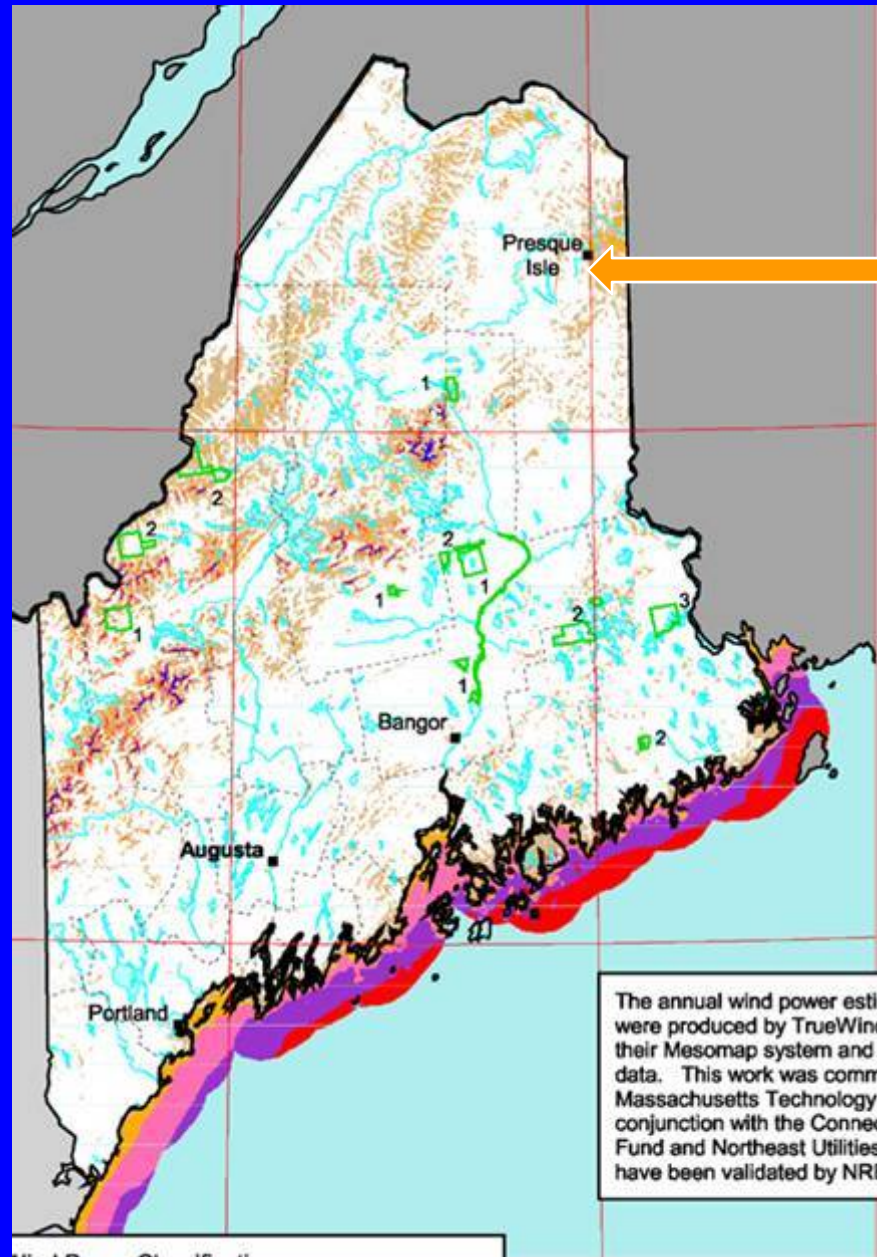


# **Mars Hill Wind Turbine Project Health Effects –Pilot Study**

- 28 turbines, 389 ft tall
- Online Dec 06, Complete Mar 07
- ~30 adults, ~15 children live within 3500 feet (1km) within ~18 homes.



Mars Hill, Maine



The annual wind power estimates were produced by TrueWind using their Mesomap system and historical data. This work was commissioned by the Massachusetts Technology Collaborative in conjunction with the Connecticut Fund and Northeast Utilities, and has been validated by NREL.

# Cross Sectional Controlled Study

Attempt made to capture all adults on the three roads – drastically reduces sampling bias

Subjects and controls approached by investigator – essentially all agreed – very low self selection bias

Controls well matched by age and sex

Initiated after media reports of complaints  
and no government investigation

Pilot Study – not meant to evaluate full dose  
response (distance versus symptoms  
mapping), but to assess for relative risks of  
sleep disturbance and health complaints

Goal: Collect preliminary data for Maine  
Medical Association.

