

**First International Symposium on Adverse Health Effects from Wind Turbines**  
**The Global Wind Industry and Adverse Health Effects: Loss of Social Justice?**  
**Picton, Prince Edward County, Ontario, Canada**  
October 29-31, 2010

Session I

No Rules, No Caution, No Accountability

Abstract and bio on slide 2 is reproduced from the Symposium Program

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**Orville Walsh, CCSAGE -  
NO GLOBAL STANDARDS**

**Abstract:** The rapid expansion of the wind energy industry globally has resulted in governmental authorities at different levels responding to opposing pressures to create or modify regulations and planning guidelines for the siting of utility scale wind turbines. Siting guidelines for health, safety, cultural and natural heritage were reviewed and compared. The results indicate wide ranges of siting standards are being adopted. Government authorities have employed a variety of criteria, resulting in significant variation in the spatial separation between wind turbines and sensitive areas as well as the intensity of the development. Separation distances in many jurisdictions are less than those recommended by health professionals suggesting some in the population are at risk. Current trends in government planning and regulations are discussed.

**Bio:** Orville Walsh is a resident of Prince Edward County, Ontario and the Chairman of the County Coalition for Safe and Appropriate Green Energy and a board member of the Alliance to Protect Prince Edward County. Walsh held senior management positions with Honda Canada and recently retired after a 30 year career.

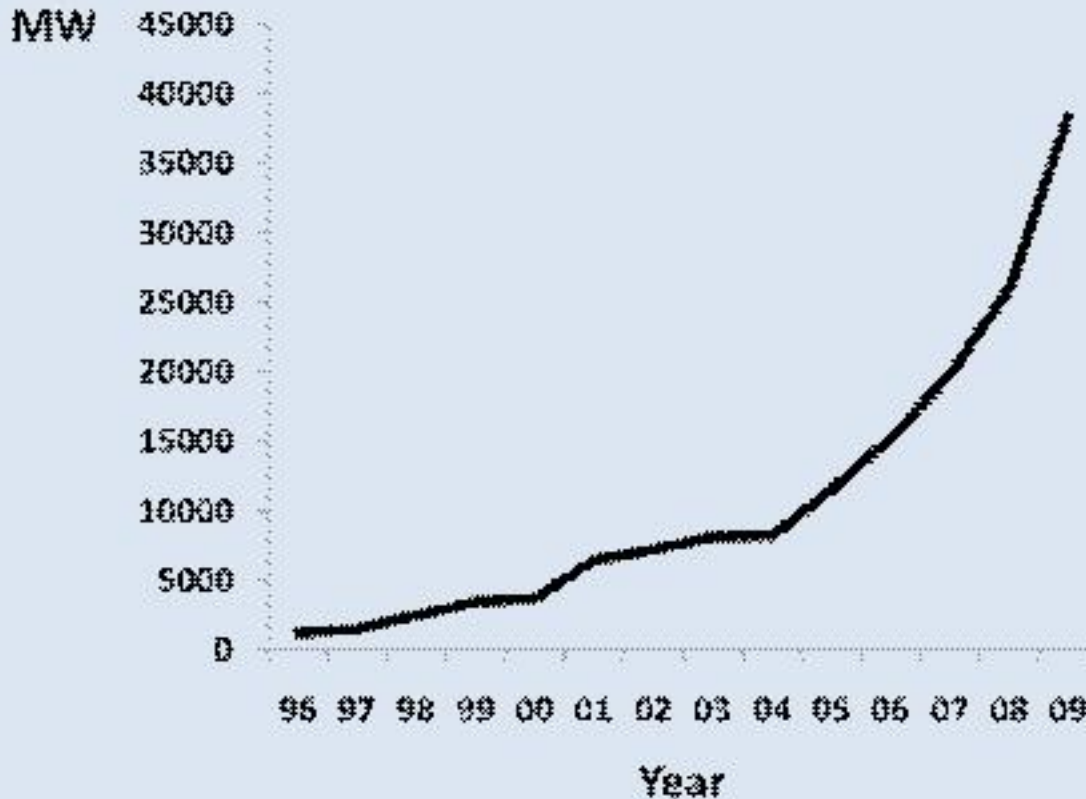


# No Global Standards

International Symposium The Global  
Wind Industry and Adverse Health  
Effects: Lose of Social Justice?

Picton, October 2010

## Global Annual Installed Wind Energy Capacity 1996-2009



### Growth will continue

- In 2009 38,000MW of wind energy installed.
- Total cumulative installations 158,000MW
- Forecasts indicate over 400,000MW installed by 2014
- Industry driven by:
  - Renewable energy targets
  - National or Provincial/State incentives
  - Economic policy (Green economy)
- Wind energy has wide government and public support.

