Wind Farm Noise
Assessment and Management

NHMRC Presentation by Dr Bob Thorne, June 2011
Today’s Presentation Introduces

- Wind farm noise issues
- Wind farm noise assessment
- Adverse health effects
- Wind farm noise management
Scoping the Issues

The Senate WF Inquiry submissions confirm

- Individuals living near operational wind farms report sleep disturbance and adverse health effects
- Wind farm developers and operators do not believe that there are adverse effects from wind farm activity
What evidence is there to support the claim that wind farm noise can affect people?

- Extensive peer-reviewed research
- Complaint histories to regulatory authorities
- Personal evidence provided by way of evidential affidavits to legal proceedings
Are Complaints Effective?

Te Rere Hau wind farm, New Zealand with over 360 complaints in 12 months
- City Council taking legal action to reduce noise

BUT

West Wind wind farm, New Zealand with over 900 complaints in 12 months
- City Council not taking action to address complaints
The Problems for Wind Farm developers and Residents stem directly from ineffective land-use planning; lack of understanding of the problems involved; inadequate acoustical & human perception analysis; and ineffective compliance authorities.
Wind farm noise assessment

Three distinct ‘measures’ apply

- Environmental risk assessment
- Noise numbers
- Adverse health effects
Risk Assessment

Overall Environmental Change
Detailed Long and Short-term Analysis
Degree of Intrusion on Wellbeing and Amenity
Noise Numbers and Low Amplitude Sound

- Difficult to measure wind farm ‘sound-in-sound’
- Sounds below 35-40dBA can be intrusive and annoying
- The CHARACTER of the sound becomes important as well as sound ‘level’ or ‘volume’
Wind turbine levels indoors

Wind turbine sound (sharp peaks) BELOW 32 dB(A) clearly audible inside residence
Sonogram of slow moving turbines 500m – 1500m distant (31 LAeq)
Turbine sound patterns

Source: Acoustic Camera, "Multiple noise sources wind turbines 300Hz-7kHz.avi"

Colour patterns show location of sound over blades
Infrasound

- Often inaudible but perceptible
- Readily measured
- Wind IS characterised as infrasound
- Turbines change wind flow with cumulative effect from multiple turbines = pressure variations with a pulsing pattern (heightened noise zones)
Adverse Health Effects

- Annoyance and Sleep Disturbance
- Anxiety, stress and harmful health effects (e.g. headaches, nausea, balance problems, sleep deprivation)
Intrusive Noise

Intrusive noise
Unreasonable interference with the comfort or repose of a person

Noise defined as

A sound that is perceptible to a human observer and has definable characteristics that modify the observer’s emotional and informational responses to that sound from pleasurable or neutral to adverse.
Wind farm noise management

Two management options apply

- Noise numbers
- Setback or buffer distances
Noise Numbers

- Apply an acoustical standard or guideline
- Numbers assume “acceptable levels” that are not scientifically proven
- Difficult to predict with any accuracy
- Difficult to measure for compliance
- Little relevance to people affected by noise
Setback Distances

- Simple to apply
- Referenced to turbine type, location and known adverse effects of audible noise and infrasound
- Detailed research is needed to establish setback distances to mitigate audible noise and the effects of pressure waves
Wind Farm Noise Mitigation

- Turbine design to reduce noise
- Wind farm design to reduce wake and turbulence effects
- Robust and effective ‘1-minute’ noise complaint system linked to automatic shut-down of problem turbines
CONCLUSIONS

- Health risks due to wind farm noise are known, and are measurable
- The causes of identified problems are not clearly known although workable hypotheses are developed
- There is an urgent need for research into the causes and effects of wind farm noise on individuals