

Comments to the Massachusetts Department of Environmental Protection (DEP)

*In re the “Wind Turbine Health Impact Study,
Report of Independent Expert Panel,” January 2012.*

By Dr. Raymond S. Hartman

BA: Princeton University

MS and PhD: MIT

(More complete qualifications provided below)

February 14, 2012

1. QUESTION:

As citizens of Massachusetts, what are we to make of the purported “scientific” findings of the “Wind Turbine Health Impact Report” commissioned by the Departments of Environmental Protection (DEP) and Public Health (DPH)?

2. INTERPRETATIONS OFFERED BY THE COMMONWEALTH:

DEP Commissioner, Kenneth Kimmel, has stated publicly:

“We appreciate the hard work of the *independent expert panel* to evaluate the issues and complete this report, which will *help inform future discussions* with the public on wind turbines. ... It is extremely important that we *have the best science available* to us as we make decisions on wind energy.”¹ (Emphases added)

The Governor has echoed that sentiment:

He “defended his agencies for inviting expert and public opinions and said he respected the study’s findings. ‘I’m sure the report is not going to please everyone and I know there are those who oppose any form of wind energy notwithstanding the fact that it’s been a growing source of alternative energy around the world.’ ... The Wind Turbine Impact Study *found no scientific evidence or medical studies* to prove that living near a wind turbine *has adverse impacts on people’s health*, though it acknowledged further study is needed to look at health impacts stemming from ‘annoyance’ for residents who live near turbines. ‘Our solution to our energy future is not going to depend on any one alternative.’ ... ‘It’s going to depend on a mix of

¹ Emily Clark, *Wicked Local Plymouth*, Posted Jan 30, 2012.

alternatives. I think what this report shows is that wind, in the right circumstances, can be an element in that mix.”² (Emphasis added)

The Boston Globe reported the statements and the conclusions of the Wind Turbine Impact Study in its January 17, 2012 article by David Abel, headlined “**Report: Wind turbines don’t cause health problems.**” The article continued – “There is little to no evidence that wind turbines pose a risk to the health of residents living near them, a panel of independent scientists and doctors found in a report commissioned by the state Department of Environmental Protection.”

3. THE FACTS ABOUT THE “WIND TURBINE HEALTH IMPACT REPORT”

The problem with this praise, support and reliance by the Commonwealth (Commissioner Kimmel and Governor Patrick) is that it is based upon the false premise that the Wind Turbine Impact Study has conducted scientific research and offers scientific conclusions. It has not and does not.

- The Wind Turbine Impact Study is *not the result of independent scientific research.*
- The Wind Turbine Impact Study *conducts no primary science, while it grossly misinterprets the real science it purports to review.*
- The Wind Turbine Impact Study *is not* “the best science available to ... make decisions on wind energy.”
 - *It is not science at all; it is advocacy.*
 - *It certainly should not be used to* “help inform future discussions with the public on wind turbines.”
- In fact, the Wind Turbine Impact Study *is Junk Science.*
 - *It would be thrown out of court as Junk Science.*
 - *It would not be acceptable or publishable in an academic peer-reviewed journal.*
- These conclusions are not based upon an antipathy toward wind power, as the Governor seems to insinuate. They are based upon facts, many of which are admitted by the Panel in the Report.

Given the enthusiastic reliance by Commissioner Kimmel and Governor Patrick upon such Junk Science, I presume the following:

Had Commissioner Kimmel and Governor Patrick reviewed similar “research” proffered decades ago by the Tobacco Research Institute which claimed to be “independent scientific” research “demonstrating” that there was “little to no evidence that” cigarettes posed “a risk to the health” of smokers and second-hand non-smokers, they would just as publicly have stated “**Cigarettes do not cause**

² The State House News Service, January 19, 2012.

health problems.” The implication would be “Go ahead, people of Massachusetts, light up.”

Had Commissioner Kimmel and Governor Patrick reviewed similar “research” proffered decades ago by the asbestos manufacturers which claimed to be “independent scientific” research “demonstrating” that there was “little to no evidence that” asbestos posed “a risk to the health” of those workers exposed to it, they would have just as publicly have stated “**Asbestos does not cause health problems.**” The implication would be “Construction workers and shipbuilders of Massachusetts, you have nothing to worry about when working with asbestos. Neither do your children in the schools in which you are installing asbestos.”

The “scientists” supported by Big Tobacco and by the asbestos manufacturers were proffering Junk Science; the relevant policy makers and business entities allowed themselves to be convinced by it. While the Junk Science drove public policy, real science was being conducted slowly and steadily. This real science ultimately demonstrated that the Junk Science was exactly that – Junk. Cigarettes and asbestos *do cause* health problems.

Because there already exists a substantial body of real science available today, wrongly ignored and/or dismissed by the DEP panel of so-called “independent experts,” scientific research which finds that industrial wind turbines *sited too close* to nearby residences *do cause* health problems, the “science” proffered by the DEP Report is Junk Science. It is advocacy, not science.

The study and report undertaken by the “panel of independent scientists and doctors” at the behest of “the state Department of Environmental Protection (DEP)” certainly was not independent. It was commissioned by a state agency (the DEP) and Governor who are admittedly very committed to expanding the role of industrial wind turbine installations in Massachusetts. I understand that members of the panel, particularly Dr. Manwell and his research center at UMass Amherst, are heavily financed by the state agencies seeking to site industrial wind turbines wherever they can, recklessly disregarding the resulting health effects and the evidence from many other states and countries indicating that industrial wind turbines sited *too close* to residences do cause serious adverse health effects. Indeed, in light of this increasing evidence, a variety of countries and US states have put moratoriums in place, blocking construction of industrial wind turbines until the full extent of the adverse health impacts is better understood.³

The DEP report conducted no primary research. It identified as relevant and focused primarily upon *only 4-5 published studies*, out of 100s of studies that have been conducted. It admits that these 4-5 studies suffer from a variety of flaws. More importantly, it disingenuously misstates and mischaracterizes the conclusions of the

³ I present in Attachment C information concerning example moratoriums currently being pursued or enacted.

published studies.⁴ The misstatements and mischaracterizations uniformly are designed to diminish or dismiss real scientific findings that turbine noise has a demonstrable adverse effect upon sleep and levels of annoyance. Finally, the Panel even *admits* that more recent and improved research conducted by the authors of several of its chosen 4-5 studies also found that *turbine noise did have adverse effects on sleep and levels of annoyance*.^{5,6}

Yet none of these findings are reflected in the Report's conclusions. As a matter of reporting scientific results, this is improper procedure. As a matter of policy support, this is unconscionable. The judgment and motives of anyone asserting that increased sleep disruption and increased levels of stressful annoyance do not cause adverse health outcomes must be seriously questioned. The report improperly dismisses as non-probative the substantial amount of primary evidence demonstrating that a statistically

⁴ For one example, the Panel makes specious statistical and econometric arguments that turbine noise, residents' attitudes toward wind turbines generally, turbine visibility, and annoyance are so inextricably intertwined that causality cannot definitively be determined (at DEP Report, p. 18).

These arguments fail as a matter of statistical and econometric modeling. I also would hope that their failure would be obvious to a non-technical audience. If noise and physical discomfort increase with wind turbine noise, noise which I understand will occur more intensely when line-of-sight occurs (that is, the turbines are visible and turbine noise and pressure flows have a direct path to and at the residents), that noise will cause discomfort, annoyance and negative attitudes *simultaneously*.

⁵ For example, the panel relies heavily upon two cross-sectional Swedish studies: (E. Pedersen & K.P. Waye, 2004), discussed at pp. 16-17 of the DEP Report; and (Pedersen & Waye, 2007) discussed at pp. 17-18 of the DEP Report. Note that the (Pedersen & Waye, 2004) study found that *"there was a significant association between [turbine] noise level and annoyance"* (p. 17) and *"sleep disturbances went up with higher [turbine] noise categories"* (p. 17). The (Pedersen & Waye, 2007) study found *"there was a clear association between noise level and hearing turbine noise"* (DEP Report, p. 18). These findings do not enter into the Panel's ultimate conclusions; at page 28, the Panel claims the evidence is *"insufficient."* This evidence *must* enter the Panel's conclusions; it is sufficient to insert caution into siting regulations for turbine noise levels and setbacks.

More importantly, the Panel references, but does not formally review, the later research of the Swedish research team. This later research combines the data from the two Swedish studies cited above. In reference to this later research, the Panel notes (p. 19): *"A more intricate statistical model of the association between turbine noise levels and annoyance that used the data from both Swedish studies was reported separately (Pedersen & Larsman, 2008). The authors used structural equation models (SEMs) to simultaneously account for several aspects of visual attitude towards the turbines and general attitude towards the turbines. These analyses suggested a significant association between noise levels and annoyance even after considering other factors."*

The Panel says nothing more about this study.

⁶ I understand that on February 1, 2012, three expert panel members discussed the Report in Waltham. I understand that at the presentation, Wendy Heiger-Bernays of Boston University School of Public Health explained that "it is possible that living too close to wind turbines can cause annoyance and sleep disruption, but we don't have measurements that can show levels that disrupt sleep." She agreed that "sleep disruption can bring on a whole host of adverse health impacts."

The question remains, in light of the evidence explicitly presented by the Panel and quoted above; and in light of the uncertainty that remains and is acknowledged by a Panel member, why do these "independent experts" ignore or dismiss that evidence when making irreversible policy conclusions and recommendations? Why not proceed more cautiously?

significant number of nearby residents suffer from mild to serious adverse health effects as a result of the noises introduced and induced by industrial wind turbines.⁷

The DEP report proposed a better research methodology – a “before-and-after” methodology, looking at health patterns before and after the installation of an industrial wind turbine installation. The panel could have implemented such a methodology at wind turbine sites in the Commonwealth and greater New England, had it chosen to do real science. It did not. Indeed, Falmouth would qualify as a test site for the better methodology proposed by the panel; however, the panel already knew what such a study would find – that the noise of industrial wind turbines sited *too close* to residences causes seriously adverse health effects. It would appear that this panel clearly did not want to publicize facts which contradicted its desired conclusions.

At many places, the panel suggests that further research is necessary. The panel is correct. The Mass DEP and the Governor should take such admonishments to heart. It was such “further research” that demonstrated that cigarettes and asbestos were dangerous to health. In retrospect, any thoughtful person would have advised people not to smoke or work with asbestos until that further research had been conducted. I would think the Governor would have made those admonishments regarding cigarettes and asbestos. The same admonishments are equally relevant here. ***Do not*** site or build industrial wind turbine (IWT) installations near residences until more research can be performed on the adverse health effects of such sitings. Such research will allow for a better calibration of allowable noise levels and proper setbacks. Again, a variety of countries and US states have already instituted stricter noise limitations and much stricter setback limits (e.g., 2 miles in Oregon; see Attachment D) from any residences.

I am a scientist. I have conducted academic research, contract research and consulting research for forty years. I have published in and continue to serve as a research peer-reviewer for top economic journals in the country. I have a BA from Princeton University (with high honors) and a Masters and PhD from MIT. All of my degrees are in mathematical economics. I have been a member (Associate Professor) of the faculties of Boston University, MIT and University of California, Berkeley. I have published more than 100 peer-reviewed articles and contract research reports using statistical and mathematical models, methods and data similar to those assessed by the DEP panel. As a member of the research faculty at MIT during the 1970s, I studied alternative energy sources (specifically solar photovoltaics) and methods of energy conservation for the Department of Energy, for the Electric Power Research Institute, and for a variety of state public utility commissions. ***I am a proponent of alternative energy, when properly implemented.*** I am currently President and Director of Greylock McKinnon Associates, an economic consulting firm specializing in analysis in support of litigation. Indeed, I regularly have testified as an expert witness on behalf of the Massachusetts Attorney General’s office in a variety of matters, including the 1995-1998 tobacco litigation (the

⁷ I can prepare a set of references to such evidence, should the DEP desire. This evidence provides the data points that statisticians and econometricians look for most aggressively: the first suffers; the worst sufferers; the “canaries in the coal mines.” The evidence provided by such data points, when properly analyzed, has strong probative value regarding who is affected and why.

result of which the Commonwealth received *billions of dollars in settlement* from “Big Tobacco”); litigation against large drug companies for defrauding the Massachusetts Medicaid program (2008-2011); the restructuring of the electric power industry (1990s); and a variety of public utility rate cases (2000s). Over the past 40 years, I have reviewed and responded to hundreds of “Expert Reports” like “The Wind Turbine Health Impact Study.”⁸

Having reviewed the DEP’s Wind Turbine Health Impact Study, I conclude the following:⁹

- The Wind Turbine Health Impact Study conducted **NO** actual research on health impacts.
- It merely cherry-picked several published studies; misstated and misinterpreted them; and then came to the unfounded conclusion that there are no adverse health effects.¹⁰ In the process it chose to ignore the evidence of adverse health effects proffered by studies in other countries and other states.
- I understand from the report that the Expert Panel never spoke with people actually experiencing problems, such as the residents in Falmouth.¹¹ As a matter of conducting scientific research relevant to energy policies that affect the citizens of the Commonwealth, this is a fatal flaw in the research design.
- Based upon my experience, I believe that the Massachusetts Wind Turbine Health Impact Study would be stricken in Court as “junk science.”¹² I believe that it would be refused publication in any peer-reviewed academic journal, because it

⁸ For the Panel’s consideration, I include a copy of my curriculum vitae as Attachment B.