# Challenging for regulators

In most jurisdictions the final responsibility and decision for the siting industrial development resides with municipal (local) authorities, guided by state or national guidelines or standards.

Crafting bylaws or ordinances to deal with utility scale wind energy developments is challenging:

- It's new
  - Unfamiliar and complex and controversial
- Unique characteristics with scale and operations
  - Large machinery, large unshielded moving components
  - Multiple machines covering a large land area
  - Elevated noise source
  - Operation on a 365/7/24 basis
  - No on-site staff, normally operated from remote locations
  - Located normally in rural and non-industrial locations

# Unique areas of concern for wind turbine siting

## Health and Safety

Noise

Shadow flicker

Catastrophic failure

Blade /Ice throw

## Natural Environment

Birds and Bats

Habitat

Wetlands, water courses

## Cultural and Economic

Property Rights

Cultural Heritage

Tourism

Viewscape

# Unique areas of concern for wind turbine siting

## Health and Safety

Noise

### Noise

Control by dB level or establish distance setbacks

Shadow flicker

### Shadow Flicker

Can be accurately predicted, control exposure

Catastrophic failure

Blade /Ice throw

### Failure and blade ice throw

Establish safe distance setbacks

# dB Based Standards

## World Health Organization Guidelines for Community Noise

Specific environment	Critical health effect(s)	LAeq [dB(A)]	LAmx fast [dB]
Outdoor living area	Serious annoyance, daytime and evening Moderate annoyance, daytime and evening	55 50	
Dwelling, indoors	Speech intelligibility & moderate annoyance, Daytime & evening	35	
Inside bedrooms	Sleep disturbance, night-time	30	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60

When noise is continuous, the equivalent sound pressure level should not exceed 30 dB(A) indoors, if negative effects on sleep are to be avoided. For noise with a large proportion of low-frequency sound a still lower guideline value is recommended. When the background noise is low, noise exceeding 45 dB LAmx should be limited, if possible, and for sensitive persons an even lower limit is preferred.

Source: GUIDELINES FOR COMMUNITY NOISE 1999



## Distance based recommendations for setbacks from utility scale wind turbines

Researcher	Country	Recommended setback
Pierpont	USA	2.0km
Frey and Hadden	U.K.	2.0km
Harry	U.K.	2.4km
French Academy of Medicin	France	1.5km
U.K. Noise Association	U.K.	1.6km

# Method

1. Utilized published comparative reviews
2. Targeted internet search by jurisdiction
  - National/Provincial/State Government Ministries/Departments and National Wind Energy Associations
3. Obtain a copy of the legislation, ordinance, bylaw or guidance documents
4. Limited to utility scale wind turbine facilities (excludes micro, small, medium)
5. Noise limits and setbacks are for rural residential and non-participating properties/dwellings

## Limitations

- Difficult to confirm if most current
- Noise penalties (tonality, impulsive) not included
- On-land only

# Sources

## Comparative studies

- Noise annoyance from wind turbines – a review- Pedersen 2003
- Wind Turbine Facilities Noise Issues – Ramakrishnan 2007
- Studies for New Brunswick and Nova Scotia municipalities- (Jacques Whitford 2008)

## Wind Industry Associations websites

- American Wind Energy Association , Clean Energy Council (Auswind), Canadian Wind Energy Association, Danish Wind Industry Association  
European Wind Energy Association

## Project Environmental assessment documents

## Government websites

- Municipal
- Canadian Provincial Ministries
- U.S. State Agencies/Departments
- U.S. Department of Energy, Energy Efficiency and Renewable Energy

Europe Country	Rural Residential Noise Limits dBA			Minimum Setback Distance (m) h=hub height, H=total height D= Rotor diameter			
	Time of day			Comments	Property Line	Dwelling	Roads
	Day	Night	Any				
Belgium	49	39					
Denmark			40			4H	
France	+5	+3		Above ambient, pre- post installation			
Germany	50	40/35					
Ireland	35-40*	43*	L <sub>90</sub> +5 dBA	Guidelines only	2D		1.1H
Netherlands			40	Interim			
Portugal	55	43					
Spain				Local/Regional			
Sweden			40				
UK	40*	43*	L <sub>90,10</sub> +5 dBA				

\*Values are minimum limits,  
i.e. when calculating the limit of ambient plus, it can not go below these established minimums

