

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN

Application of Wisconsin Electric Power Company; Wisconsin)
Energy Corporation; and W.E. Power, LLC; for a Certificate of) Docket No. 05-CE-130
Public Convenience and Necessity for Construction of Three)
Large Electric Generation Facilities, the Elm Road Generating)
Station, and Associated High Voltage Transmission)
Interconnection Facilities to be Located in Milwaukee and)
Racine Counties)

DIRECT TESTIMONY OF DR. MARTY S. KANAREK
ON BEHALF OF APPLICANTS

23
24
25
26
27
28
29
30
31
32
33
34

Q. Please state your name, business address and title.

A. My name is Marty S. Kanarek. My business address is Department of Population Health Sciences, University of Wisconsin-Madison, 610 N. Walnut Street, Madison, 53726.

Q. Please describe your educational and professional background and qualifications.

A. I have a B.A. in Biology from Grinnell College, a MPH (Master of Public Health) in Environmental Health from the University of Minnesota, and a Ph.D. in Epidemiology from the University of California-Berkeley School of Public Health. I have been Assistant, Associate and now Professor of Environmental Epidemiology jointly in the Department of Population Health Sciences (formerly The Department of Preventive Medicine) in the Medical School and in the Gaylord Nelson Institute for Environmental Studies (where I have been Director of the Center for Human Systems and the Chair of the Undergraduate Certificate Program) for the past 25 years (since 1978). At the

1 University of Wisconsin-Madison I have taught courses in Introductory Epidemiology,
2 Advanced Epidemiology, Air Pollution and Human Health, and several other
3 environmental health courses including Introduction to Environmental Health and People,
4 Chemicals and Environment, and the Senior Certificate Seminar in Environmental
5 Studies. I have done research and published on many facets of environmental health and
6 environmental epidemiology. These have included published research on indoor air
7 pollutants, drinking water and cancer (asbestos, trihalomethanes, nitrates),
8 polychlorinated biphenyls (PCB's), mercury and other contaminants of Great Lakes and
9 small lake fish, environmental lead and others. I have 6 years experience with the Health
10 Effects Branch in the Office of Research of Development of the U.S. Environmental
11 Protection Agency (EPA) and have been a consultant to the National Institutes of Health
12 (NIH), National Cancer Institute (NCI), National Heart, Lung and Blood Institute
13 (NHLBI), and the International Agency on Research on Cancer (IARC)-World Health
14 Organization (WHO) among other national and international organizations. I am a
15 Fellow (highest rank) in the American College of Epidemiology, which is the
16 professional accrediting organization in epidemiology. My full curriculum vitae is
17 appended as Exhibit__(MSK-1).

18 **Q. What did you specifically review regarding the proposed Elm Road Generating**
19 **Station?**

20 A. I reviewed "Wisconsin Electric: An Updated Prevention of Significant Deterioration and
21 Non-Attainment New Source Review, and Maximum Achievable Control Technology
22 Permit Application; Construction and Operation of Elm Road Generating Station Town
23 of Caledonia, Wisconsin, June 2002."

1 In addition I had access to the “Additional Information regarding the air pollution control
2 permit applications for the Elm Road Generating Stations, Primary Site” that was
3 provided by We Energies to Mr. Raj Vakharia, DNR and the “Draft Environmental
4 Impact Statement: Elm Road Generating Station”, PSC, DNR, April 2003.

5 **Q. Are coal burning electric power plant emissions responsible for the current**
6 **epidemic of childhood asthma that is occurring in Milwaukee and many other**
7 **places in the U.S. and around the world?**

8 A. There appears to be an increase in childhood asthma within the past 25 years, while, at
9 the same time, emissions from coal plants have decreased in the U.S. The increase in
10 asthma rates is reflected in self-reported prevalence rates, increases in doctor office visits
11 (roughly doubled), increases in emergency room visits, increases in hospitalizations and
12 mortality (roughly doubled). There are many risk factors that are associated with the
13 increased rates. They include family history of asthma, history of lower respiratory
14 infections, obesity, poverty, low birth weight, maternal smoking and nutritional factors
15 among others.

16 There are many scientific hypotheses as to the underlying cause of the increase in
17 asthma disease and mortality during the last 25 years.