⁹ I include a more detailed yet succinct discussion of the failures of the Wind Turbine Health Impact Study at Attachment A.

¹⁰ That is certainly the conclusion that the Governor and Commissioner Kimmel have bruited about.

¹¹ I attach, as Attachment E, a letter from a Falmouth resident, Neil Anderson, which appeared in the Greenfield Recorder, which makes very clear the adverse impacts he and his family are suffering. I also refer the Commission to the science conducted at Falmouth by two respected acousticians: S.E. Ambrose, INCE (Brd. Cert.) and R. W. Rand, INCE Member, The Bruce McPherson Infrasound and Low Frequency Noise Study - *Adverse Health Effects Produced By Large Industrial Wind Turbines Confirmed*, December 14, 2011. <http://randacoustics.com/wp-content/uploads/2011/12/The-Bruce-McPherson-ILFN-Study.pdf>.

¹² “Junk science is faulty scientific data and analysis used *to advance special interests and hidden agendas.*” (See my attached presentation, Attachment A, on why the DEP Report is Junk Science) I have testified more than 100 times over the last 35 years, mostly in major national litigation. In every case, the quality of the testimony is subjected to scrutiny as to whether it is real or junk science. I have never had testimony stricken for being junk science. If a court deems testimony to embody “junk science,” such testimony is stricken.

provides no new scientific research and it misstates and misinterprets the few published articles it has blessed as relevant.¹³

- The Massachusetts Wind Turbine Health Impact Study is Junk Science at its worst. It is dishonest. It is motivated by profit (subsidized by the public, including, ironically, those whose health will be adversely affected by the turbines) and by politics.

I have been a supporter of Governor Patrick. I have been a supporter of wind energy, properly implemented. I have been surprised to learn that Governor Patrick, whom I have considered a capable and intelligent politician, is so misinformed or uninformed and so energized and motivated by Junk Science. If he has not read the Report closely enough to see its flaws, he is uninformed and should not be. If he has motivated Kenneth Kimmel and the DEP to find a set of conclusions that fit his political aspirations, he is doing so at the cost of the health and economic-well being¹⁴ of many Massachusetts citizens. The facts are there. This DEP Report on Wind Turbine Health Impacts does NOT present the facts; it presents a contorted and fallacious summary aimed at drawing false conclusions. Indeed, the Commonwealth's ill-informed support of proposals to site industrial wind turbines under the setback and noise limits put forward by the Panel's Report will cause illness and loss of property values, impacts for which the Commonwealth may find itself liable. It is useful to remember that Big Tobacco felt as if it could claim anything; that no research could *really* prove that smoking caused adverse health effects. After decades of avoiding an adverse court ruling, the evidence finally became insurmountable and Big Tobacco paid a very large sum for that liability.

¹³ Parenthetically, I have taught graduate courses and given graduate seminars on the Economics of Energy and the Environment at BU and MIT. If this report by this "expert" panel were submitted in such courses, I would fail it as graduate work in policy analysis.

¹⁴ I have addressed only that portion of the DEP Report that analyzes health impacts. There are also major financial impacts upon the values of the primary assets of the citizens whose health is most adversely affected. Specifically, the values of their houses will also be grossly reduced. Some families, who want to move away from existing industrial wind turbines in Massachusetts and elsewhere across the country, simply cannot sell their houses. Or they would not sell their houses without warning the prospective buyers of the possible adverse health effects. The "science" put forward asserting otherwise is likewise fatally flawed. Houses are simply being abandoned in Falmouth, Vinalhaven Maine, and Wisconsin, to name only a few examples of which I am aware.

If members of the DEP, Commissioner Kimmel and/or the Governor are so sure there are no adverse health effects, why *aren't people buying these houses* as second homes for next to nothing? There is apparently a wonderful post-and-beam home in lovely Vinalhaven Maine abandoned as a result of the adverse health effects of the industrial turbine noise. See, for example,

- http://www.youtube.com/watch?v=jtGijb_oNeQ;
- <http://www.youtube.com/watch?v=JaxkFhdry4&feature=related>;
- http://www.youtube.com/watch?v=XH0NUyrZ_OQ&feature=related; and
- <http://www.nytimes.com/2010/10/06/business/energy-environment/06noise.html>.

Selected analyses and testimony of a Certified Real Estate Appraiser, Michael McCann, who has studied and quantified lost property values resulting from proximity to industrial wind turbines, can be found at <http://www.wind-watch.org/ww-propertyvalues.php>.

The Commonwealth should stop endangering the health of particular residents. It should stop pretending to be doing science and actually commission real science. Wind-powered energy has a place in the portfolio of generation facilities for the power grid of New England. The inconvenient truth for the DEP and Governor Patrick is that industrial *wind turbines cannot be sited simply anywhere*. If the Commonwealth wants to sacrifice the health and homes of a subset of its residents in the name of Big Wind, just say so. The guidelines proposed in the DEP Report do just that. However, the Commonwealth should keep in mind that current and continuing research into the negative health effects and lost property values caused by improper siting of industrial wind turbines will demonstrate that the Commonwealth and Big Wind are liable for ruining the health and lives of many of its citizens and destroying the values of the single most important asset of many Commonwealth families – their homes.

Dr. Raymond S. Hartman

For completeness, I append the following Attachments:

- Attachment A: A more detailed discussion of the Junk Science found in the DEP's Expert Panel Report
- Attachment B: A copy of my *Curriculum Vitae* (somewhat dated)
- Attachment C: Moratorium initiatives in Canada, Wisconsin, Connecticut
- Attachment D: Oregon Setback ruling
- Attachment E: Letter from Neil Anderson appearing in the Greenfield Recorder

Attachment A:

**A more detailed discussion of the Junk Science found
in the DEP's Expert Panel Report**

The Wind Turbine Health Impact Study is Junk Science*

BY RAYMOND S. HARTMAN **

* Wind Turbine Health Impact Study: Report of Independent Expert Panel, January 2012, prepared for: Massachusetts Department of Environmental Protection, Massachusetts Department of Public Health.

** I am a Shelburne resident, living in the Patten District. I have a BA from Princeton University and a Masters and PhD from MIT. All of my degrees are in mathematical economics. I have been a member (Associate Professor) of the faculties of MIT, Boston University and University of California, Berkeley. I have published more than 100 peer-reviewed articles and contract research using statistical and mathematical models, methods and data. I am currently President and Director of Greylock McKinnon Associates, an economic consulting firm specializing in analysis in support of litigation. Indeed, I regularly have testified as an expert witness on behalf of the Massachusetts Attorney General's office in a variety of matters, including the 1995-1996 tobacco litigation (the result of which the Commonwealth received billions of dollars in settlement from "Big Tobacco"); litigation against large drug companies for defrauding the Massachusetts Medicaid program (2008-2011); the restructuring of the electric power industry (1990s); and a variety of utility rate cases (2000s). Over the past 40 years, I have reviewed and responded to hundreds of "Expert Reports" like "The Wind Turbine Health Impact Study."

Junk Science: What Is It?

“Junk science is faulty scientific data and analysis used *to advance special interests and hidden agendas.*”

General Examples

“**Government regulators** may use junk science to expand their regulatory authority, increase their budgets or advance the political agenda of elected officials.”

“**Businesses** may use junk science to bad-mouth competitors’ products, make bogus claims about their own products, or to promote political or social change that would increase sales and profits.”

“**Politicians** may use junk science to curry favor with special interest groups, to be politically correct or to advance their own personal political beliefs.”

Junk Science: What Is It?

Specific Real-World Examples

The Tobacco Research Institute

- It was funded by the big tobacco companies.
- It produced “scientific research” for 50 years or more “demonstrating” that smoking was good, or at least not bad, for people.
- Over time, as doctors and patients complained that smoking caused lung cancers and cardiovascular diseases, the Tobacco Research Institute produced more “scientific research” demonstrating that something else caused the disease.
 - ⇒ **The “research” was Junk Science.**
 - ⇒ **It was untrue, manipulated and unreliable.**
 - ⇒ **The “research” caused disease and death.**

Asbestos Manufacturers

- Asbestos was used for decades in shipbuilding, construction and a variety of other trades.
- Those workers installing and working with asbestos were told for decades that research demonstrated that the workers were safe.
- Workers were not safe.
- Asbestos caused innumerable cases of cancer - mesothelioma.
- The asbestos manufacturers put forward research “demonstrating” that the cancers were not caused by the asbestos.
 - ⇒ **The “research” was Junk Science.**
 - ⇒ **It was untrue, manipulated and unreliable.**

Manufacturers of DDT

- DDT was first used as a pesticide in the 1940s.
- It was claimed to be a successful and safe pesticide.
- The US government began banning DDT for particular uses in the 1960s.
- It was banned outright in 1972.
 - ⇒ **The original “research” was Junk Science.**
 - ⇒ **It ignored the health and environmental risks of DDT.**

The Wind Turbine Health Impact Study is Junk Science

Deval Patrick sponsored and defends the study which “found no scientific evidence or medical studies to prove that living near a wind turbine has adverse impacts on people’s health, though it acknowledged further study is needed to look at health impacts stemming from ‘annoyance’ for residents who live near turbines.”¹

The conclusions reached by the study are utterly and profoundly dishonest.

The study is labeled a “Report of Independent Expert Panel.”

- The panel was not independent.
- Several “experts” have pro-wind industry connections.²
- The Panel is no more qualified or expert than the substantial number of opponents, including Dr. Pierpont and myself.

The Panel relies primarily on an inexplicably small number (4) of published research papers, out of 100s that are available.

- Two Swedish research papers, one Dutch research paper and one New Zealand Research paper.
- The Panel dismisses for unsupported reasons all the other studies.
- In statistical modeling, this is called “cherry picking” – choosing only those studies that support a desired conclusion.

The sizes of the wind turbines studied are quite small.

- The turbines studied were only 164-213 feet tall.
- These are much smaller than those proposed for Mount Massaemet which are nearly 500 feet tall.
- **Noise effects increase with the size of the turbine blades.**

1/ State Capitol Briefs, Afternoon Edition, Thursday, January 19, 2012, State House News Service.

2/ For one important example, I understand that Dr. James Manwell’s Wind Energy Center is heavily funded by the Commonwealth. I believe that it is therefore impossible for him to offer a neutral opinion on the health effects of industrial wind turbine installations, given the Commonwealth’s obvious infatuation with wind energy.

The Wind Turbine Health Impact Study is Junk Science

The data, models and statistical analyses in these papers are flawed, in ways explicitly noted by the Panel.

- The Panel notes: “The peer-reviewed papers have weaknesses, including the cross sectional designs and sometimes quite low response rates (p. 28).”
- The Panel further notes: “The model from which this conclusion was drawn, however, imposed a linear relation on the association between noise level category and annoyance. But ... it appeared that the relation might not be linear (p. 18).”
- In statistical modeling, the imposition of a linear relationship when it is invalid is called specification bias.
 - ⇒ When present, the model and analysis are wrong.
 - ⇒ The studies introduce a multiplicity of other possible factors, all of which interfere with properly analyzing and estimating the impact of the primary factor upon health – turbine noise.

The Panel mentions but ignores the findings of the most recent analysis by the authors of two of their chosen studies (the Swedish studies). This most recent study contradicts the Panel’s conclusions as follows:³

- “A more intricate statistical model of the association between turbine noise levels and annoyance that used the data from both Swedish studies ... ***suggested a significant association between noise levels and annoyance even after considering other factors.***”
- Why didn’t the Panel consider this third study by the same authors, which used better analytic and statistical methods?
 - ⇒ This exclusion is unprofessional, unscientific and outright dishonest.
 - ⇒ This is Junk Science.

^{3/} As noted explicitly by the Panel at page 19.