<u>Australia</u> State and <u>New Zealand</u>	Rural Residential Noise Limits dBA		Minimum Setback Distance (m)		
	Anytime of day	Comments	Property Line	Dwelling	Roads
<b>Australia</b>		Draft guidelines being prepared			
Northern Territory		No specific guidelines			
New South Wales	L <sub>A90,10</sub> +5dBA	*35 LAeq,10			
Queensland		No specific guidance			
South Australia	L <sub>90</sub> +5dBA	*35LA90			
Tasmania		No specific guidance			
Western Australia	35 LA10			1000	
Victoria	L <sub>90</sub> +5dBA	*40LA95			
<b>New Zealand</b>	L <sub>90</sub> +5dBA	*35-40 L90 (10min)			

\*Values are minimum limits,  
i.e. when calculating the limit of ambient plus, it can not go below these established minimums

USA State Municipality	Rural Residential Noise Limits			Minimum Setback Distance (m) h=hub height, H=total height, D=rotor diameter		
	Any time of day		Comments	Property Line	Dwelling	Roads
	dB(A)	dB(C)				
<b>Wisconsin</b>						
State Model Ordinance	50			1.1H	305	1.1H
Buffalo County	50			H+15		
Door County	50			1.1H	2H/305	1.1H
Town of Magnolia	35 /+5	38		5D/305	805	305
Manitowoc County	+5			305		
Mitchell	50			1.1H	1.1H	1.1H
Morrison	50			1.1H	305	
New Glarus	45	Yes	By frequency bands			
Town of Rockland	50			1.1H	305	1.1H
Shawano County	+5	Yes		2H/152	4H/305	
Town of Union	+5 & 35	50	Or LeqC-LA90 < +20	5D/305	805	3H

USA State Municipality	Rural Residential Noise Limits dB(A)		Minimum Setback Distance (m) h = hub height, H = total height, D = rotor diameter		
	Any time of day	Comments	Property Line	Dwelling	Roads
<b>Michigan</b>					
State Model Ordinance	55	at property line	1.0 -1.5H		
Bank County	60				
Gratiot County	55	at property line	1.5h	2h or 305	
Huron County	50			2h or 305	1.5h
City of Ionia	55	Or +5dBA			
Lodi	55	At project property line	1.5h		
Long Lake Township	+10	Above ambient baseline	2H	1.25H	5H
Manchester Township	55		1.5H		1.5H
Ostego County	+10	At project property line	381		381
Ottawa County	+5		1.5H	1.5H	1.5H
City of Portland	+5	At project property line	1.5H	2H or 305	

USA State Municipality	Rural Residential Noise Limits dBA		Minimum Setback Distance (m) h = hub height, H = total height, D = rotor diameter			
	Time of day		Comments	Property Line	Dwelling	Roads
	Day	Night				
<b>Minnesota</b>						
State Model Ordinance	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		3D-5D (based on cardinal direction)	152+noise	76
Big Stone County	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		1.1H	229	1.1H
Browns County	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		1.5H	229	1.5H
Cooks County	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		H		
Fillmore County	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		1.1H	229	
Lyon County	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		1.1H	305	H
Martin County	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		H	229	
Nicollet County	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		1.1H	229	1.1H
Swift County	L <sub>10</sub> 65 L <sub>50</sub> 60	L <sub>10</sub> 55 L <sub>50</sub> 50		1.1H	229	H



USA State	Rural Residential Noise Limits dBA			Minimum Setback Distance (m)			
	Time of day			Comments	Property Line	Dwelling	Roads
	Day	Night	Any				
Oregon	L50 55 L10 60 L1 75	L50 50 L10 55 L1 60	36	+10 over ambient assumed to be 26  In any one hour		1000	

USA State Municipality	Rural Residential Noise Limits			Minimum Setback Distance (m) h = hub height, H = total height, D = rotor diameter		
	Any time of day		Comments	Property Line	Dwelling	Roads
	dB(A)	dBC				
<b>New York</b>						
State Model Ordinance	50			1.5H	457	1.5H
Fenner	50		Property line	1.5H	1.5H	
Hamlin	+6		Above ambient	183	366	183
Martinsburg				91	457	
St. Lawrence County	50			152	305	152
<b>North Carolina</b>						
State Model Ordinance	55			1.5H	2.5H	1.5H
Ashe County	45			305		1.5H
Camden County	None			1H	2H	
Currituck County				1.5H	2.5H	1.5-2.5H
Hyde County	55			1.1H	2.5H	1.5H
Kill Devil	60					
Tyrell County	55			1.5H	2.5H	1.5H
Watuga County					1.5H	18

