1 Wind Energy:

"In addition to the above, the following local considerations will be taken into account by the Council in relation to any planning application;

- Impact on human health in relation to noise disturbance (including consistency with the World Health Organisations 2018 Environmental Noise Guidelines for the European Region), shadow flicker and air quality."*

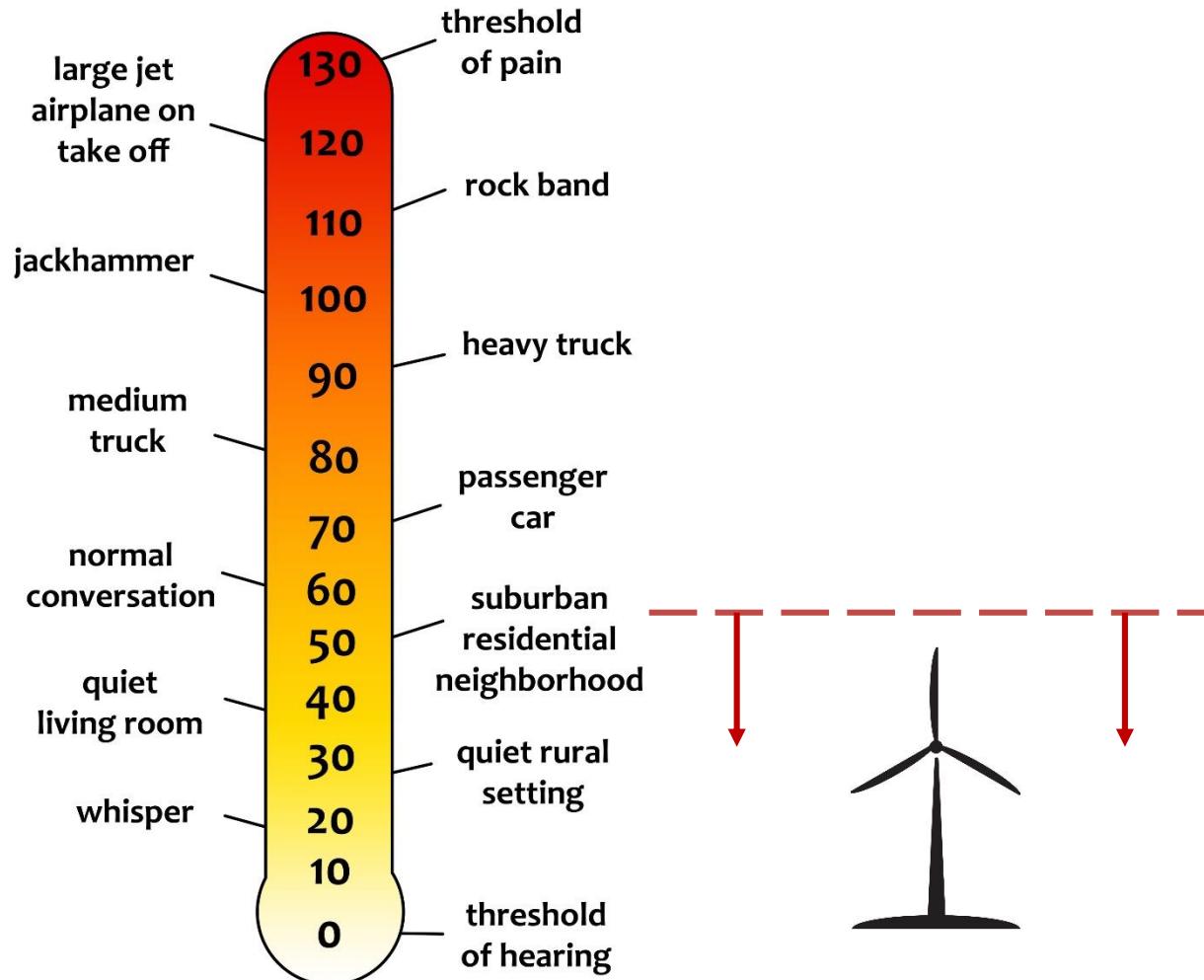


*Simon Jennings, Executive Scientist
Environment & Climate Action*



Sound Level Scale Wind Turbine Noise

Decibel Scale (dBA)