The Wind Turbine Health Impact Study is Junk Science

The Panel identifies the preferred type of study – time-series analyses, looking at families and households before and after the industrial turbines are put into operation => “A Before-and-After Study.”

- The Panel notes “Cross-sectional studies [which the Panel uses] lack the ability to determine the temporality of cause and effect; in the case of these kinds of studies, we cannot know whether the annoyance level was present before the wind turbines were operational from a cross sectional study design.”
- Why didn’t the Panel look at time-series experiences that have occurred in New England – Maine, Vermont, and Massachusetts?⁴
- This is the most natural set of experiments to be done and is easily available.
- Is the reason because they knew what such experiments would find – that Industrial Wind Turbines cause sleep problems and severe annoyance, leading to health problems?

The Panel does admit to finding the following:

- “Wind turbines can produce unwanted sound (referred to as noise) during operation (p. ES-4)”
- “The whooshing that is heard is NOT infrasound ... [It] is at higher frequency ... It is important to note then that when a complaint is tied to the **thumping or whooshing** that is being heard, the complaint may not be about ILFN at all even if the complaint mentions low frequency noise. Kamperman et al. (2008) state that, ‘It is not clear to us whether **the complaints about ‘low frequency’ noise are about the audible low frequency part of the ‘swoosh-boom’ sound, the once-per-second amplitude modulation ... of the ‘swoosh-boom’ sound, or some combination of the two** (p. 13).”⁵
- “Most epidemiologic literature on human response to wind turbines relates to self-reported ‘annoyance’ ... (p. ES-5).”
- “A very loud wind turbine could cause disrupted sleep, particularly in vulnerable populations, at a certain distance, while a very quiet wind turbine would not likely disrupt even the lightest of sleepers at that same distance (p. ES-6).”

4/ I understand that the ISO-NE seasonal-claimed capability spreadsheet identifies the following industrial wind turbine (IWT) sites which could have been used for “Before-and-After” studies: 19 IWT projects in Massachusetts; 9 IWT projects in Maine, including Mars Hill which is outside the ISO-NE area and so is not listed on the ISO’s spreadsheet; 3 IWT projects in Rhode Island; 2 IWT projects in New Hampshire; and 2 IWT projects in Vermont.

5/ Emphasis added. These are precisely the sounds described by Neil Anderson from Falmouth.

The Wind Turbine Health Impact Study is Junk Science

The Panel however concludes that there is insufficient evidence that industrial wind turbines will have any effects upon residents near the installation. It states:

- “There is *limited evidence* from epidemiologic studies suggesting an association between noise from wind turbines and sleep disruption. In other words, *it is possible* that noise from some wind turbines can cause sleep disruption. ... But there is not enough evidence to provide particular sound-pressure thresholds at which wind turbines cause sleep disruption (p. ES-5 and ES-6).”
- “Whether annoyance from wind turbines leads to sleep issues or stress has not been sufficiently quantified. While not based on evidence of wind turbines, there is evidence that sleep disruption *can adversely affect mood, cognitive functioning, and overall sense of health and well-being* (p. ES-6).”
- “There is *insufficient evidence* that the noise from wind turbines is *directly* (i.e., *independent from an effect on annoyance or sleep*) causing health problems or disease (p. ES-6).”

Reflect closely on this language.

- Noise causes annoyance and disrupts sleep.
- Annoyance and sleep disruption causes stress and disease states.
- While the evidence demonstrates that industrial wind turbines cause annoyance and disrupt sleep, the Panel finds *it is insufficient or an indirect cause*.
- **Do you believe that assertion?**

**The Panel’s Report and conclusions
are JUNK SCIENCE.**

The Wind Turbine Health Impact Study is Junk Science

What does this mean for Shelburne?

- There **will** be wind turbine noise.
- Prepare yourself for the “‘swoosh-boom’ sound, the once-per-second amplitude modulation ... of the ‘swoosh-boom’ sound, or some combination of the two.”⁶
- This noise **will** disrupt the sleep of an unknown number of Shelburne and Buckland residents.
- This noise **will** cause low-to-severe cases of “annoyance,” every day, every hour, every minute for an unknown number of residents.
- The non-stop annoyance and sleep disruption **will** cause stress and disease states for an unknown number of residents.
- This noise **will** affect many Shelburne residents in precisely the same fashion as has been found in Falmouth, Vinalhaven and across New England.
- Are you ready to be guinea pigs for an experiment in which we suffer the possible consequences while outside developers make hundreds of millions of dollars in subsidies, and then leave town?

6/ See the Impact Study, p. 13, cited above.

Attachment B:

A copy (somewhat dated) of the *curriculum vitae* of Raymond S. Hartman

August 2010

Raymond S. Hartman
Curriculum Vita

Date of Birth: 3/31/47

Address/Phone: Greylock McKinnon Associates
1 Memorial Drive, Suite 1410
Cambridge, MA 02142
617-871-6901

DEGREES

B.A. (MAGNA CUM LAUDE) Princeton University 1969
M.S. Massachusetts Institute of Technology 1971
Ph.D. Massachusetts Institute of Technology 1977

Ph.D. DISSERTATION

An Oligopolistic Pricing Model of the U.S. Copper Industry (MIT, 1977)

HONORS, SCHOLARSHIPS, AND FELLOWSHIPS

1969-71 National Science Foundation Fellowship to MIT
1965-69 Alfred P. Sloan Scholarship to Princeton
1969 Woodrow Wilson Fellowship Honorable Mention
1965 National Merit Scholarship Finalist

RESEARCH AND TEACHING INTERESTS

Econometrics/Statistics
The Economics of Regulated Industries
Energy and Environmental Economics
Microeconomics
Industrial Organization
Law and Economics

POSITIONS

1967-1969 Research Staff, Financial Research Center and Center for Economic Research, Princeton University

1970 Research Staff, Board of Governors, Federal Reserve Board, Washington, DC

1972-1992 Consultant and Staff Economist, Arthur D. Little, Inc.

1977-1984 Research Faculty, Massachusetts Institute of Technology

1977-1983 Assistant Professor, Department of Economics, Boston University

1983-1989 Associate Professor, Department of Economics, Boston University

1983-1988 Principal & Academic Principal, The Analysis Group

1988-1993 Visiting Associate Professor/Visiting Faculty, Boalt School of Law, University of California, Berkeley

1988-1995 Founding Principal, The Law and Economics Consulting Group

1995-1996 Vice President, Charles River Associates

1996-1999 Senior Consultant, Charles River Associates

1996-2000 Director, Cambridge Economics, Inc.

2000-2004 Special Consultant, Lexecon Inc.

1997- Director and President, Greynock McKinnon Associates

OTHER PROFESSIONAL ACTIVITIES

Research Referee, *Bell/Rand Journal of Economics, Resources Policy, IPC Science and Technology Press, Management Science, Land Economics, Science, Energy Journal, Applied Economics, Econometrica, Review of Economics and Statistics, Journal of Business and Economic Statistics, International Economic Review, Journal of Economics and Management Strategy, Pakistan Journal of Applied Economics, Journal of Health Economics, American Economic Review, Review of Industrial Organization*

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"The Economic Impacts of Environmental Regulations on the US Copper Industry," with K. Bozdogan and R. Nadkarni, The Bell Journal of Economics, 10(2), Autumn 1979, pp 589-618.

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"A Probability Model of Oligopoly Pricing," Applied Economics, 14(3), June 1982, pp. 219-234.

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"Measuring the Effects of Utility-Sponsored Conservation Programs - Do the Programs Work," Energy Systems and Policy, 8(3), 1984.

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"Product Quality and Market Efficiency: The Effect of Product Recalls on Resale Prices and Firm Valuation," The Review of Economics and Statistics, 69(2), May 1987, pp. 367-371.

"The Use of Hedonic Analysis for Certification and Damage Calculations in Class Action Complaints," with M. Doane, The Journal of Law, Economics and Organization, Fall 1987.

"Taking the Con Out of Conservation Program Evaluation" with Michael Doane, Resources and Energy, 9, 1987, pp. 187-207.

"Self-Selection Bias in the Evaluation of Voluntary Energy Conservation Programs," Review of Economics and Statistics, 70(3), August 1988.

"Household Preference for Interruptible Rate Options and the Revealed Value of Service Reliability," with M. Doane and C.K. Woo, The Energy Journal, 9, 1988.

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"Product Emulation Strategies in the Presence of Reputation Effects and Network Externalities: Some Evidence from the Minicomputer Industry," with D. Teece, Economics of Innovation and New Technology, Volume 1, 1990, pp. 157-182.

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"Strategic Rate Making in the Context of Dynamic Ramsey Pricing," with K. Jensen and K. Seiden, Applied Economics, 26, 1994, pp. 363-374.

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Contributions of economic forecasting articles to the popular press, such as Management Forum and Nations Business

PAPERS IN PROGRESS

"Welfare Measures in Discrete Choice Markets"

"The Nature of Pharmaceutical Competition and the Implications for Antitrust Analysis under the Hatch-Waxman Act," with Richard Frank

CONFERENCE PAPERS AND PRESENTATIONS

"Policies To Maximize Economic Growth In Japan," in Foreign Experience with Monetary Policies to Promote Economic and Social Priority Programs, Committee on Banking and Currency, 92nd Congress, Washington, May, 1972.

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"Making Electricity Markets Work: Competitive Models and Constraints to Competition," paper given at the Conference, "Keeping the Lights On: Technical and Institutional Issues in a Restructured Electricity Industry," Massachusetts Institute of Technology, Cambridge, October 19-20, 1995.

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"The Nature of Pharmaceutical Competition and the Implications for Antitrust Analysis under the Hatch-Waxman Act," paper with Richard Frank, Conference on Pharmaceutical Research, Development and Markets, Harvard Law School, Petrie-Flom Center, June 12, 2009.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT); ANALYSIS GROUP, INC., (AG); LAW AND ECONOMICS CONSULTING GROUP (LECG); AND ARTHUR D. LITTLE, INC., (ADL) REPORTS

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Hartman, "Returns to Scale and Scope in the Electric Utility Industry: Review of Existing Econometric Analyses and Examination of Their Applicability to the Proposed Merger Between Southern California Edison and the San Diego Gas & Electric Company," LECG Working paper, September, 1989.

Hartman, "Measuring Productivity for the United States Postal Services," Report to the Resource Technology Center of Arthur D. Little, Inc. and the United States Postal Services, January, 1991.

Hartman, "The Relevance of Incentive Regulation to the United States Postal Service," Report to the Resource Technology Center of Arthur D. Little, Inc. and the United States Postal Services, February, 1992.

Hartman, "The Relevance of Incentive Regulation for Environmental Policy Modeling," Report to the World Bank, February, 1992.

Hartman, "Issues in the Valuation and Aggregation of Goods and Services: A Concept Paper," Report to the World Bank, Socio-Economic Data Division, International Economics Department, May, 1992.

Hartman, "A Framework for the Spatial Development of Infrastructure: The Electric Power Industry," Report to the Government of Indonesia, Bappenas, Jakarta, July, 1992.

Hartman, "Stimulating Pollution Abatement Efforts in the Brantas River Basin," Report to World Bank, Indonesian Environmental Mission, Jakarta, August, 1992.

Hartman, "Policies to Control Emissions from Energy Production and Use in Thailand," Report to the World Bank, East Asia Country Operations, January, 1993.

World Bank, Thailand: Managing Environmental Impacts in a High-Growth Economy, Country Economic Report, April 5, 1993.

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ADL, Growth Patterns of U.S. Industries and Markets in 1973: The Year Ahead, 1972.

ADL, Tourism in Maryland: Analysis and Recommendations, Report to the Maryland Department of Economic and Community Development, 1972.

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Hartman, "A Critical Review of the Delmarva 1981-2000 Load Forecast," with James C. O'Keefe, Arthur D. Little Working Paper, September 1981, Arthur D. Little, San Francisco.

Hartman, "Analyzing and Measuring the Effects of Utility Sponsored Conservation Programs," Arthur D. Little Energy Group Discussion Paper, September 1982, Arthur D. Little, San Francisco.

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"An Examination of the Use of Probability Modeling for the Analysis of Inter-fuel Substitution in Residential Fuel Demand," with M. Hollyer, MIT Energy Lab Working Paper #MIT-EL-77-018WP, July 1977.

"A Critical Survey of Three Copper Industry Models and Their Policy Uses," MIT Energy Lab Working Paper #MIT-EL-77-028WP, September 1977.

"The Evolutionary Model of Technical Change: Historical Evidence from Great Britain and the United States," with D. Wheeler, mimeo, December 1977.

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"The Incorporation of Solar Photovoltaics into a Model of Residential Energy Demand," MIT Energy Laboratory Working Paper #MIT-EL 80-014WP, May 1980.