USA State Municipality	Rural Residential Noise Limits					Minimum Setback Distance (m) h = hub height, H = total height, D = rotor diameter		
	dBA			dBC	Comments	Property Line	Dwelling	Roads
	Day	Night	Any					
<b>Maine</b>								
State Model Ordinance	55	45						
Town of Buckfield			+5	Max 50		Larger of 13H or 1609		4H
Dixmont*	50	40		+20 Max 50-55	$L_{eq}C_{(post)} -$ $L_{90}A_{(pre)} < 20$ dB	762	1609	457
Town of Montville			+5	+20 Max 50		Larger of 13H or 1609		4H
<b>Massachusetts</b>								
State Model Ordinance			+10		At propertyline and dwelling	30	1.5H	1.5H
Salem			+10			0.75H	H	

\* Sound limits apply when within 0-1609m of non-participating property, lower limits apply for those greater than 1609m

Canada Province Municipality	Rural Residential Noise Limits dBA				Minimum Setback Distance (m) h =hub height, H=total height, b=blade length		
	Time of day			Comments	Property Line	Dwelling	Roads
	Day	Night	Any				
British Columbia			40				
Alberta	50	40		40 dBA at 1.5km if no receptor			
Pincher Creek MD	50	40	45	At project boundary	1.1H		1.1H
Manitoba*				Guidance document only	1.5H	500-550	1.5H
Ontario				Number of turbines ⇒ +SPL (40dBA is target)	h or can be reduced to b+10	550-1500	b+10
			40	Target for predictive modeling		550	
			40-51	for compliance			
Québec			40				
New Brunswick*			40-53	wind speed, guidance only			
Nova Scotia*			40-53	wind speed, guidance only			
Prince Edward Island				45 dBA applied	H	4H	

\* Manitoba, New Brunswick and Nova Scotia appear to be utilizing the non-current Ontario regulations for guidance

# Ontario, Canada Noise Distance Setbacks

Number of Turbines (within 3km)	Total distance from wind turbine to nearest noise receptor of the wind turbine by Sound power level of wind turbine (expressed in dBA)			
	102	103-104	105	106-107
1-5	550	600	850	950
6-10	600	700	1000	1200
11-25	750	850	1250	1500

- Proponents in Ontario have the option of using the noise setback matrix (above) or to conduct a noise study (predictive). The noise study uses 40dBA as the maximum noise level permitted at a receptor.

- For compliance, it is not clear if the noise levels over 40dBA that are permissible in Ontario Noise Guidelines for Wind Farms 2008 (up to 51dBA) may be allowed.

# Safety

- The noise setback requirements are assumed to provide sufficient protection to dwellings from catastrophic turbine failure, blade and ice throw.
- The majority of jurisdictions provide some protection to personal property by establishing a fall zone, specifying setbacks equal to and greater than the total height of the turbine. The majority of setback distances are between 1.1 and 1.5 times the total height of the turbine.
- Few jurisdictions provide a high level of safety for blade/ice throw near roads and property.
- Ontario Canada is the only senior government which does not specify a setback from property lines and roads that is greater than the turbine total height.

# Noise

- Most rely on noise modeling prior to construction for establishing distance from dwellings and/or properties.
  - A-scale for noise used, a few using C-scale
  - Only a few jurisdictions used a fixed setback distance
- Maximum permissible noise levels varied:
  - Above ambient limits ranged from +3 to +10 dBA
  - dBA limits range from 35 to 60
  - Incremental limits with wind speed
  - Different decibel measurements used
- Definition of noise measuring point varied:
  - Project property line
  - Non-participating property line
  - Fixed distance from dwelling

# Noise

1. Only a few jurisdictions have established noise distance setbacks approaching those recommended by researchers.
  2. The noise limits based on decibels are close to those noise levels where negative health impacts can be expected.
- This suggests that some in the population are at risk.



## Guidelines and Regulations

- Reacting to local governments, senior levels of Government establishing siting regulations or guidelines and authority.
  - Ontario, Canada and Green Energy Act
- Will result in more wind turbines sited at maximum limits.

# Balance or Compromise

*“A balanced assessment of wind energy proposals requires that these benefits be weighed against any possible negative effects on recognised environmental and cultural values.”*


Policy and planning guidelines for development of wind energy facilities in Victoria -  
Sustainable Energy Authority Victoria

*“There will be individuals who live close to existing and future wind farms who will disagree with these standards we set. As I do in all siting decisions, I feel for these people, but I believe we will treat them fairly and balance their concerns with the state’s real and important drive to advance clean energy projects.”*

Wisconsin PSC Chairman - Eric Callisto

*“An appropriate balance must be achieved between power production and noise impact”*

Planning Guidelines - Ireland



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