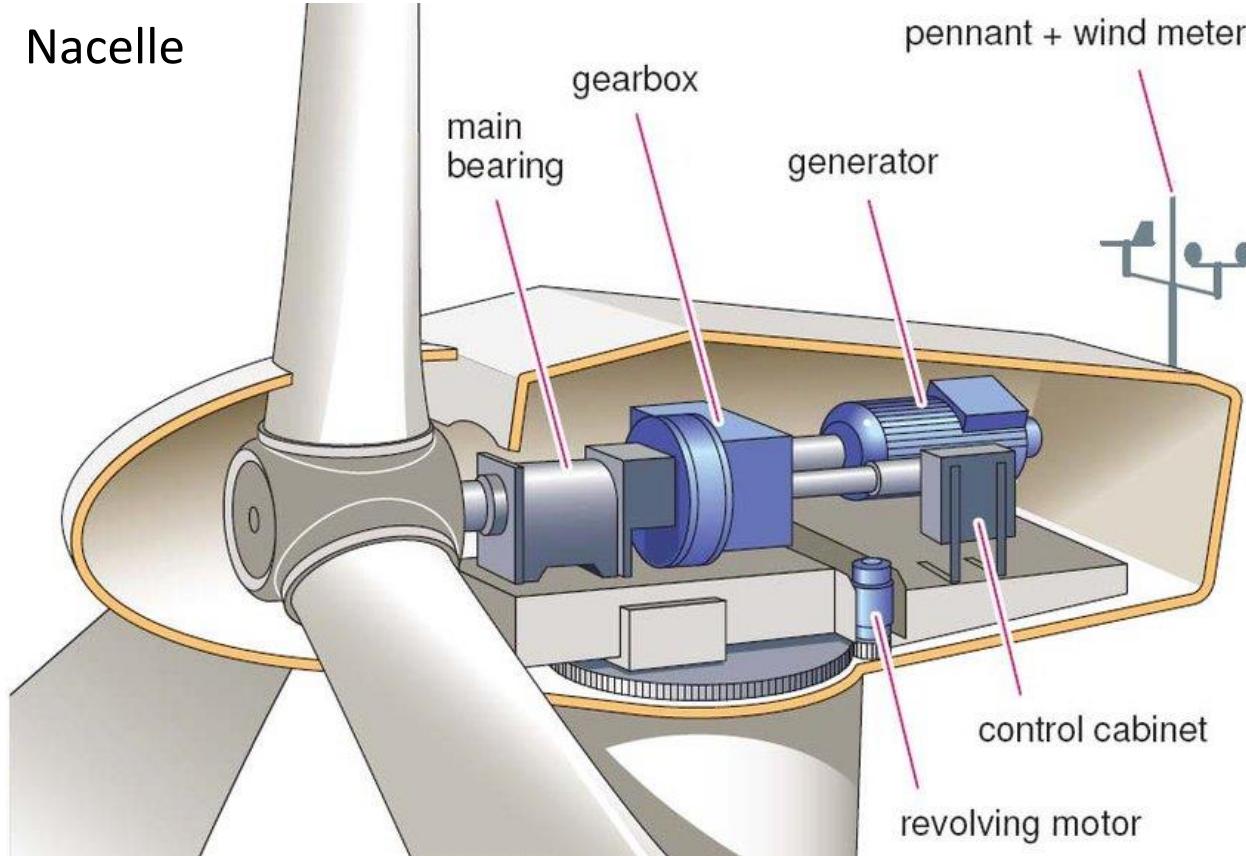




Sources of Wind Turbine Noise

Mechanical

Nacelle



Gearbox, generator, cooling systems, tower

Tower

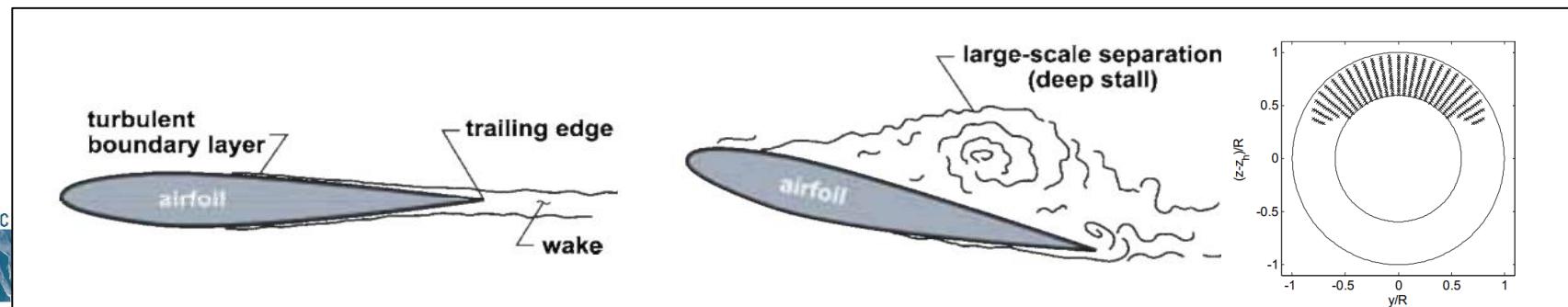
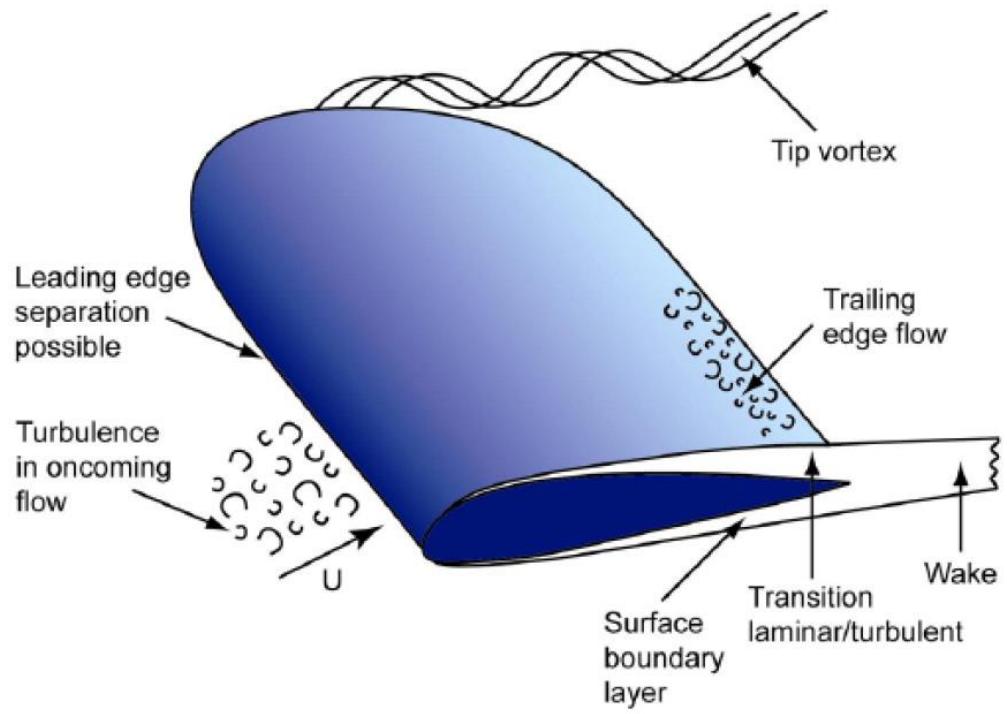
▲ 5.46×10^{-7}
 $\times 10^{-7}$





Sources of Wind Turbine Noise

Aerodynamic





Wind Turbine Noise Assessment

ETSU-R-97, 1996 (UK)

PGG, 2013 (UK)

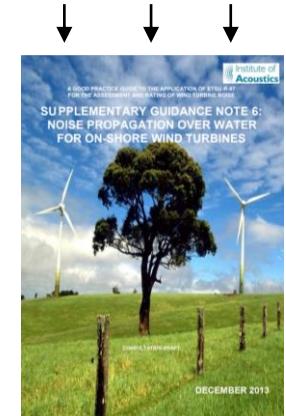
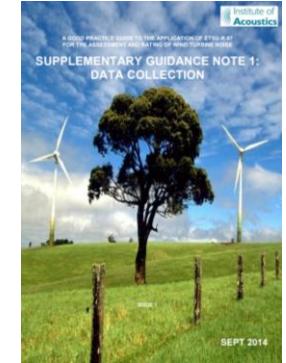
- *Background data collection*
- *Planning – Data analysis and setting noise limits (UK)*
- *Assessment of compliance*
- *Noise predictions*
- *Cumulative Issues*

IEC TS 61400-11-2, 2024

- *Instrumentation*
- *Planning measurements*
- *Measurement locations (e.g. external, internal)*
- *Non-acoustic measurements (e.g. meteorological data, operational data)*
- *Data filtering (e.g. binning, met, SCADA data)*
- *Sound pressure level (e.g. parameters, operational, specific)*
- *Tonal audibility, amplitude modulation, impulsivity, rating levels*
- *Infrasound*
- *Low frequency sound*



Supplementary documents 1 - 6



No standard, best practice or guidance on the assessment of harmful effects



Environmental Noise Guidelines, 2018

Lden calculation

- WHO recommendation based on Lden
- Lden is a long-term 24 hr noise indicator with penalties for evening (5 dB) and night (10 dB)

$$L_{den} = 10 \log \left(\frac{12 \cdot 10^{\frac{L_{day}}{10}} + 4 \cdot 10^{\frac{L_{evening}+5}{10}} + 8 \cdot 10^{\frac{L_{night}+10}{10}}}{24} \right)$$

where,

Lday is a long-term 12 hr sound level indicator (7.00am – 7.00pm)

Levening is a long-term 4 hr sound level indicator (7.00pm – 11.00pm)

Lnight is a long-term 8 hr sound level indicator (11.00pm – 7.00am)



Recommendation

For average noise exposure, the GDG conditionally recommends reducing noise levels produced by wind turbines below **45 dB L_{den}** , as wind turbine noise above this level is associated with adverse health effects.