"Consumer Choice Among Alternative Fuels and Appliance Technologies: An Analysis of the Effects of Alternative Energy Conservation Strategies," MIT Energy Laboratory Working Paper #MIT-EL 82-036WP, June 1982.

"Estimation of Hedonic Supply Curves For Residential Water Heaters Using Technical Data and Federal Testing Guidelines," with Alan Cox and Mary Litterman, MIT Energy Laboratory Working Paper #MIT-EL 82-037WP, June 1982.

"A Monte Carlo Examination of the Heckman and the Manski-Lerman Estimators in Discrete/Continuous Models of Demand," October 1986.

"The Value of Service Reliability: Alternative Welfare Measures," with C.K. Woo, October, 1988.

"The Use of Hedonic Analysis in Defining and Measuring Market Size: The Extension of the Merger Guidelines to Heterogeneous Products," Working Paper No. 91-12, Program in Law and Economics. School of Law, Boalt Hall

EXPERIENCE IN CONSULTING AND EXPERT TESTIMONY

Overview of Qualifications

Dr. Hartman is an economist specializing in microeconomics, econometrics and the study of industrial organization. Microeconomics is the science used to analyze and characterize the behavior of groups of consumers and producers that constitute markets. Econometrics is a science that makes use of mathematics and statistics to measure and quantify economic behavior and economic phenomena in markets. The study of industrial organization makes use of both microeconomic theory and econometrics. It focuses upon the structure, conduct and performance of the participants (consumers and producing firms) in markets and industries, for the purposes of predicting behavior and addressing such policy issues as antitrust, regulation and industrial policy.

He has taught economics, conducted economic research and provided economic consulting in his areas of specialization for thirty-five years. He taught economics as an Assistant Professor and Associate Professor within the Department of Economics at Boston University over the period 1977-1988. He taught economics as a Visiting Associate Professor and member of the Visiting Faculty at the School of Law, Boalt Hall, University of California at Berkeley over the period 1988-1993. He was a member of the research faculty at MIT over the period 1977-1982, during which time he conducted research in energy markets for the United States Department of Energy. During the same time, he declined the offer of a Visiting Assistant Professorship within the Department of Applied Economics at MIT, and instead lectured on a selective basis. Since 1971, he has consulted to federal and state governmental bodies, private corporations, law firms, consulting companies, research organizations and international lending organizations. He has been and continues to be a research referee for a variety of academic journals, including the top academic journals in the country. He is the author of more than 100 refereed journal articles, book chapters and research/consulting reports.

He has submitted oral and written testimony before federal and state courts of law and regulatory commissions. His testimony as an expert witness has addressed anticompetitive behavior, merger efficiencies, breach of contract, employment discrimination, patent infringement, class certification and the estimation of damages in a variety of markets and industries including, but not limited to, the pharmaceutical industry, the health care services industry, the electric power industry, the banking industry, the agrochemical industry, the copper industry, the defense industry, the cable TV industry, the tobacco industry, the electrical and mechanical carbon products industry, the medical devices industry and the construction industry. He has consulted to counsel on litigation matters in a broader array of markets.

While his experience has been broadly-based across industries, two industries/markets have been primary subjects of substantial consulting, research and litigation support.

Experience in Energy Markets and Regulated Industries

Since 1977, Dr. Hartman's expertise and experience have involved regulated industries generally and the markets for electric power and natural gas specifically. His consulting and/or litigation assignments have included load forecasting, evaluation of conservation and load management programs, econometric cost analysis, analysis of revenue requirements and rate-making, analysis of value of service reliability, the analysis of mergers and acquisitions, analysis of industry restructuring, analysis of manipulation of spot and future prices in energy markets, and analysis of contract damages arising from DOE's partial breach of the Standard Contract regarding storage of spent nuclear fuel waste. In these assignments, Dr. Hartman has consulted for such clients as Arizona Public Service, the Pacific Gas and Electric Company, the Southern California Edison Company, the Southern California Gas Company, the San Diego Gas and Electric Company, Portland General Electric Company, Bonneville Power Administration, General Public Utilities, Northeast Utilities, Niagara Mohawk Power Corporation, the Delmarva Power Corporation, Florida Power Corporation, Sithe Energies, the California Energy Commission and Public Utilities Commission, the Missouri Public Service Commission, the Rhode Island Division of Public Utilities, the Attorney General of the State of Massachusetts, the Electric Power Research Institute, the Gas Research Institute, the U.S. Department of Energy, the U.S. Department of Justice, the World Bank, and the governments of Indonesia and Thailand. He has consulted for a number of other clients whose identity must remain confidential. Over the last five years, he has testified numerous times before the United States Court of Federal Claims on behalf of the DOJ and DOE with regard to damages caused by DOE's partial breach of the Standard Contract.

Experience in Health Care and Pharmaceutical Markets

Over the past 15 years, Dr. Hartman has participated as testifying or consulting expert in a wide array of matters related to health-care markets generally and, more specifically, markets for medical devices and pharmaceutical products. For examples, working with a team of health care experts, he submitted written testimony assessing and measuring the impacts of smoking on Medicaid health care costs in the Commonwealth of Massachusetts. He submitted testimony analyzing the competitive impacts upon and damages to a class of dental laboratories caused by the restrictive dealer practices of a dominant U.S. manufacturer of medical prostheses - false teeth. He consulted to the group of wholesaler defendants in the Brand-Name Prescription Drugs Antitrust Litigation, addressing issues of wholesaler pricing across classes of trade. He consulted to and/or submitted testimony for counsel to manufacturers of cardiovascular stents, related cardiovascular devices and generic drugs in a variety of patent infringement matters, addressing such issues as competition, market definition, liability, market penetration of new products and economic damages arising from patent infringement. He consulted for one group of private plaintiffs in the antitrust matter regarding the prescription drugs lorazepam & clorazepate and for the Federal Trade Commission in the matter of Hoechst Marion Roussel, Inc., Carderm Capital L.P. and Andrx Corporation concerning antitrust claims involving the prescription drug Cardizem CD. That consultation addressed issues of market definition, product competition, class certification and damage estimation. He consulted to counsel on the matter of damages to the class of direct purchasers of the prescription drugs Taxol and Flonase. He consulted to counsel and/or submitted testimony on the matter of damages to classes of indirect end-payer purchasers of the prescription drugs K-Dur, Augmentin, Wellbutrin, Zyprexa, Bextra, Celebrex, Tricor, Nexium, Estratest, Lotrel, Ketek, Flonase and Vioxx.

He submitted testimony addressing class certification, liability and/or damages for the class of end-payer purchasers in antitrust, state consumer protection or RICO litigation concerning the prescription drugs Hytrin, BuSpar, Relafen, Lupron, Premarin, Ditropan, the hormone replacement therapy Estratest,

Cipro in the states of New York and California and in the United States, K-Dur, Neurontin in the United States and Pennsylvania, and Risperdal in the State of Louisiana. In the MDL AWP litigation, he submitted testimony in support of the certification of to the class of end-payer purchasers of those pharmaceutical products produced by AstraZeneca, the Bristol-Myers Squibb Group, the Johnson & Johnson Group, the GlaxoSmithKline Group and the Schering Plough Group that were alleged to have been the subject of a scheme to fraudulently inflate their Average Wholesale Price (AWP); he subsequently submitted and presented at trial testimony supporting findings of causation, liability and the calculation of damages for those end-payer groups for which class certification was granted and upheld at the appellate level. He has consulted to and/or submitted testimony for the Offices of the Attorneys General for the states of Massachusetts, Texas, New York, Connecticut, Montana and Nevada in analogous matters. He submitted testimony addressing class certification, liability, damages and settlement allocation in the MDL litigation, *New England Carpenters Health Benefits Fund, et al, Plaintiffs, v. First Databank, Inc., a Missouri Corporation and McKesson Corporation, a Delaware Corporation, Defendants*, in which violations of U.S. RICO and state consumer protection statutes were allegedly violated. He submitted similar testimony addressing and calculating the economic damages of these alleged activities upon the Medicaid agency and other governmental agencies of several specific states. He submitted testimony regarding class certification in the MDL matter alleging ERISA violations, *In re Express Scripts, Inc., PBM Litigation*. He has consulted to drug companies on related matters when they have arisen in a patent litigation context. His testimony has been the basis for the certification of class in a variety of these matters. His testimony has been the basis for approval supporting settlement agreements in a variety of these and other pharmaceutical matters.

He has provided testimony and/or white papers for counsel used in arbitration for a hospital seeking to revoke surgical privileges for an allegedly incompetent thoracic surgeon and for an insurance company that alleged physicians were overcharging for services provided under Medicare.

Specific Assignments

1972-1975: In consultation with Arthur D. Little, Inc., Dr. Hartman developed economic impact models to assess the effects of environmental regulations upon the U.S. pollution abatement equipment industry and upon a particular U.S. copper smelting company.

1972-1975: In consultation with Arthur D. Little, Inc., Dr. Hartman developed economic models to assess the regional macroeconomic and industrial impacts of alternative strategies to promote tourism-related industries. The models were used in the United States by the states of Maryland and Maine and for the Philadelphia Bicentennial Commission. Internationally, the models were used by the Ministry of Planning of Mexico to assess the national and regional importance of tourism coming into Acapulco.

1976-1977: Consultation with Arthur D. Little, Inc. for the U.S. Environmental Protection Agency. The effort involved the design, estimation and implementation of an econometric simulation model that was used to assess the impact of pollution abatement legislation on the U.S. copper industry. The model was designed to incorporate engineering cost estimates attributable to the abatement legislation while accounting for the noncompetitive pricing behavior in the industry. The model was used to evaluate and revise proposed abatement legislation. This analysis was the basis for Dr. Hartman's Ph.D. dissertation and several of his publications.

1977-1982: Working as the testifying expert, Dr. Hartman analyzed the presence of a price-fixing conspiracy among the major U.S. copper producers during the 1970's. His testimony addressed issues of liability and developed a model of damages. See

Affidavit to United States District Court for the Southern District of New York, *J.N. Futia Co., Inc., Plaintiff, Against Phelps Dodge Corporation, et al., Defendants*, 78 Civ. 4547 (ADS), 1978.

Deposition for United States District Court, Southern District of New York for *Reading Industries, Inc., et al. (Plaintiffs) against Kennecott Copper Corporation, et al. (Defendants)*, 17 Civ. 1736 (MEL), 1982.

1979: Working for the California Energy Commission, Dr. Hartman developed and presented a Statement of Opinion and Critical Review of Selected Energy End-Use Models and Proposed Specifications for PG&E End-Use Modeling Efforts before the California Energy Commission Hearings on Utility Construction and Siting, November 26-30, 1979.

1984: Testifying expert for the class of all individuals who employed the services of members of Massachusetts Furniture and Piano Movers Association. The analysis developed an econometric model to assist in certifying the class and measuring the damages common to that class. See

Affidavit to United States District Court for the District of Massachusetts in the Matter of *Kenett Corporation et al v. Massachusetts Furniture and Piano Movers Association Inc. et al*, May 1984, Civil Action No. 82-140-Z.

1984-1986: In consultation with the U. S. Postal Service, Dr. Hartman identified appropriate econometric methods for analysis of the determinants of Postal Service costs. The particular methods he suggested were "hedonic" cost techniques, which are specifically designed to account for the fact that both increased levels of production and improved product attributes increase costs. The techniques assisted the Postal Service in quantification of the cost impacts of the attributes of service quality for alternative classes of service. For example, the techniques allowed for estimation of the differential cost impacts of alternative service priorities, size and weight attributes of the various classes of mail.

He later applied these techniques for a group of second class mailers. The analysis was introduced before the Postal Service Commission to assess whether proposed postal rate changes reflected actual costs.

1984-1986: The development of econometrically-based strategic planning models, which allow for estimation of the effects on corporate profits of alternative product design and pricing strategies. The models allow for examining specific design strategies by explicitly incorporating detailed product attributes. The models were developed for Westin Hotels and Shell Oil. The Westin models have been implemented into an interactive PC tool that facilitates pricing decisions at the front desk.

1985: For analysis presented before the International Trade Commission, Dr. Hartman helped develop and estimate a model to evaluate the domestic effects of importation of certain synthetic aramid fibers. The analysis was used in adjudicating an international patent infringement complaint.

1985-1986: Dr. Hartman participated in an analysis of one of the nation's largest mutual funds. The study was undertaken as part of a class action alleging inappropriate management fees. The study assessed competition in the money market mutual fund industry. It measured investors' sensitivity to changes in yield and to the level of services provided. It also statistically identified the determinants of the costs of providing mutual fund services.