# Mars Hill Wind Turbine Project Health Effects – Preliminary Findings

## Population Sample - Demographics

- *22 subjects interviewed. 10 female, 12 male.*
- *Subjects: Distance to nearest turbine ranges 1200 – 3400 ft; Mean distance 2500 feet*
  
- *27 controls interviewed. 12 female, 13 male.*
- *Controls: Average distance 15,000-16,000 feet.*

**AGE AND SEX MATCHED**

## Mars Hill Wind Turbine Project Health Effects – Pilot Study

### Subjects and Controls: Sex, Age, Distance

F	67	3400
F	62	2400
F	65	2500
F	73	3000
F	66	3200
F	38	1200
F	41	2300
F	49	2500
F	41	1500
F	18	1500

**Avg. Age: 52**  
**Range: 18-73**

M	65	3400
M	77	2400
M	75	3000
M	74	3200
M	52	1200
M	50	2100
M	51	2400
M	47	2300
M	58	2400
M	79	1500
M	56	1200
M	43	1500

**Avg. Age: 61**  
**Range: 43-79**

F	31	~15,000
F	50	~15,000
F	33	~15,000
F	63	~15,000
F	28	~15,000
F	40	~15,000
F	77	~15,000
F	64	~15,000
F	73	~15,000
F	70	~15,000
F	19	~15,000
F	81	~15,000
F	56	~15,000

**Avg. Age: 51**  
**Range: 19-81**

M	65	~15,000
M	60	~15,000
M	61	~15,000
M	40	~15,000
M	57	~15,000
M	40	~15,000
M	47	~15,000
M	39	~15,000
M	74	~15,000
M	81	~15,000
M	33	~15,000
M	47	~15,000
M	55	~15,000
M	43	~15,000

**Avg. Age: 57**  
**Range: 33-81**

# Troubled by Shadow Flicker

**Exposed # 22**

**Non Exposed # 27**

<i>symptom</i>	<i>Number</i>	<i>Percentage</i>		<i>Number</i>	<i>Percentage</i>
<b>Nausea</b>	2	9%		<b>0</b>	<b>0</b>
<b>Dizziness</b>	4*	18%		<b>0</b>	<b>0</b>
<b>Trigger Migraine</b>	1	5%		<b>0</b>	<b>0</b>
<b>Unease</b>	2	9%		<b>0</b>	<b>0</b>
<b>new Rx</b>	<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>
<b>Total # Affected</b>	<b>7</b>	<b>32%</b>		<b>0</b>	<b>0</b>

\*2 subjects had dizziness AND nausea

Unintentional

# Weight Change

**Exposed # 22**

**Non Exposed # 27**

<i>symptom</i>	<i>Number</i>	<i>Percentage</i>		<i>Number</i>	<i>Percentage</i>
<b>Increase</b>	6	27%		0	0
<b>Decrease</b>	2	9%		1	4%
<b>new Rx</b>	0	0		0	0
<b>Total # Affected</b>	8	36%		1	4%



New or worsened

# Headaches

**Exposed # 22**

**Non Exposed # 27**

<i>symptom</i>	<i>Number</i>	<i>Percentage</i>		<i>Number</i>	<i>Percentage</i>
<b>New</b>	7	32%		<b>0</b>	0
<b>Worse</b>	0	0		1	4%
<b>↑migraine</b>	2	9%		0	0
<i>New</i> <b>R<sub>x</sub></b>	2	9%		0	0
<b>↑</b> <b>R<sub>x</sub></b>	1	9%		0	0
<i>Total</i> <b>R<sub>x</sub></b>	<b>3</b>	<b>14%</b>		<b>0</b>	<b>0%</b>
<b>Total # Affected</b>	<b>9</b>	<b>41%</b>		<b>1</b>	<b>4%</b>

New or worsened

# Auditory/Vestibular

**Exposed # 22**

**Non Exposed # 27**

<i>symptom</i>	<i>Number</i>	<i>Percentage</i>		<i>Number</i>	<i>Percentage</i>
<b>Dizziness</b>	3	14%		0	0
<b>Tinnitus</b>	3	14%		0	0
<b>Ear Pain</b>	1	5%		0	0
<b>Ear Pulse</b>	3	14%		0	0
<b>new Rx</b>	0	0		0	0
<b>Total # Affected</b>	9	41%		0	0