No recommendation is made for average night noise exposure L_{night} of wind turbines. The quality of evidence of night-time exposure to wind turbine noise is too low to allow a recommendation.

To reduce health effects, the GDG conditionally recommends that policy-makers implement suitable measures to reduce noise exposure from wind turbines in the population exposed to levels above the guideline values for average noise exposure. No evidence is available, however, to facilitate the recommendation of one particular type of measure over another.

Strength

Conditional

Conditional



ENVIRONMENTAL NOISE GUIDELINES

for the European Region

Recommendations

Specific recommendations have been formulated for road traffic noise, railway noise, aircraft noise, wind turbine noise and leisure noise. Recommendations are rated as either strong or conditional.

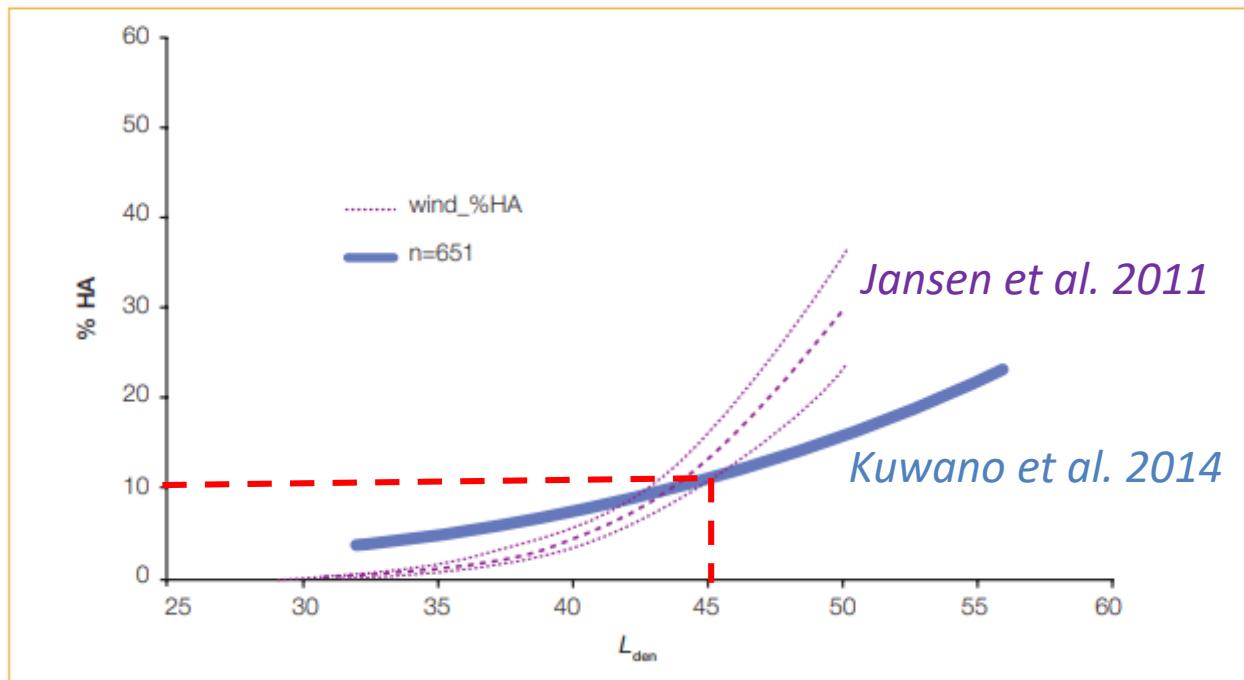
Strength of recommendation

- A **strong** recommendation can be adopted as policy in most situations. The guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences. The quality of evidence for a net benefit – combined with information about the values, preferences and resources – inform this recommendation, which should be implemented in most circumstances.
- A **conditional** recommendation requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply.



Environmental Noise Guidelines, 2018

Fig. 16. Overlay of the two wind turbine annoyance graphs



Notes: Overlay of the two wind turbine outdoor annoyance graphs adapted from Janssen et al. (2011, red) and Kuwano et al. (2014, blue). The Kuwano et al. curve is based on L_{dn} ; no correction for L_{dn} has been applied.¹⁸
For further details on the studies included in the figure please refer to the systematic review on environmental noise and annoyance (Guski et al., 2017).

Jansen et al. 2011 – based on 10% highly annoyed at 43.5 dB L_{den}

Social studies - Sweden (2), Netherlands (1) – calculated downwind levels (DLs) at NSRs at a community scale (29-56 dB), constant wind speed 8 m/s @ 10 metres height.

*Correction factor of +4.7 dB was applied to convert DL to 43.5 dB L_{den} (DL=38.8 dB)
 $LA90$ (downwind) ~ 37 dB*

Kuwano et al. 2014 – based on 10% annoyance at 45 dB L_{dn}

*Social studies - Japan (1)
WHO - L_{dn} estimated to be L_{den}
Calculated levels ($LAeq$) at a community scale (not known if DLs) – Converted to L_{dn} by correction factor of 6dB ($L=39$ dB) – not clear where correction factor comes from*

WHO document is based on very limited data, which only estimated the L_{den} for the sites studied, rather than assessing it directly from wind statistics.
Acknowledged in the WHO document:

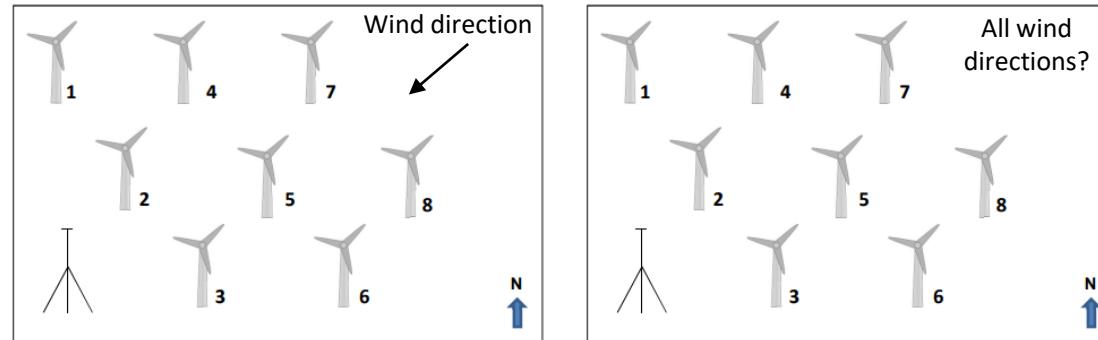
“may be concluded that the acoustical description of wind turbine noise by means of L_{den} or L_{night} may be a poor characterisation of wind turbine noise.”