1985-1986: The development for GTE Laboratories of econometric demand models for analysis and measurement of the determinants of demand for telecommunications services. The models explicitly address the separate customer decisions to subscribe to one of several telecommunications carriers and the demand for telecommunications services, conditional upon the subscription decision. The analysis was employed by GTE to assist their subsidiary, GTE Sprint, in the design of marketable services, where the services were differentiated by tariff, perceived service quality, provider reputation, and specialized customer services. The analysis is summarized in the paper

"Estimation of Household Preferences for Long Distance Telecommunications Carrier", *Journal of Regulatory Economics*, Volume 6, 1994.

1985-Present: Dr. Hartman has performed a variety of economic damage analyses in cases of personal injury, wrongful injury and wrongful death. He has worked for both plaintiff and defendant. He was last deposed in such matters in 1995.

1986: For a major natural gas pipeline, preparation of an analysis of the effects of natural gas deregulation as proposed in the Federal Energy Regulatory Commission's Notice of Proposed Rulemaking No. 436.

1986-1987: Working for the class of owners of selected General Motors' X Cars and VW Rabbits, Dr. Hartman specified and estimated econometric models that assisted in the certification of class and estimation of class damages. The damages flowed directly from allegedly-concealed design flaws in these automobiles. The methods are described in

"The Use of Hedonic Analysis for Certification and Damage Calculations in Class Action Complaints," with M. Doane, *The Journal of Law, Economics and Organization*, Fall 1987.

1986-1987: Development of damage models for litigation in high technology industries. The models were developed in several cases. One involved alleged patent infringement by a major Japanese semiconductor firm, and the second involved market foreclosure of a domestic minicomputer emulator. In these efforts, Dr. Hartman developed econometric models to estimate the market potential, absent the violation, for the particular product foreclosed or whose patent was infringed. The methods are described generically in

"Product Emulation Strategies in the Presence of Reputation Effects and Network Externalities: Some Evidence from the Minicomputer Industry," with D. Teece, *Economics of Innovation and New Technology*, Volume 1, 1990.

1987: Analysis of the competitive effects of relaxing the restrictions on the Bell Regional Operating Companies regarding their vertical extension upstream into equipment manufacture and downstream into the provision of selected telecommunication services. The study was introduced before Judge Greene in the triennial review of the divestiture of the Bell operating companies from AT&T.

1987-1988: For a major gas utility, participation in analysis of the economic effects arising if bypass of an existing pipeline were allowed by state and federal regulation. The analysis developed methods for assessing when competitive bypass is socially desirable. The analysis also developed and used an econometric model to simulate the effects of bypass on demand and prices.

1988: Analysis of the competitive effects the acquisition of trade secrets through the predatory hiring of a competitor's essential labor force. See

Analysis submitted in testimony in the case *Universal Analytics Inc. v. MacNeil Schwendler, Corp.*

1988-1989: As part of their proposed acquisition of Public Service of New Hampshire, Dr. Hartman was retained by Northeast Utilities, Inc. to develop and estimate load forecasting models. The models were used to assess the demand implications of alternative rate assumptions proposed as part of the acquisition. The forecasts were introduced as part of Northeast Utilities' filings before the bankruptcy court, the state public utility commissions, the SEC and the FERC.

1989: As part of major antitrust litigation against the leading vendors of airline computer reservation systems, Dr. Hartman helped develop liability analysis and models for the estimation of damages.

1989: As a proposed testifying expert for Parnelli Jones, Inc., Dr. Hartman analyzed the antitrust implications of Firestone's retail trade practices, particularly alleged vertical and horizontal restraints of trade. He designed damage models for the alleged violations.

1989 - 2000: Dr. Hartman performed the market analyses required for Hart-Scott-Rodino applications and second requests supporting mergers and acquisitions in a variety of industries, including specialty chemicals, airlines, health care and medical diagnostic products, and energy products and services.

1989-1990: Dr. Hartman participated as a principal investigator and testifying expert for the Division of RatePayer Advocates of the California Public Utility Commission in an analysis of the economic and legal implications of the proposed merger between Southern California Edison Company and San Diego Gas and Electric Company. Dr. Hartman's responsibilities included overall study design, econometric analysis of scale and scope economies arising with the merger, and analysis of efficiencies purportedly arising with the coordination of the demand-side management programs of the two utilities. His direct and surrebuttal testimony is found in

California Public Utilities Commission, Division of Rate Payer Advocates, Report on the Proposed Merger of the Southern California Edison Company and the San Diego Gas and Electric Company, Volume V, Chapter II, Application 88-12-035, February, 1990, Exhibit 10,500; and

California Public Utilities Commission, Division of Rate Payer Advocates, Report on the Proposed Merger of the Southern California Edison Company and the San Diego Gas and Electric Company, Surrebuttal: Econometric Analysis of Merger Impacts, Application 88-12-035, July, 1990, Exhibit 10,511.

1989-1990: Working with Arthur D. Little, Inc., Dr. Hartman participated as a principal investigator and testifying expert in a merger study for several small New England utilities within Nepool. Dr. Hartman designed and implemented a statistical study of returns to scale and scope in the industry. Using the statistical results, Dr. Hartman developed opinions regarding the efficiency effects of the proposed merger. His analysis appears as an independent Appendix to

Arthur D. Little, Inc., Evaluation of EUA's Proposed Acquisitions of UNITIL and Fitchburg, Report to Gaston and Snow, March 12, 1990, presented in support of the acquisition to the Securities and Exchange Commission and the New Hampshire Public Utilities Commission.

1990: Working for a group of commodity futures exchanges, Dr. Hartman participated as Principal Investigator in a critical review of a statistical and econometric study performed by the Commodity Futures Trading Commission. The CFTC study was developed to assess the effects of dual trading on commodity futures markets, in order to implement proposed regulations curtailing such trading.

1990: Working with Barakat and Chamberlin, Inc., Dr. Hartman developed a Ramsey pricing model for Arizona Public Service Corporation. The Ramsey pricing model was used to develop and explore alternative rate strategies for a variety of residential, commercial and industrial market segments. The analysis was submitted in formal rate hearings.

1990-1992: Working with the Technology Research Center of Arthur D. Little, Inc. for the United States Postal Service, Dr. Hartman specified and estimated econometric models to analyze the determinants of productivity for the largest 120 post offices in the United States. The econometric models are being used to identify the most and least productive offices, with the purpose of learning from the performance of the most productive offices in order to improve the performance of the least productive offices. The models are being used to design and implement incentive regulation mechanisms to increase productivity across post offices.

A second set of econometric models have been specified and estimated to quantify the effects of the attributes of alternative postal services and rate classes upon total postal service costs. The results of this analysis are being used to design postal rates for alternative classes of service which reflect the real costs of providing the services. The analysis and its results will be introduced into the postal rate hearings.

1990-1997: Working with the World Bank, Dr. Hartman has specified and is estimating a set of econometric models to measure both the level and types of pollutants emitted by United States plants and establishments and the costs of abating those pollutants. The models identify and quantify, at the plant level, the relationship between the emission of approximately 300 pollutants and the scale of production, the types of technology used, the age and characteristics of the plant and equipment used, the extent to which abatement equipment has been installed, and the costs (capital and operating) of abating alternative pollutants.

The models will be used in the following ways in developing countries and Eastern European countries: to assist the countries to predict and assess the environmental implications of reliance upon certain technologies and industries in development; to assess the effectiveness of alternative regulatory methods for abating pollution, including effluent standards, effluent taxes, effluent licenses, technology standards, effluent banks, and alternative property right schemes; to implement incentive regulation mechanisms to better stimulate abatement compliance; and to identify and prioritize those industries that can abate certain pollutants at least cost.

As part of this effort, Dr. Hartman has also designed a specific incentive regulation system for pollution abatement compliance in Indonesia. The system is based upon the most recent theory in regulated incentive mechanisms. The system will ultimately evolve into an effluent bank or a system of effluent fees. If the effort is successful, it will form the basis for environmental institutions in other developing countries. In the process of designing this system, he has reviewed the institutional and statutory basis for environmental policy in Indonesia.

Also as part of this work, Dr. Hartman is in the process of designing the institutional and statutory structures for Environmental Protection Agencies in a variety of developing countries. The institutional structures will be designed to articulate and implement pollution abatement policies that are informed by the econometric modeling described above.

1991: Dr. Hartman participated as a principal investigator and testifying expert for the Missouri Public Service Commission in a critical analysis of the proposed merger between Kansas Power and Light Company and Kansas Gas and Electric Company. Dr. Hartman's responsibilities included overall study design, analysis of scale and scope economies arising with the merger, analysis of unanticipated transitional cost arising with the merger and an econometric event study of the stock market's response to the merger. His testimony appears in

[A Critical Analysis of the Proposed Merger Between Kansas Power and Light Company and Kansas and Electric Company](#), Report to the Missouri Public Service Commission, March 25, 1991.

1991: Working for the Resolution Trust Corporation in its litigation against Michael Milken and Drexel Burnham Lambert Inc., Dr. Hartman developed data and econometric models to measure the size of the relevant antitrust markets dominated by Drexel and to estimate the size of the economic damages produced by Drexel's alleged monopolization of those markets.

1991-1992: Working for the Indonesian government and the United States Agency for International Development, Dr. Hartman critically reviewed the structure of the Indonesian electric power industry and the institutions regulating that industry. The purpose of the analysis was to assist the government with privatizing their energy industries. His analysis focused upon the following: developing better data and models for predicting demand and supply; identifying and implementing more efficient industrial structures; and developing better regulatory regimes.

1992: Working for the World Bank, Dr. Hartman designed methods to measure and compare the social value of the environmental effects of alternative development projects, at the microeconomic and macroeconomic levels. His analysis focused upon standard and contingent valuation survey approaches and their use in econometric settings.

1992-1993: Working for the World Bank in Bangkok, Dr. Hartman characterized and critically analyzed the environmental effects of Thailand's energy use patterns. He focused upon the use and production of electric power, petroleum, coal and natural gas. He developed recommendations for environmental policy changes that included, but were not limited to, fuel taxes, effluent standards, technology standards, and privatization of environmental monitoring within a "bubble" policy approach.

1992-1993: Working for a biomedical company (a producer of vascular grafts) in an antitrust situation, Dr. Hartman designed and implemented survey techniques and econometric models to measure the size of the relevant markets and market power within those markets.

1992-1993: In a proceeding before the International Trade Commission, Dr. Hartman critiqued ITC econometric methods used for estimating elasticities of demand, supply and substitution among domestic and imported products. His focus was selected steel products. He formulated and estimated alternative models and methods to improve the existing estimates. He developed presentation materials for the Commission and testified before the Commission. His testimony is included in

LECG, Petitioners' Economic Testimony in the Matter of Certain Carbon Steel Flat Products, Final Hearing before the United States International Trade Commission, June 29-30, 1993; and

LECG, Petitioners' Post Hearing Brief in the Matter of Certain Carbon Steel Flat Products, before the United States International Trade Commission, July 7, 1993.

1992-1997: Working for the World Bank, Dr. Hartman has designed and is currently implementing a set of regional econometric/engineering models that accurately portray and predict the economic, environmental, infrastructural and socio-demographic effects of large-scale, World-Bank-funded infrastructural projects. The models combine input-output and econometric methods.

Given the Bank experience that many of their financially-sponsored projects create significant unanticipated environmental effects, the models are designed to be broad and comprehensive enough to incorporate and predict all important effects. The models systematically characterize the relationship between resource-based economic growth and the regional environment in which that growth occurs.

The models are currently being implemented for assessing project developments in the Carajas region of the Brazilian Amazonian rain forest, which is a large, dynamic and ecologically sensitive frontier area. The methods implemented for Brazil will be generalized for analysis of economic growth in ecologically similar areas, such as the Lake Baikal region of the former Soviet Union.

1993-1994: Working for the Commonwealth of the Northern Mariana Islands, Dr. Hartman developed and presented testimony rebutting a complaint by the United States Department of Justice that the Public School System of the Commonwealth practiced employment discrimination against teachers of Filipino and native Carolinian origin. Dr. Hartman's testimony examined both hiring and compensation practices. His testimony included hedonic regression analysis of the market for public school teachers in the islands. This analysis measured how teacher attributes and qualifications determined teacher salaries and hiring. The results of the analysis indicated that salary differentials resulted from differences in teacher qualifications rather than discrimination.

1993-Present: Working either as the testifying expert or supporting other testifying experts, Dr. Hartman has participated in a variety of patent infringement cases. He has developed, supported and estimated alternative theories and measures of damages for manufacturers of coaxial cable, a variety of alternative medical devices and several generic drug manufacturers.