New or  
worsened

# Sleep Disturbance

**Exposed # 22**

**CONTROLS # 27**



<i>Symptom</i>	<i>Number</i>	<i>Percentage</i>		<i>Number</i>	<i>Percentage</i>
<b>Falling Asleep</b>	10	45%		0	0
<b>Waking</b>	17	77%		1	4
<i>1-2/wk</i>	4	18%		0	0
<i>3-4/wk</i>	5	23%		0	0
<i>5-7/wk</i>	9	41%		0	0
<i>New</i> <b>R<sub>x</sub></b>	<b>5</b>	<b>23%</b>		<b>0</b>	<b>0%</b>
<b>Total # Affected</b>	<b>18</b>	<b>82%</b>		<b>1</b>	<b>4%</b>

New or worsened

# Psychiatric Symptoms

**Exposed # 22**






**Non Exposed # 27**

<i>symptom</i>	<i>Number</i>	<i>Percentage</i>		<i>Number</i>	<i>Percentage</i>
<b>stress</b>	13	59%		0	0
<b>anger</b>	17	77%		0	0
<b>anxiety</b>	7	32%		0	0
<b>irritability</b>	6	27%		0	0
<b>hopelessness</b>	12	55%		0	
<b>Depression</b>	<b>10</b>	<b>45%</b>		<b>0</b>	<b>0</b>
<i>new</i>	8	36			
<i>worsened</i>	2	9			
<i>New or</i>  	<b>4</b>	<b>18%</b>		<b>0</b>	<b>0</b>

# Prescription Medication Use

**Exposed # 22**

**Non Exposed # 27**

<i>symptom</i>	<i>Number</i>		<i>Number</i>
<b>Accepted</b>	12		4
<b>new</b> 			
 	3		0
<b>Total New</b>	15		4
<b>Or</b>  			

**15 New or increased prescriptions (12 people)**  
11 additional prescriptions offered and declined  
in subject group

# Types of Medications

## Subjects:

**Cymbalta**

**Mirtazepine**

**Trazodone**

**Hydrocodone**

**Topamax**

**Anxiolytics (2)**

**BP meds (3)**

**Lexapro**

**Zoloft**

**Meloxicam**

**Tylenol III**

## Controls

**Antihypertensives: 3**

**Antiarthritic 1**

# Quality of Life Perception

**Exposed # 22**

**Non Exposed # 27**

<i>symptom</i>	<i>Number</i>	<i>Percentage</i>		<i>Number</i>	<i>Percentage</i>
<b>Increased</b>	0	0		<b>0</b>	0
<b>Decreased</b>	21	95%		0	0
<b>Considered moving away</b>	19	86%		0	0

# Quality of Life Perception

“No desire to go outside”

“Feel trapped”

“Dreams have been dashed”

“Was our dream home . . . it’s all been stolen from us”

“My husband’s (who has MS) only pleasure in life was to see the wild animals. They are gone.”

“Sinking feeling every night when I (come home) and see them.”



# Anger

**“ Absolute rage – you feel you want to kill someone, and don’t know who to kill ”**

***(67 y.o. woman)***

**“ So angry I could kill “**

***(65 y.o. man)***

**“ Makes my blood boil ”**

***(65 y.o. woman)***

# Hopelessness

**“ Nobody will help us ”**

**“ This is an awful thing to have happen to you ”**

**“ People don't believe us – (complaints) fall on deaf ears ”**

**“ No one cares. No one listens.”**

**“ They just tread on us.”**

*“Daddy, I’m going to  
sleep at the hotel with  
Mom.”*

# Mars Hill ME DEP Nighttime Noise Variance 45=>50 dbA

“There are 4 protected locations where the noise level would be above 45 dBA, but less than 50 dBA, **which is approximately equivalent to the noise that songbirds make . . .** the Department finds that the applicants’ project will not have an unreasonable adverse impact . . . and therefore grants a variance from the noise standards for the windpower farm.”

DONE AND DATED AT AUGUSTA, MAINE, THIS 1<sup>ST</sup> DAY OF JUNE, 2004.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

By: *Dawn R. Gallagher*  
DAWN R. GALLAGHER, COMMISSIONER

PLEASE NOTE THE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application January 12, 2004  
Date of application acceptance January 22, 2004

Date filed with Board of Environmental Protection  
RC/L21635AN/BN