Environmental Noise Guidelines, 2018

$Lden$ vs $LA90$

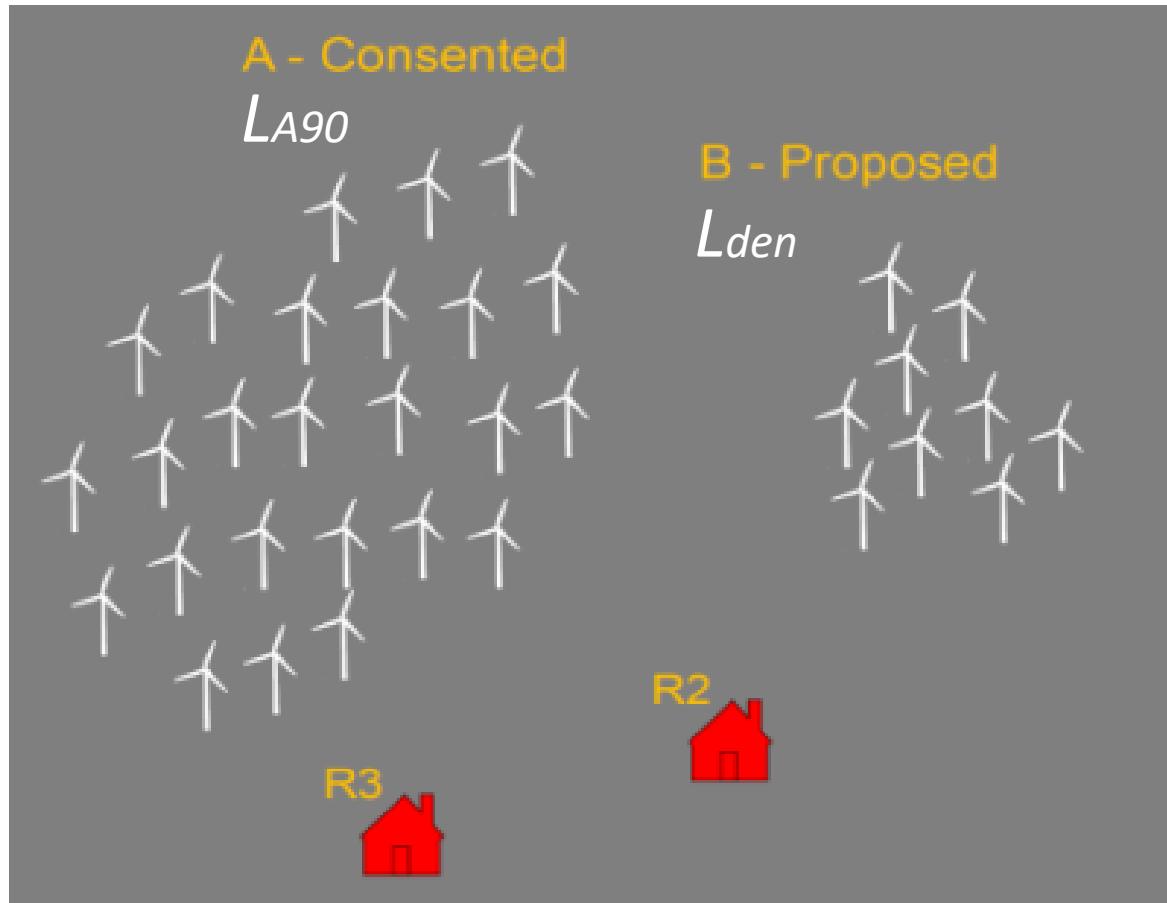
- *IEC 61400-11-2:2024 Wind energy generation systems – Part 11-2: Acoustic noise measurement techniques*
- *$Lden$ based on $LAeq$ (day/evening/night): $LAeq$ measurements are susceptible to being contaminated by transient sound events – background measurements for planning could be effected by transient sound*
- *Statistical indices (LAN) allow for some level of automatic reduction of the influence of transient events*
- *Using WHO recommendation could underestimate WTN levels associated with any annoyance if it occurs*
- *Undertaking predictive assessments of compliance with $Lden$ at the planning stage would generally be difficult and there is no guidance provided as to how this could be done.*