1993-1998: Working as the testifying expert, Dr. Hartman developed models estimating the damages to the business of a construction general contractor that were caused by the malicious prosecution of the contractor's insurance company.

1994: Working for the United States Wheat Associates in a proceeding before the ITC, Dr. Hartman designed and implemented an econometric study to assess and quantify the extent to which Canadian Wheat Board imports into the U.S. undersold domestic supplies and thereby materially interfered with the United States Department of Agriculture Wheat Program. The econometric study was hedonic. The study measured how non-price attributes are valued in U.S. wheat markets. The non-price attributes analyzed included such things as protein content, shipment defects, moisture content and a number of end-use performance characteristics. Having measured the value of these attributes in U.S. markets, the analysis indicated how the Canadian Wheat Board fixed import prices below market levels, given the attributes of the imported wheat.

1994: Working as a testifying expert for Gallo Wines in a proceeding before the ITC, Dr. Hartman designed and implemented a statistical study of the US wine industry that analyzed the impacts of Chilean wine imports upon the domestic industry that would result from the inclusion of Chile in a Free Trade Agreement with the US.

1994: Working as a testifying expert for an insurer of a member of the Asbestos Claims Facility and Center for Claims Resolution, Dr. Hartman developed a statistical analysis estimating alternative indemnification liabilities expected under the Settlement Share Analysis of the Center for Claims Resolution and under the tort system. The results were used to make strategic decisions regarding the desirability of participating in the Class Action Settlement relative to litigating the claims.

1994: Working for several regional Bell Operating companies, Dr. Hartman has developed models and survey procedures to analyze and quantify the determinants of demand for local services, long-distance services and PCS services. The models quantify how consumers respond to and select among alternative carriers who differentiate their services by performance attributes and vendor reputation. The models also estimate the level of service demand, conditional upon the selection of service vendor. The models are being used to quantify the nature of competition among local carriers and long-distance carriers in the Intralata market. The models are also being used to help develop bidding strategies for specific RBOCs as they participate in the FCC auctions for the PCS spectra.

1995: Working as a testifying expert for a group of independent television stations and program producers, Dr. Hartman developed an econometric analysis of the impacts of the Prime Time Access Rule (PTAR) upon the economic performance of independent television stations. The analysis was submitted to the Federal Communications Commission as part of their consideration of the repeal of the Rule. Dr. Hartman's analysis proved that PTAR had a strong, statistically significant effect upon the economic performance of these stations, and that its repeal would adversely impact them.

His testimony is included in

The Economic Effects of Repealing the Prime Time Access Rule: Impact on Broadcasting Markets and the Syndicated Program Market, Report prepared by LECG and presented before the Federal Communications Commission, MM Docket No. 94-123, March 7, 1995.

1995: Working for a big six accounting firm, Dr. Hartman designed and implemented a hedonic regression analysis to calculate transfer prices under the comparable uncontrolled price (CUP) method. The analysis is discussed in

"The Use of Regression Techniques in Transfer Price Analysis," with Delores Wright and J.D. Opdyke, *European Taxation*, 1996.

1995-1996: Working as the testifying expert for a major high tech firm in New England, Dr. Hartman has developed rebuttal and affirmative testimony to rebut claims of age discrimination in the termination of a group of employees over forty. His rebuttal testimony involved critically reviewing statistical analyses purporting to demonstrate disparate treatment and disparate impact. His affirmative testimony has involved designing and implementing econometric models to identify and estimate those factors actually determining the compensation and termination decisions of the defendant.

1995-1996: Working as the testifying expert for the Office of Attorney General of the State of Massachusetts, Dr. Hartman has analyzed and helped develop the State's positions on the following issues:

restructuring the electric utility industry in Massachusetts and New England; regulating those entities in the restructured industry that will remain subject to regulation; and valuing those assets that may be stranded as a result of restructuring. As part of the effort, Dr. Hartman also critically reviewed the restructuring proposals of the largest utilities in the state. His testimony appears in

"The Market for Power in New England: The Competitive Implications of Restructuring," a report prepared for the Office of the Attorney General, Commonwealth of Massachusetts and submitted February 16, 1996 in support of their filing to the Department of Public Utilities as part of DPU 95-30, which was initiated August 15, 1995.

1995-1996: Working as the testifying expert, Dr. Hartman represented Florida Power Corporation in a contract dispute with Independent Power Producers. His analysis and testimony focused upon issues of damages incurred as a result of a breach of contract.

1995-1999: Working with a team of economists, Dr. Hartman represented the group of wholesalers in the retail prescription drug price fixing conspiracy case. His efforts included industry analysis and participation in cross examination of plaintiffs' experts.

1996: Working as the testifying expert for the Division of Public Utilities of the State of Rhode Island, Dr. Hartman has analyzed and helped develop the State's positions on restructuring the electric utility industry in Rhode Island and New England, for both the State's Public Utilities Commission and the FERC. As part of the effort, Dr. Hartman also critically reviewed the restructuring proposals of some of the utilities in the state. His testimony appears in

"The Division Plan to Restructure the Electric Utility Industry in Rhode Island," Volume 2 of Supporting Testimony to the State of Rhode Island and Providence Plantations Public Utilities Commission, in re: Electric Industry Restructuring, Docket 2320, April 12, 1996.

1996: Working with a team of engineering firms, an international investment banking firm, a big six accounting firm and several national law firms, Dr. Hartman developed models of demand, supply and futures markets in restructured electric power markets to assist a major industry participant in evaluating specific alternative acquisition strategies.

1996: Working with a team of economists developing evidence for presentation before the High Court of New Zealand, Dr. Hartman critically reviewed and rebutted a variety of econometric analyses of natural gas markets and more broadly-defined energy markets in New Zealand. These analyses were used to determine the size of antitrust markets for a variety of energy products.

1996: Dr. Hartman was retained by a major mid-west utility to critically review and rebut analyses and evidence presented before the FERC and the relevant State Commissions concerning the competitive impacts of the proposed Primergy merger.

1996-2003: Working as the testifying expert, Dr. Hartman analyzed the employment practices and procedures of the Florida Power Corporation during a reduction in force, to assess the validity of a complaint that those practices and procedures resulted in a pattern of age discrimination. In his testimony, Dr. Hartman implemented a variety of statistical and econometric analyses to address and quantify claims of disparate impact and disparate treatment.

1996-1997: Working for US Airways with a team of economists, Dr. Hartman specified and estimated a variety of econometric consumer choice models to measure customer preferences for the services of alternative air carriers in a cross section of US-European origin-destination markets. The models were used to evaluate the economic impacts of both the proposed alliance between American Airlines and British Airways and alternative proposals to condition that alliance.

1996-1997: Working as the testifying expert, Dr. Hartman represented a major national retail pharmaceuticals wholesaler in litigation brought by a regional distributor alleging monopolization of wholesale services to distinct classes of trade. His analysis addressed market definition, the analysis of competition generally and analysis of the competitive impact of specific contractual arrangements.

1997: Working with a team of experts, Dr. Hartman analyzed economic impacts of the construction of the Warrior Run Cogeneration plant which was under construction in Western Maryland and was contracted to sell power to Allegheny Power System's (APS) Maryland subsidiary, Potomac Edison.

1997: Working as the testifying expert for the Office of Ratepayer Advocates of the California Public Utilities Commission, Dr. Hartman critically reviewed the efficiencies estimated by Applicants to be induced by the proposed merger of Pacific Enterprises and Enova Corporation.

1997: Working with a team of economists, Dr. Hartman prepared affirmative and rebuttal testimony in a breach of contract matter in the pharmaceutical industry arbitrated before the International Chamber of Commerce.

1997-2000: Working as the testifying expert, Dr. Hartman developed analysis supporting certification of class and estimation of damages for the class of purchasers of thermal fax paper in the US over the period 1990-1992 who were damaged as a result of a price fixing conspiracy by major suppliers.

1998: Working as the testifying expert, Dr. Hartman analyzed the employment practices, procedures and personnel data of the Florida Power Corporation, in general and in particular, to assess the validity of a complaint that a specific employee had been subjected to racial discrimination.

1998-1999: Working with a team of economists for the Office of the Attorney General of the State of Massachusetts, Dr. Hartman developed and implemented econometric models to analyze and measure the health care costs arising under the Medicaid program that have been attributable to smoking. The analysis appears in the following documents:

David M. Cutler, Arnold M. Epstein, Richard G. Frank, Raymond S. Hartman, Charles King and Joseph P. Newhouse, *The Impact of Smoking on Medicaid Spending in Massachusetts: 1970-1998 -- Report on Methods*, June 15, 1998;

David M. Cutler, *et. al.*, *The Impact of Smoking on Medicaid Spending in Massachusetts: 1970-1998 - Results From The Inclusive Approach for Adults*, July 1, 1998;

David M. Cutler, *et. al.*, *The Impact of Smoking on Medicaid Spending in Massachusetts: 1991-1998 - Results From The Disease-Specific Approach for Adults and Overall Summary*, July 11, 1998.

Drawing upon these efforts, Dr. Hartman worked with the same team of experts to analyze the economic impacts of the Master Settlement Agreement and to present their findings to the Tobacco Fee Arbitration Panel.

1999: Working as one of two testifying experts for the Office of the Attorney General of the Commonwealth of Massachusetts, Dr. Hartman critically analyzed potential rate increases relevant to Joint Petitions introduced by both Eastern Enterprises/Colonial Gas Company and Boston Edison/Commonwealth Energy Systems. His testimony appears as

Joint Testimony of Seabron Adamson and Raymond Hartman on Behalf of the Massachusetts Attorney General, in the matter of the Joint Petition of Eastern Enterprises and Colonial Gas Company For Approvals of Merger Pursuant to G.L. c. 164, §§ 96 and 94, DTE 98-128, March 26, 1999.

Joint Testimony of Seabron Adamson and Raymond Hartman on Behalf of the Massachusetts Attorney General, in the matter of the Joint Petition of Boston Edison Company, Cambridge Electric Light Company, Commonwealth Electric Company and Commonwealth Gas Company For Approval of Rate Plan Pursuant to G.L. c. 164, §§ 76 and 94, DTE 99-19, April 30, 1999.

1999-2000: Dr. Hartman was retained by a group of industrial purchasers of copper to develop and implement methods and models to assess liability and measure damages in the matter involving the manipulation of the spot and future prices of copper on the London Metals Exchange by Sumitomo Corporation and Yasuo Hamanaka over the period 1987-1996.

1999-Present: Dr. Hartman consulted with counsel and the testifying expert in the development of data and models needed to certify class and measure damages in a price fixing case involving the manufacturer (Mylan) of generic clorazepate and lorazepam.

1999-2001: Working as the testifying expert, Dr. Hartman analyzed liability arising from a variety of restrictive dealer arrangements implemented by Dentsply International Inc., a U.S. manufacturer of artificial teeth, to foreclose entry by rival manufacturers from the US dental-laboratory dealer network. Dr. Hartman developed and implemented methods to measure damages to the class of dental laboratories that purchased artificial teeth from Dentsply at prices above the competitive prices that would have obtained absent the restrictive dealer arrangements.

1999-2000: Working with a team of economists for the Federal Trade Commission, Dr. Hartman analyzed the pro-competitive and anti-competitive nature of settlement agreements between generic and pioneer drug manufacturers resolving patent infringement litigation arising from certification under Paragraph IV of the Hatch Waxman Act (Drug Price Competition and Patent Term Restoration Act). Particular settlements analyzed include the settlement between Abbott Laboratories and Geneva Pharmaceuticals regarding the drug Hytrin and the settlement between Hoechst Marion Roussel (Aventis) and Andrx Corporation regarding the drug Cardizem.

1999-2000: Working as the testifying expert for the class of purchasers of Nine West shoes, Dr. Hartman was asked to analyze liability and measure damages arising from an alleged conspiracy to raise and maintain the prices of women's shoes manufactured by the Nine West Group Inc. and sold by a variety of general merchandise retailers through their upscale retail department stores. The defendants in the case included Nine West Group Inc., Federated Department Stores, Inc., Dayton Hudson Corporation, Lord and Taylor, Nordstrom, Inc., May Department Stores, Macy's, Bloomingdale's, Inc., and other general merchandise retailers.

2000: Working with the testifying expert, Dr. Hartman assisted in the analysis and estimation of economic damages to a Class defined as all smokers with 20-pack years each of whom contracted lung cancer which was substantially contributed to by cigarette smoking.

2000: Working with a team of economists, Dr. Hartman developed econometric models to analyze and measure the impacts of subject imports, non-subject imports and factor price changes upon the prices of structural steel beams during the period 1998-1999. The work was presented before the International Trade Commission.

2001: Working with a team of economists, Dr. Hartman developed econometric models to analyze and measure the impacts of subject imports, non-subject imports and factor price changes upon the prices of structural steel beams and during 2000. He also developed econometric models to analyze and measure the impacts of subject imports, non-subject imports and factor price changes upon the prices of cold rolled and hot rolled steel during the Period of Inquiry of 1997-1999. Both efforts were presented before the International Trade Commission.

2001-2004: Working as the testifying expert, Dr. Hartman developed and submitted testimony in support of class certification of and the calculation of damages to the class of indirect purchasers of the anti-hypertensive drug, Hytrin, produced by Abbott Laboratories and the generic equivalent of Hytrin, generic terazosin hydrochloride, produced by Geneva Pharmaceuticals. The class alleges monopolization and violation of the Hatch Waxman Act (Drug Price Competition and Patent Term Restoration Act).

2001-Present: Working as consultant and testifying expert, Dr. Hartman has been retained by counsel to the classes of indirect or direct purchasers of a variety of branded pharmaceuticals (including but not limited to Augmentin, Bextra, Cipro (New York, California, U.S.), BuSpar, Celebrex, Vioxx, K-Dur, Taxol, Lupron, Relafen, Paxil, Neurontin, Remeron, Ditropan, Tamoxifen, Premarin, Wellbutrin and Zyprexa) to analyze and submit testimony dealing with class certification, liability, market definition, damage calculations and settlement allocations arising from violations of the Hatch Waxman Act (Drug Price Competition and Patent Term Restoration Act), related state-specific unfair competition statutes and the RICO Act.

Dr. Hartman's testimony in this area has been relied upon (and cited thereto) for certification of end-payer consumer classes in the following matters:

- *In re: Terazosin Hydrochloride Antitrust Litigation*, United States District Court, Southern District of Florida, Case No. 99-MDL-1317-Seitz/Klein [Order Granting Indirect Purchaser Plaintiffs' Motions for Class Certification of State-Wide Classes, April 8, 2004]
- *In re Cipro Cases I and II*, D043543 (JCCP Nos. 4154, 4220), Court of Appeal, Fourth Appellate District, Division One, State of California [Decision affirming class certification not titled but marked as "Not to Be Published in Official Reports," Filed 7/21/04]
- *In re: Relafen Antitrust Litigation*, United States District Court, District of Massachusetts, Master File No. 01-12239-WGY [Memorandum granting certification for an exemplar class, May 12, 2004]
- *In re Pharmaceutical Industry Average Wholesale Price Litigation*, United States District Court for the District of Massachusetts, MDL, No. 1456, Civil Action: 01-CV-12257-PBS.
- *New England Carpenters Health Benefits Fund; Pirelli Armstrong Retiree Medical Benefits Trust; Teamsters Health & Welfare Fund of Philadelphia and Vicinity; and Philadelphia Federation of Teachers Health and Welfare Fund, District Council 37, AFSCME - Health & Security Plan; June Swan; Maureen Cowie And Bernard Gorter*

v. First Databank, Inc., and McKesson Corporation, United States District Court District of Massachusetts, C.A. No. 1:05-CV-11148-PBS.

Dr. Hartman's testimony has been relied upon (and cited as necessary) for approval of proposed settlement allocations in the following matters:

- *In re: Lupron® Marketing and Sales Practices Litigation*, United States District Court, District of Massachusetts, MDL No. 1430, Master File No. 01-CV-10861-RGS [Memorandum and Order Approving Settlement and Certifying the Class, May 12, 2005]
- *HIP Health Plan of Florida, Inc., On Behalf of Itself and All Others Similarly Situated v. Bristol-Myers Squibb Co. and American Bioscience*, Case Number 1:01CV01295, United States District Court for the District of Columbia
- *In re Buspirone Antitrust Litigation*, MDL No. 1413, United States District Court for the Southern District of New York
- *In re Relafen Antitrust Litigation*, United States District Court, District of Massachusetts, Master File No. 01-CV-12222-WGY
- *In re Remeron Antitrust Litigation*, United States District Court, District of New Jersey, Master Docket No. 02-CV-2007

2001: Working as consultant to counsel for various U.S. steel producers, Dr. Hartman worked with a team of economists to develop econometric models to analyze and measure the impacts of imports, demand and factor price changes upon the prices of domestically produced carbon steel flat products and carbon steel long products in the Section 201 hearings before the International Trade Commission. Dr. Hartman testified before the ITC in the hearings. The Commission decided in favor of most of the products subject to these analyses.

2001: Working as consultant to counsel for Nucor Steel Corporation, Dr. Hartman worked with a team of economists to develop econometric models to analyze and measure the impacts of imports, demand and factor price changes upon the prices of domestically produced carbon steel cold rolled products for preliminary hearings before the International Trade Commission.

2001-2002: Consulting to counsel for the Plaintiff Class, Dr. Hartman analyzed the targeting of youth by cigarette advertisements in the matter *in re Devin Daniels, et. al., v. Philip Morris Companies, Inc., et. al.*, Case Number 719446, coordinated with JCCP 4042.

2001-2003: Working as testifying expert, Dr. Hartman developed and presented statistical evidence analyzing the relative performance of a particular cardiovascular surgeon litigating the fact that his surgical privileges had been revoked as a result of incompetent surgical performance and results. He testified before an arbitration panel in the matter.

2003: Working as the testifying expert for Defendants, Dr. Hartman submitted testimony analyzing the allegation of racial discrimination on the part of Wells Fargo Home Mortgage, Inc. and Norwest Mortgage, Inc.

2003: Working as a consulting expert to counsel for the class of purchasers of graphite electrodes, Dr. Hartman developed econometric models to assess the impact of alleged antitrust violations.

2003: Working as a consulting expert for counsel to the class of direct purchasers, Dr. Hartman reviewed materials in a matter regarding antitrust allegations concerning the manufacture and sale of microcrystalline cellulose in the United States.

2003: Working as a consulting expert to counsel for a large electrical generation company, Dr. Hartman developed economic and econometric models to analyze the allegation that this electrical generation company participated in a conspiracy to manipulate prices of power sold in California.

2003: Working as the testifying expert, Dr. Hartman submitted testimony which analyzed and calculated the economic impacts and damages to the U.S. growers and quota holders of flue-cured and burley tobacco leaf caused by a price-fixing conspiracy among the major U.S. tobacco leaf buyers and cigarette manufacturers. The \$1.4 billion settlement ultimately reached in the matter was the second highest antitrust settlement in history.

2004: Working as the consulting expert for the United States Department of Justice, Dr. Hartman critically analyzed the calculation of the economic damages borne by an electric power generation utility as a result of the breach of the Standard Contract with the U.S. Department of Energy to remove spent nuclear fuel in 1998. Dr. Hartman's analysis included a critical review and rebuttal of the models and data put forward by the utility's experts in the calculation of damages; the development and presentation of alternative and improved models and corrected data to more accurately calculate damages; a critical review of econometric analyses put forward by one of the utility's experts; and a review of the economics of re-licensing existing nuclear generating facilities.

2004: Working as the testifying expert, Dr. Hartman submitted testimony in support of the certification of the class of purchasers of electrical carbon products who have been alleged to have been impacted and injured economically as a result of a price-fixing customer-allocation conspiracy of the major suppliers of such products in the United States.

2004-Present: Working as the testifying expert, Dr. Hartman submitted testimony in deposition and at trial in support of the certification of the class of end payer purchasers of those pharmaceutical products produced by AstraZeneca, the Bristol Myers Squibb Group, the Johnson and Johnson Group, the Glaxo-Smith-Kline Group and the Schering Plough Group that were subject to an alleged scheme to fraudulently inflate their Average Wholesale Price (AWP), thereby fraudulently inflating the reimbursement rates paid by the Class members for those pharmaceuticals when their reimbursement rates were formulaically related to the AWP. Dr. Hartman developed, implemented and presented at trial a theory of causation and under that theory calculated damages to the relevant indirect purchaser classes. The District Court and Appellate Court found in favor of Plaintiffs. Dr. Hartman has consulted and continues to consult and/or submit testimony on appeals and on related litigation undertaken by the Offices of the Attorneys General for the Medicaid Agencies of the states of New York, Connecticut, Arizona, Nevada, Montana, Texas, Pennsylvania and the Commonwealth of Massachusetts.

2004-2005: Working as a consulting expert to counsel for a major electricity and gas utility holding company, Dr. Hartman developed models to evaluate allegations of affiliate abuse by the regulated gas distribution entities and the trading entities of the holding company. The alleged abuses concerned spot and forward gas markets in California.

2005: Working as the testifying expert for the United States Department of Justice, Dr. Hartman developed models to critically analyze the cost submissions to the U.S. Court of Federal Claims by the TVA for monetary damages alleged to have resulted from partial breach by the U.S. Department of Energy of the Standard Contract to remove spent nuclear fuel from TVA beginning in 2002. Dr. Hartman's analysis included

a critical review and rebuttal of the models, data and cost analyses put forward by the utility and the development and implementation of alternative and improved models and corrected data to more accurately calculate costs attributable to the alleged partial breach.

2005-2007: Working again as the testifying expert for the United States Department of Justice, Dr. Hartman developed models to critically analyze the cost submissions to the U.S. Court of Federal Claims by the Systems Fuel Inc., a subsidiary of Entergy, for monetary damages alleged to have resulted from partial breach by the U.S. Department of Energy of the Standard Contract to remove spent nuclear fuel from SFI facilities in Mississippi and Arkansas. Dr. Hartman's analysis has included a critical review and rebuttal of the SFI models, data and cost analyses put forward by the utilities and the development and implementation of alternative and improved models and corrected data to more accurately calculate costs attributable to the alleged partial breach.

2005-2010: Working as one of two testifying experts, Dr. Hartman submitted testimony calculating monetary damages caused by the allegedly fraudulent promotion of the drug Neurontin for indications that were not approved by the FDA (off-label promotion). As part of his analysis, he consulted on the estimation of the econometric models calculating those prescriptions induced by the off-label promotion. His testimony has been submitted in the MDL and Pennsylvania matters. He has testified at trial in this matter.

2006: Working as the testifying witness for counsel to the named plaintiffs and the class, Dr. Hartman submitted testimony in support of certification of the Indirect Purchasers of the drug Ditropan.

2006-Present: Working as the testifying expert, Dr. Hartman has submitted testimony supporting class certification, liability and calculating damages resulting from an alleged conspiracy between McKesson and First Data Bank to inflate prices paid for a broad spectrum of brand name drugs by manipulating the list prices of those drugs (AWPs and WACs). Once class was certified and damages calculated, Dr. Hartman submitted testimony analyzing and supporting several proposed settlements to the litigation. Dr. Hartman is currently extending his analysis to state AG litigation, to assist those AGs to recover the overcharge damages paid on Medicaid reimbursement as a result of the conspiracy, as well as reimbursement by other governmental agencies.

2007-Present: Working as a consulting expert, Dr. Hartman worked with a team of economists estimating econometric models to analyze and quantify the extent to which allegedly illegal off-label promotion by the manufacturer of the drug Zyprexa caused increases in the amount of Zyprexa prescribed and sold.

2008: Working as the testifying expert, Dr. Hartman submitted testimony supporting certification of and calculation of damages for by the class of users of and payers for the drug Bextra as a result of fraudulent marketing activities and fraudulent clinical representations made by the drug's developers and/or manufacturers (defendants Pharmacia, Pfizer, and Searle).

2008-2009: Working as the testifying expert for the named plaintiffs and the class, Dr. Hartman submitted testimony in support of class certification for the indirect purchasers of the drug Estratest, which was marketed and promoted by its manufacturer Solvay for hormone replacement therapy, despite the fact that it had received no FDA approval to do so even though Solvay had actively sought FDA approval and repeatedly made applications to the FDA for decades.

2008-2009: Working as the testifying expert for the United States Department of Justice, Dr. Hartman developed models to critically analyze the cost submissions to the U.S. Court of Federal Claims by the Energy

Northwest. Dr. Hartman's analysis focused upon correct procedures to analyze cost effective responses in the actual world to DOE delays in taking spent nuclear fuel.

2009: Working as the testifying expert for a large health insurer, Dr. Hartman critically assessed whether providers submitted claims in excess of what was allowed under Medicare reimbursement practices and procedures.

2009-2010: Working as one of two testifying experts, Dr. Hartman submitted testimony analyzing liability and calculating monetary damages caused by the allegedly fraudulent promotion of the anti-psychotic drug Risperdal for indications that were not approved by the FDA (off-label promotion). As part of his analysis and testimony, he estimated and presented econometric models calculating those prescriptions induced by the off-label promotion.