Environmental Noise Guidelines, 2018

Cumulative Issues



Predictive assessment of impact (% HA) for planning applications difficult



Planning Guidelines Ireland

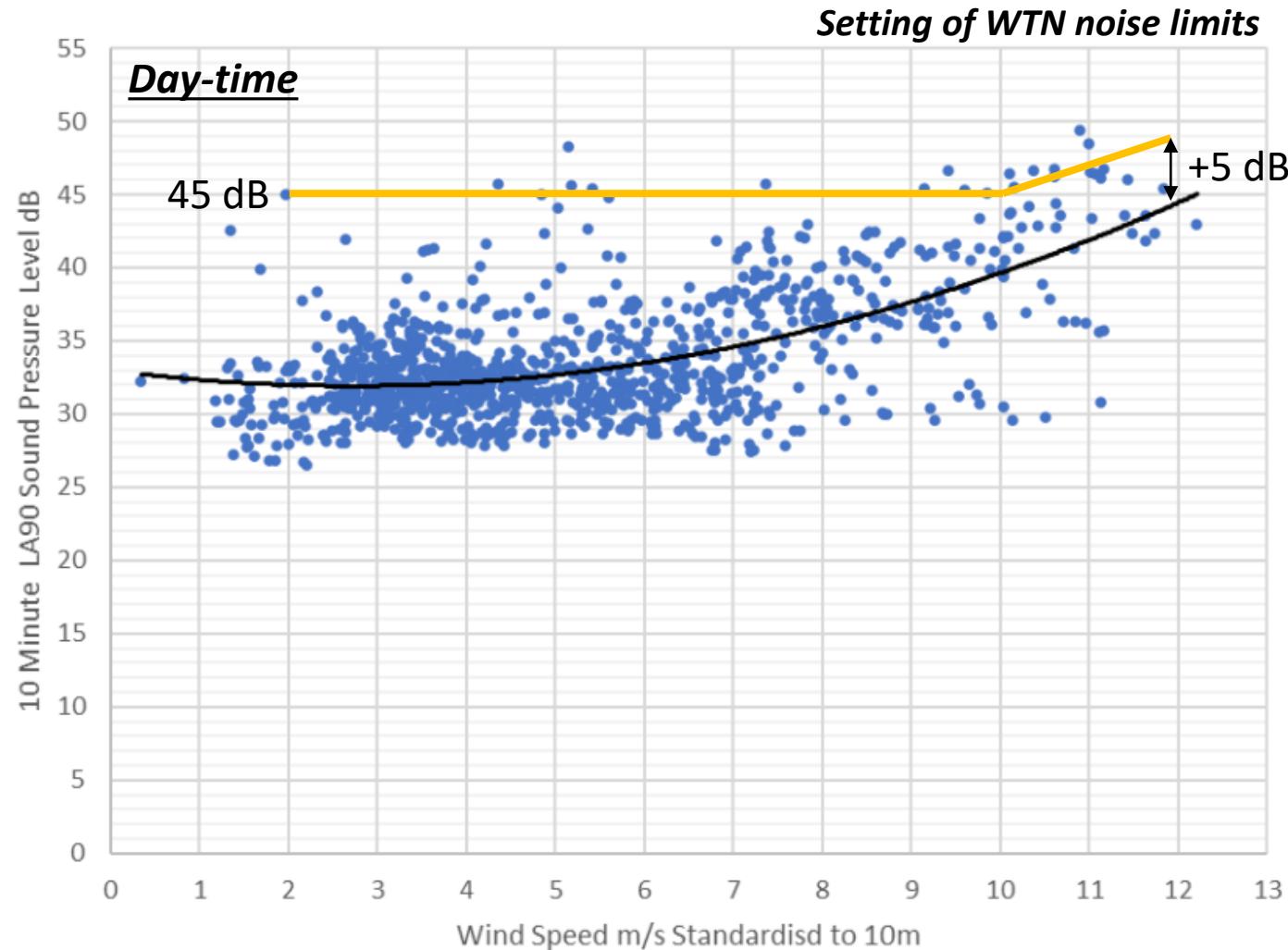
- **2006 Guidelines –**

- “a lower fixed limit of 45 dBA (L90) or a maximum increase of 5 dB background noise”.
- Save in “low noise environments **where** background noise is less than 30 dB(A), it is recommended that the daytime level of the LA90, 10min of the wind energy development noise be limited to an absolute level within the range of 35-40 dB(A)”. Use of the word *where* and doesn’t specify how to establish the lower limit between 35 and 40 dB.
- It provides that a fixed limit of 43 dBA L90 will protect sleep inside properties during the night, based on a UK planning recommendation at the time (PPG 24) of an average internal noise level of 35 dB LAeq to prevent sleep disturbance (out of date).
- “Noise from wind turbines is radiated more in some directions than others, with areas down-wind experiencing the highest predicted noise levels”. Generalised statement – AM.
- “Aerodynamic refinements that have combined to make turbines quieter..... include the change from lattice to tubular towers, the use of variable speed operations, and the switch to 3 blade turbine designs. Improvements in gearbox design and the use of anti-vibration techniques in the past ten years have resulted in significant reductions in mechanical noise. The most recent direct drive machines have no high-speed mechanical components and therefore do not produce mechanical noise.”
- Characteristics
- Largely based on ETSU-R-97.



Wind Energy Development Guidelines (2006)

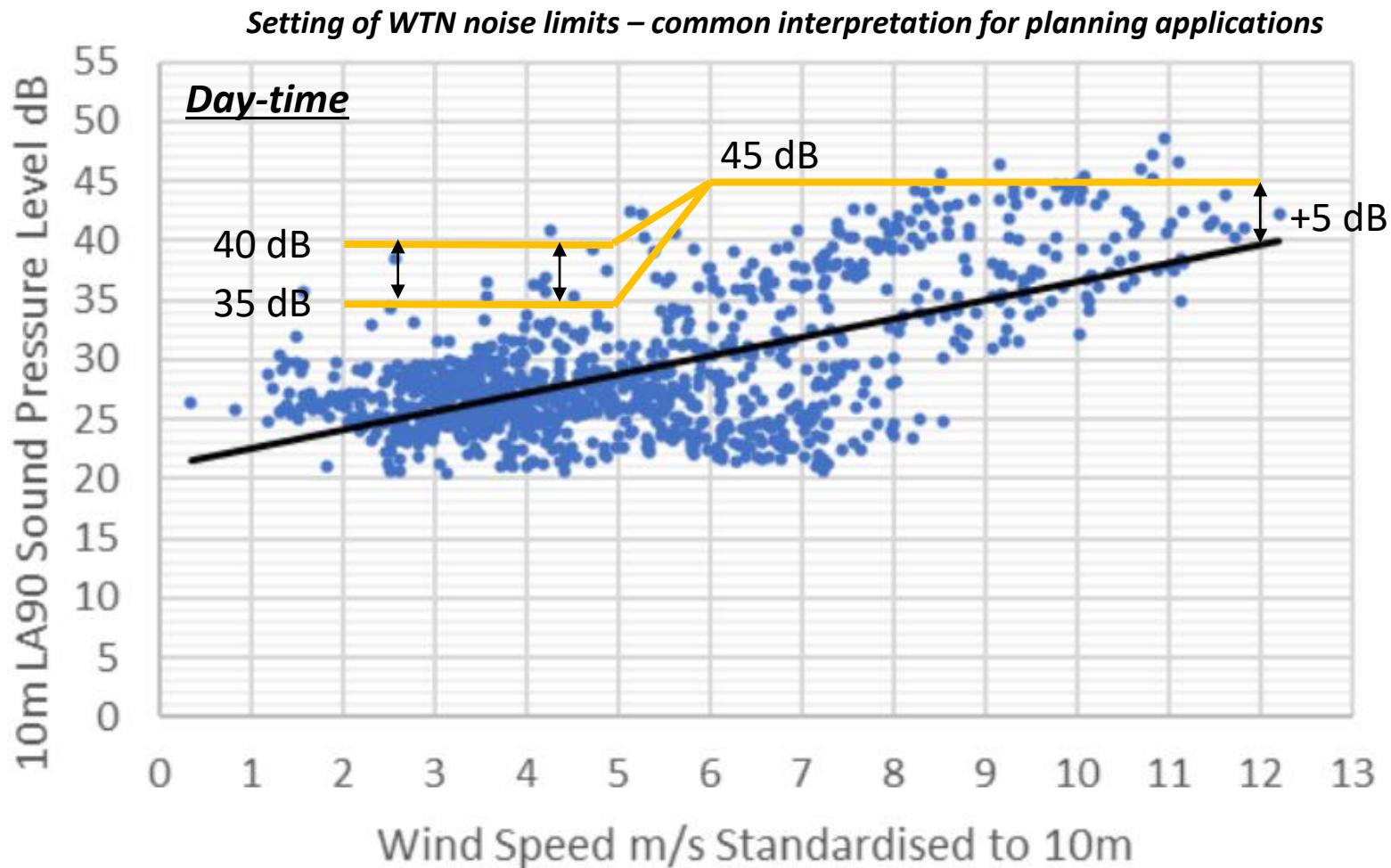
Ireland





Wind Energy Development Guidelines (2006)