2010-Present: Working as a testifying expert, Dr. Hartman developed and submitted testimony in support of class certification, calculation of damages and market definition for the class of indirect purchasers of Provigil. The class alleges monopolization and violation of the Hatch Waxman Act (Drug Price Competition and Patent Term Restoration Act) to foreclose generic entry.

2010-Present: Working as a testifying expert, Dr. Hartman developed and submitted testimony in support of class certification, calculation of damages and market definition for the class of indirect purchasers of Toprol XL and metoprolol succinate. The class alleges unlawful double patenting and violation of the Hatch Waxman Act (Drug Price Competition and Patent Term Restoration Act) to foreclose generic entry.

Attachment C:

Moratorium initiatives in Canada, Wisconsin, Connecticut

An Example Moratorium from Ontario Canada

The following motion was passed yesterday by the Arran-Elderslie Council. It will be circulated through AMO. *January 23, 2012*

Whereas the Ontario Federation of Agriculture which is Ontario's largest farm organization has asked Premier McGuinty and the provincial government to suspend the building of Industrial Wind Turbines across the province as of January 20, 2012;

And Whereas dozens of municipalities across this province have repeatedly asked for a moratorium on the construction of Industrial Wind Turbines until questions such as health concerns of people living in proximity to the Industrial Wind Turbines, proper setbacks of Industrial Wind Turbines, devaluation of neighbouring properties, decimation of the rural landscape, and destruction of wildlife habitats are properly studied and addressed;

And Whereas many of these municipalities have asked for the province to hand back the planning authority for Industrial Wind Turbines, but to no avail; And Whereas the Ontario Auditor General has even tried to explain to this government the serious errors being made under the Green Energy Act with regards to more jobs being lost than created, the consumer and taxpayer subsidizing the Industrial Wind Turbine projects to create huge profits for large off-shore companies while making electricity very expensive for the citizens of this province, or the implications of decommissioning Industrial Wind Turbines twenty years from now;

Thereby Be It Resolved that the Municipality of Arran-Elderslie, along with all other municipalities across this province who share these concerns regarding the damaging and devastating repercussions within our communities, hereby request that the Premier invoke an immediate moratorium of one year, with yearly extensions as required on the construction of Industrial Wind Turbines within the Province of Ontario until the concerns noted above are properly studied and addressed.

Further Be It Resolved that this moratorium be put in place before the ROMA/OGRA 2012 Conference starting February 26, 2012. Further Be It Resolved that if the moratorium is not announced prior to the start date of the conference, that all municipal officials in attendance at the conference representing municipalities in opposition to the autocratic and dictatorial processes utilized by the government in establishing the Green Energy Act, shall leave the room immediately when the agenda reaches the point that the Premier or his designate addresses the conference, in a show of solidarity to once again demonstrate to our provincial government our frustration, anger and disappointment over their complete and total mishandling of the Green Energy Act and Industrial Wind Turbines in particular.

Further, that this motion shall be forwarded through the AMO to all municipalities in the Province of Ontario, Premier McGuinty, Local Members of Provincial Parliament, the Minister of Energy and the Minister of the Environment.

Wisconsin wind turbine moratorium sought by Sen. Frank Lasee, R-Ledgeview

Research needed to show wind farms are safe, he says

By Doug Schneider
Green Bay Press-Gazette

GLENMORE — The sights and sounds outside her son's window made Sarah Cappelle consider something once unthinkable: Trying to sell the home in which her family has lived for generations.

The two-story house off Glenmore Road has become less dream, more nightmare since wind turbines were erected in 2010 on farmland just to the southeast.

Worries about the effects of the structures prompted Cappelle and husband Dave to stand in support Monday as state Sen. Frank Lasee, R-Ledgeview, proposed a state ban on wind-turbine construction until studies have deemed the turbines don't harm humans and animals.

"It's not fair to put something so noisy and so large so close to people, unless you can be sure it's safe," Lasee said.

A bill he introduced Monday would declare a moratorium on construction of wind farms until the state Public Service Commission is in possession of a report that ensures turbines like those dotting the landscape in this southern Brown County town don't cause health problems. He wasn't sure if the bill would gain the support needed for passage in the chamber, but said proposing it is the right thing to do.

Wind farms have prompted passionate debate, but limited agreement, on their long-term impacts on humans. And lack of regulatory agreement in Wisconsin, particularly on the issue of how far a turbine must be from a property line, has tempered developers' enthusiasm about erecting wind farms. A corporation earlier this year scrapped plans for a 100-turbine development in the Morrison-Glenmore area.

Backers of wind energy say it is a clean, safer alternative to coal and nuclear energy, pointing to the fact that they don't consume fuel and don't produce ash or other waste. They also say wind-development could create thousands of jobs in technology and construction. Opponents say turbines can be noisy, unsightly, problematic for birds and bats and, most important, cause vertigo and sleep disorders. Concerns are growing about a condition labeled "wind-turbine syndrome," and a daylight phenomenon called "shadow flicker."

Regulators say the state's wind developments are safe, and that they fall within noise-emission limits.

The Cappelles believe their toddler son's inability to sleep, their 6-year-old's recurring ear infections and Sarah's never-ending colds are a product of the Shirley Wind development near their home.

They say that family members had never had health problems until the turbine near their house went into service last fall. That prompted consultation with a real estate agent — where they learned that no one likely would pay fair market value for a house with a view of a wind turbine.

"My mother grew up here. My grandmother was here for 50 years," Sarah Cappelle said. "This is where I always wanted to raise our kids. But now, I'm not sure if we should stay."

Lasee said he knows of at least three Glenmore-area families who have left their homes because of health problems that, while not formally diagnosed, didn't appear until nearby turbines went on-line.

—dschneid@greenbaypressgazette.com and follow him on Twitter @PGDougSchneider.

Substitute House Bill No. 6249

Public Act No. 11-245

AN ACT REQUIRING THE ADOPTION OF REGULATIONS FOR THE SITING OF WIND PROJECTS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. (NEW) (Effective July 1, 2011) (a) On or before July 1, 2012, the Connecticut Siting Council, in consultation with the Department of Public Utility Control and the Department of Environmental Protection, shall adopt regulations, in accordance with the provisions of chapter 54 of the general statutes, concerning the siting of wind turbines. Such regulations shall include, but not be limited to, (1) a consideration of (A) setbacks, including considerations of tower height and distance from neighboring properties; (B) flicker; (C) a requirement for the developer to decommission the facility at the end of its useful life; (D) different requirements for projects of different sizes; (E) ice throw; (F) blade shear; (G) noise; and (H) impact on natural resources; and (2) a requirement for a public hearing for wind turbine projects.

(b) The Connecticut Siting Council shall not act on any application or petition for siting of a wind turbine until after the adoption of regulations pursuant to subsection (a) of this section.

Approved July 13, 2011

Attachment D:
Oregon Setback Ruling

County commissioners approve new wind power rules

By SAMANTHA TIPLER East Oregonian | Posted: Tuesday, June 28, 2011 5:56 pm

After years of work and months of meetings, the Umatilla County commissioners approved changes to the county's rules deciding where and how wind farms can be built.

Commissioners voted just before 5 p.m., after yet another daylong meeting of debating and hearing testimony.

To include the last sticking points, commissioners broke their approval down into three separate votes.

They unanimously agreed on two out of three.

The first was an approval to set aside the Walla Walla River watershed as a protected area. All three commissioners approved it.

The second was to approve all the changed rules, except the setback for rural homes. All three commissioners also approved that.

Like in so many meetings before, the setback was the divisive issue.

Commissioners Dennis Doherty and Larry Givens approved of the two-mile distance between a rural home and a wind turbine.

They referenced the flood of opinions and information they had received during previous meetings, as well as wanting to be cautious in planning for the county's future, for their reasons.

Commissioner Bill Hansell did not agree.

He preferred more study into the setback issue, or, if not that, a one-mile distance.

Hansell worried the two-mile setback would close Umatilla County's doors to wind power development. He also worried it could be used as a weapon between quarreling landowners.

The two-mile setback passed. Givens and Doherty voted for it, Hansell voted against. County commissioners approve new wind power rules.

(Note: emphasis added.)

Attachment E:

**Letter from Neil Anderson, resident of Falmouth,
appearing in the Greenfield Recorder, Greenfield Massachusetts**

Neil Anderson letter

**Appearing in
Greenfield Recorder
01/28/2012**

‘Pound ... pound ... pound’

My experience with wind turbines

What makes a person who has been in the alternative energy business for over 30 years, shut down his home-building business (Energy Star certified), spend most of his time, as well as his savings, while racking up mileage traveling to different communities, feel compelled to “bad mouth” certain alternative energy projects?

The answer is an improperly sited wind turbine.

I live in Falmouth where there are three wind turbines. All are 1.65MW, 400 feet tall with 135-foot blades that weigh 7½ tons.

One of the turbines is 1,320 feet from my house.

The problem is not wind power. The problem has to do with size and distance. Any structure of this size, especially with massive moving parts, does not belong 1,320 feet from anyone’s house. Nevertheless, it is there. All that I can do is tell my experiences, while at the same time hope to educate the public.

Picture a 747 jumbo jet spinning around, 200 feet in the air. Add in high, gusty winds. The 747 wants to spin as fast as a pinwheel. Instead, by tilting and twisting the wings, the 747 is forced to spin slower. Similarly, this is how wind turbines capture the energy in the wind.

The forces involved in this transfer of energy (besides the electrical energy), are very dynamic. High, gusty winds versus 23-ton turbine blades!

Experiencing these tremendous forces is frightening. And, yes, it can get jet engine loud.

But the most distressing and harmful thing about the turbine is the constant and repetitive low frequency pressure pulses that are generated during the downswing motion of each blade (every 1½ seconds). This action forces out a pressure wave, which in turn creates a wake in the air, much like that in the water behind a boat with a motor. It is when in this wake that the effects from the turbine are the worst.

Try this: Hold your arm out the car window as you travel down the road. Every 1½ seconds, alternate your palm from vertical to horizontal. Feel, hear and sense what happens. Next close all the windows, except leave one in the back open 3 inches. See how long you can

stand that repetitive pulsing sensation.

Regarding the low frequency part, I'm sure all of us have experienced the very low bass tones blasting from an approaching car, most times unaware of where the car is. All you hear is the sound. It is piercing.

It seems to be coming from everywhere.

Hopefully the similarities mentioned above will give the reader a slight indication of what a turbine produces.

Over and over and over. Pound ... Pound ... Pound. It never stops. Windows nor walls, earplugs nor noise machines can stop it. This pulse has a unique ability to travel very far, as it bounces off of everything. It has recently been proven that the intensity of the pulse is higher inside a home.

Pound ... pound ... pound.

Soon you can't sleep. Frequent headaches appear. Heart palpitations. And what is that strange pressure in my head and ears? Heart rate and blood pressure increase (The pulse actually mimics the heart beat this is a terrible feeling!) You begin to have problems with balance, and irregularities with hearing.

Pound ... pound ... pound.

It never goes away. Not only is it unhealthy, it is like torture.

All these symptoms and others were experienced by my family, as well as numerous other families in the neighborhood. Some experienced these symptoms within days of the start of the turbines. Others more slowly. For me it took almost 2 months. But the results have been devastating — physically, mentally and financially.

After nearly 1 year of turbine abuse that resulted in a visit to the emergency room (insomnia, dehydration and chronic bronchitis), and in a desperate and passionate outburst before our Select Board, the turbine was ordered to be shut off when wind speeds reached 23 mph That was last March, 2011.

The turbine has been off now since early November, (due to a vote of support from town meeting members), while we wait on "mitigation options." Except for the ringing in my ears and sensitivity to loud or sudden noises, all the symptoms have gone away.

One certain thing that we have learned is that the only possible and successful mitigation option is separation. It is very simple. These industrial- size wind turbines do not belong anywhere near residential areas. There can be no compromise.

Please consider this first-hand personal experience when planning and regulating alternative energy projects for your community. 400-foot wind turbines in residential neighborhoods is

not the way to do it, especially when there are better options.
Energy conservation leads a long list of noninvasive methods that must be pursued in this fight for self-sustainability, and against the problems of global warming.

I will be in Shelburne Falls today at 7 p.m., (along with my neighbor Annie Hart) and Dr. Nina Pierpont (via Skype) to talk about the realities of living under wind turbines and to answer questions. This event is free.

Neil Anderson

For more information:
www.shelburnewind.info.
Neil Andersen is a Falmouth resident.