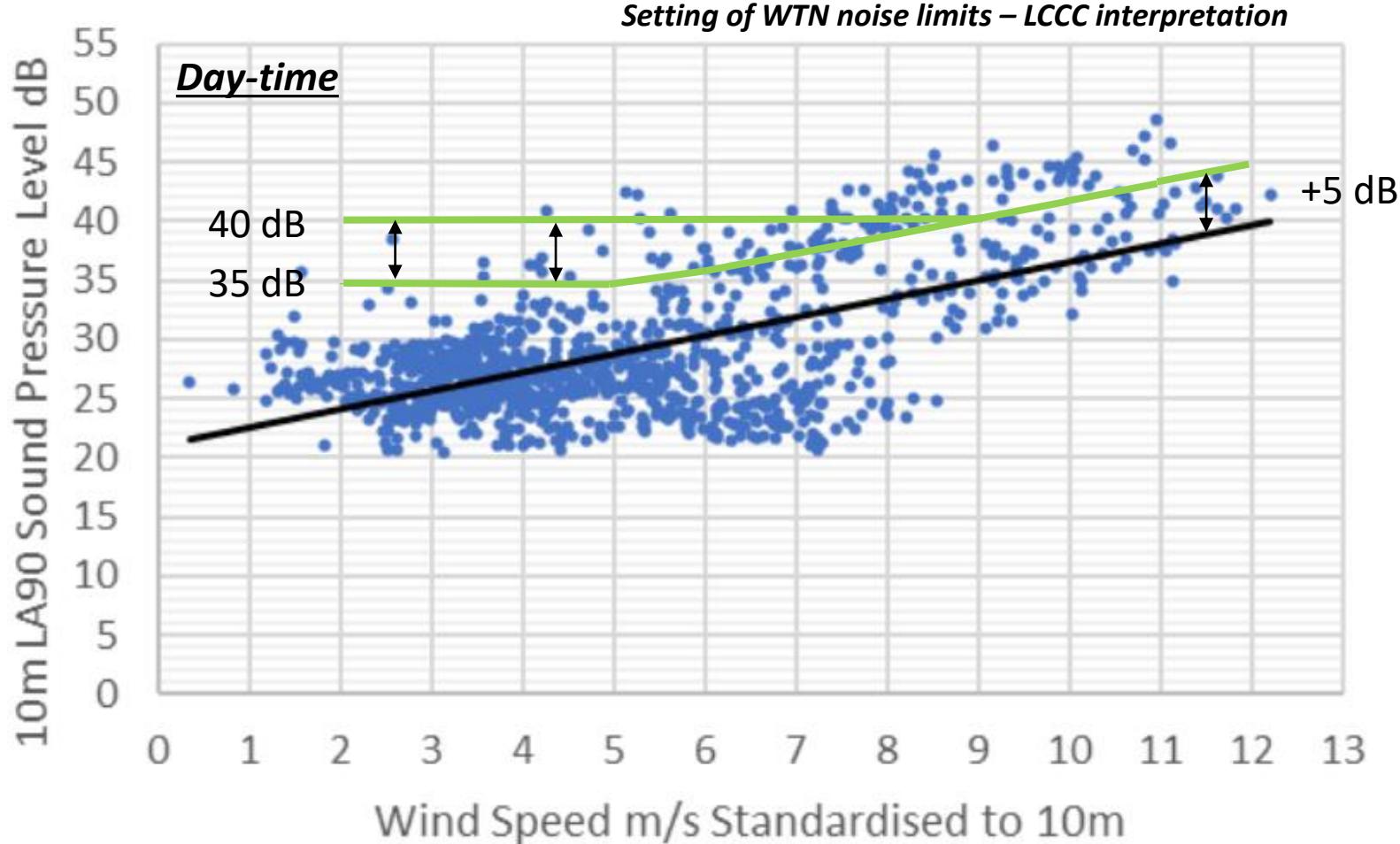
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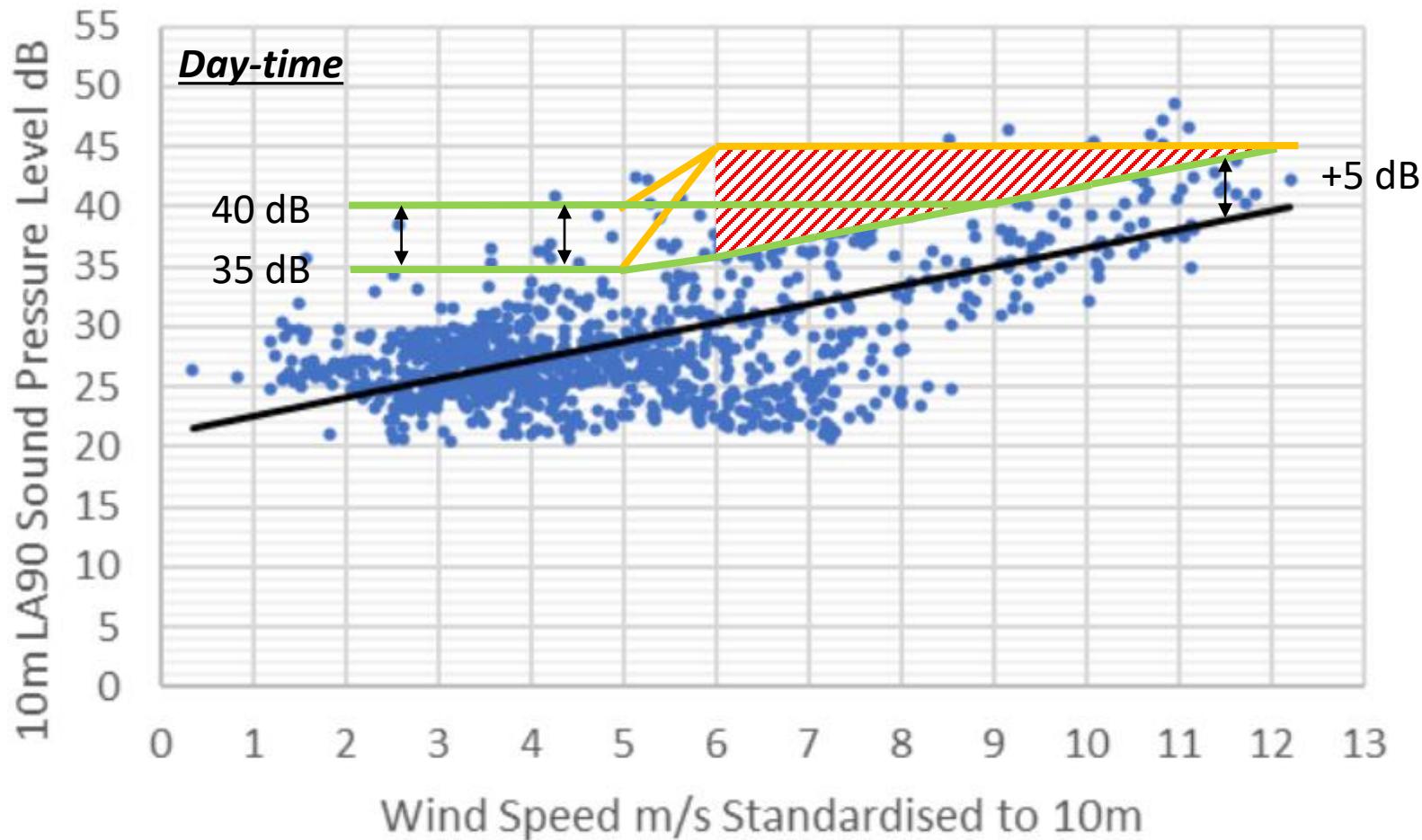
LCCC Approach





Wind Energy Development Guidelines (2006)

LCCC Approach

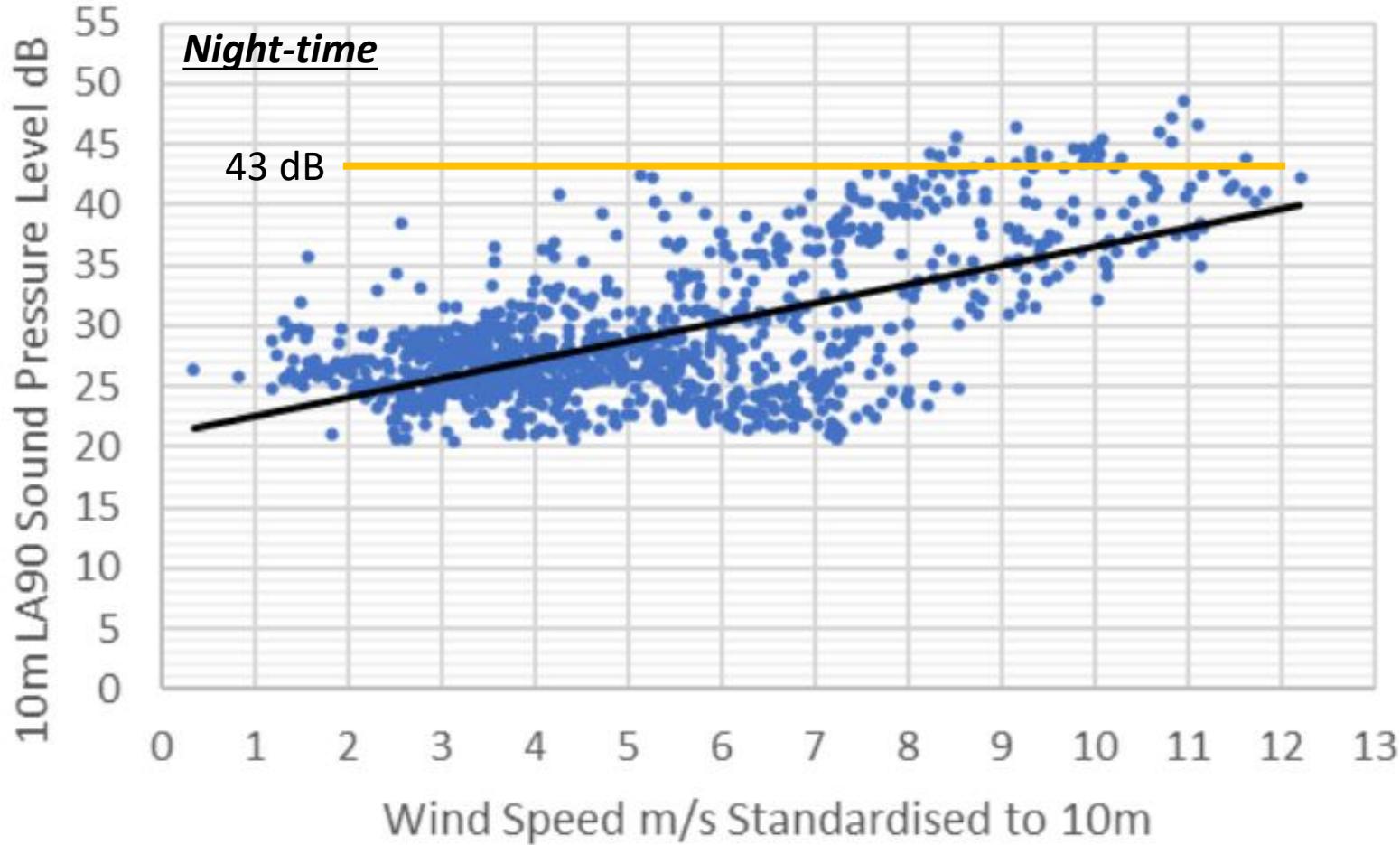




Wind Energy Development Guidelines (2006)

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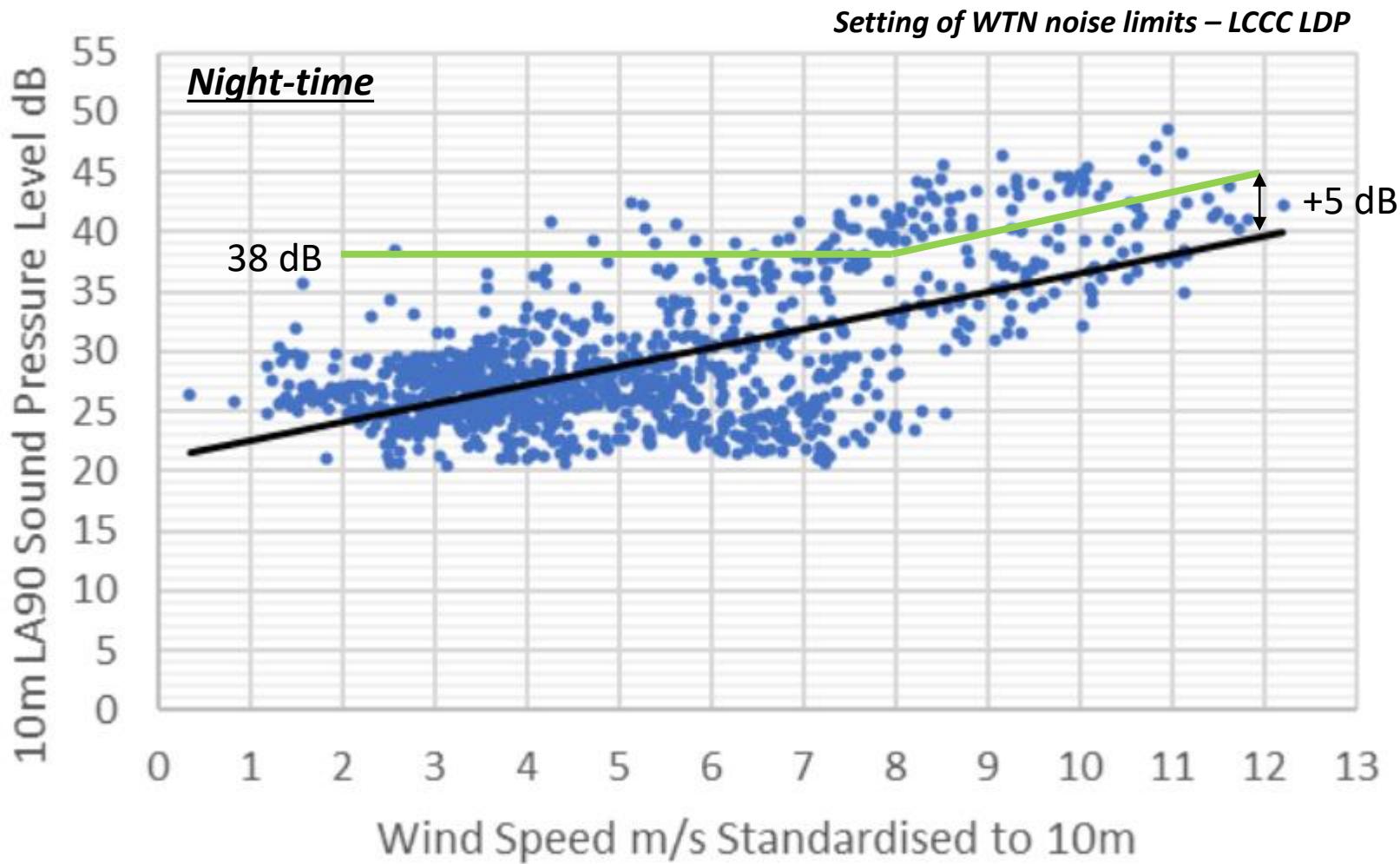
Setting of WTN noise limits – interpretation for planning applications





Wind Energy Development Guidelines (2006)

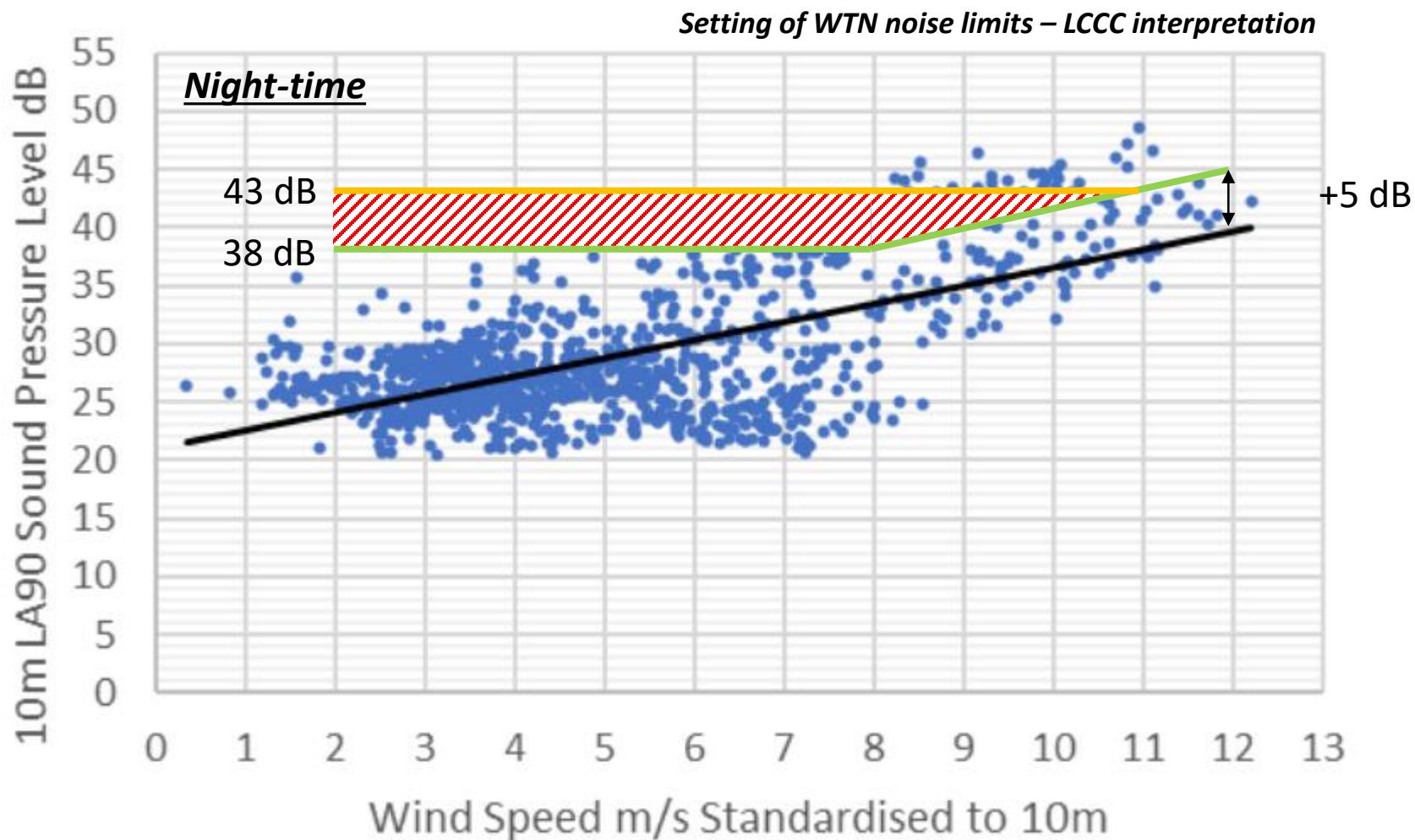
LCCC Approach





Wind Energy Development Guidelines (2006)

LCCC Approach





No recommendation made in ENG 2018

SHADOW FLICKER – Wind Energy Development Guidelines, 2006

Careful site selection, design and planning, and good use of relevant software, can help avoid the possibility of shadow flicker in the first instance. It is recommended that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day.

SHADOW FLICKER – Draft Wind Energy Development Guidelines, 2019

The planning authority or An Bord Pleanála should impose condition(s) to ensure that no existing dwelling or other affected property will experience shadow flicker as a result of the wind energy development subject of the planning application and the wind energy development shall be installed and operated in accordance with the shadow flicker study submitted to accompany the planning application, including any mitigation measures required.

A condition should be attached to all planning permissions for wind energy development to ensure that there will be no shadow flicker at any existing nearby dwelling or other relevant existing affected sensitive property and that the necessary measures outlined in the shadow flicker assessment submitted with the application, such as turbine shut down during the associated time periods, should be taken by the wind energy developer or operator to eliminate the shadow flicker.



Statements – Limerick Development Plan 2022-2028, Chapter 11 DMS

“The Council will be guided by the Wind Energy Guidelines, 2006, the recent Draft Wind Energy Guidelines, DHPLG, 2019 and any subsequent Section 28 guidance document.”

“Aspects to be considered by the Council when assessing planning applications for wind energy below SID thresholds include:

- Shadow flicker and mitigation measures”*

LCCC implement Draft Wind Energy Guidelines, DHPLG, 2019 in this case i.e. no property to be effected by shadow flicker

No recommendation made in ENG 2018

Objective EH 026

Air Pollution - It is an objective of the Council to implement the provisions of national and EU Directives on air pollution and other relevant legislative requirements in conjunction with other agencies as appropriate.

Objective EH 027

Improvement of Air Quality - It is an objective of the Council to improve air quality and help prevent people being exposed to unacceptable levels of pollution in Limerick, through the support of sustainable modes of transport, renewable energy, promotion of energy efficient buildings and homes and urban greening.

Objective EH 029

Air Quality during Construction - It is an objective of the Council to protect environmental quality and implement site appropriate mitigation measures during construction and demolition phases of a development, with respect to air quality, including dust.

Summary

- No standard, guidance or best practice available for assessing impact of wind turbine noise on human health (including in the ENGs).
- ENG (conditional) recommendation based on limited data and acknowledges L_{den} may not be an appropriate parameter to measure WTN.
- Use of ENGs could underestimate impact (L_{den} is a long-term noise indicator). Additionally, no WHO curve to estimate impact on human health (level v %HA) based on Jansen *et al.* and Kuwano *et al.* studies (unlike road, rail and air).
- Interpretation of WEDGs (2006) is crucial for setting day-time noise limits in planning.
- LDP requirement for night-time noise limits provides more protection from levels at noise sensitive locations than WEDGs 2006 and ENG (in opinion of LCCC).
- **Recommendation:** Not to make a variation to the existing LDP and await new guidelines - expected in 2025.



Comhairle Cathrach
& Contae **Luimnigh**
Limerick City
& County Council



Thank You
Questions?