18 These include:

19 1) The increase is not real; it is an artifact of increased recognition by doctors and
20 shifting of diagnostic categories. This hypothesis has been extensively investigated
21 and rejected by most scientists. It appears that the increase is real and is not an
22 artifact.

- 1 2) The “hygiene hypothesis” which supposes that because of the increase in hygiene
2 during the past 25 years, and shifts in childhood patterns from past outdoor play to
3 indoor activities (television, video games and computers) and a culture of cleanliness,
4 children are not exposed to immunologic antigens at the proper time in their
5 development which leaves them more susceptible to asthma inducing antigenic
6 factors later in life.
- 7 3) There has been an increase in indoor air triggers that are made worse because of
8 increased time spent indoors and increased insulation and lack of proper ventilation.
9 These include:
- 10 a. Environmental Tobacco Smoke (ETS)
 - 11 b. Nitrogen oxides- primarily from gas cooking stoves
 - 12 c. Cockroach antigens
 - 13 d. Mouse antigens
 - 14 e. Cat and other animal dander
 - 15 f. Molds
 - 16 g. Dust mites
 - 17 h. Cleaning sprays, hair sprays, air fresheners
 - 18 i. Fireplaces, wood-burning stoves
- 19 4) There has been an increase in obesity and lack of physical exercise in childhood. 25
20 years ago and before, children used to spend considerable time playing outdoors. The
21 “modern” U.S. child does less physical activity and spends much time watching
22 television and playing video games.

1 5) There has been a concern about certain outdoor (ambient) air triggers for asthma
2 including:

- 3 a. ozone-resulting from auto emissions reacting in the atmosphere
- 4 b. particulate matter-from numerous sources including autos, industries and
5 electric power production
- 6 c. sulfur dioxide-from industries (paper mills, etc.) and power production

7 This hypothesis has been rejected by most scientists in the field, since the outdoor air
8 of the U.S. has become considerably cleaner due to many efforts by the EPA under
9 the U.S. Clean Air Act, the states, local government, industries and workplaces.

10 6) Psychosocial and socioeconomic factors including:

- 11 a. access to medical care
- 12 b. overcrowding
- 13 c. more time spent indoors
- 14 d. more carpeting and “soft” materials indoors

15 There are many research projects underway in the full gamut of different health scientific
16 disciplines trying to tease out the causative factors for the increase in childhood asthma.

17 Most experts emphasize the potential role of the indoor environment, particularly
18 moisture problems, molds, dust mites, cockroach and other potential indoor
19 environmental sensitizing agents to allergy and asthma, and the role of obesity, lack of
20 exercise and other lifestyle changes over the last 25 years. The Centers for Disease
21 Control (CDC), the National Academy of Science and EPA describe major environmental
22 "triggers" for asthma including pollen (tree, grass and weed), bacterial endotoxins,
23 cockroaches, mice, dust mites, furry pets, molds, and certain chemicals, including

1 formaldehyde, volatile organic chemicals from cleaning products, nitrogen oxides and
2 particulates from indoor combustion, and environmental tobacco smoke and fragrances.
3 The emphasis in the scientific literature in preventable “triggers” is on the indoor
4 environment. The bottom line relevant to the Elm Road application is that power plant
5 emissions do not appear to be important in the causality of asthma.

6 **Q. What is the relative contribution of outdoor (ambient) and indoor air pollution**
7 **sources in considering human exposure to toxic air pollutants?**

8 A. I have taught the course “Population Health Sciences/Environmental Studies 502: Air
9 Pollution and Human Health” every fall semester for the last 25 years. The course is an
10 advanced public health course which reviews the entire field of the health impacts of air
11 pollution. The largest change over time that I have seen in teaching this course, is the
12 increasing emphasis we must put on indoor air pollution exposure as compared to
13 outdoor pollution sources as those are potentially of significance because of toxic
14 exposures to the public. There are several lines of scientific research that lead us in this
15 direction. Starting around 1980, personal exposure monitors were developed for several
16 different air pollutants which allowed for continuous monitoring of individuals as they
17 went about their normal days. It was found that individual exposures to small
18 particulates and nitrogen oxides, which had been previously emphasized as outdoor air
19 pollutants of public health significance, were potentially much higher indoors (from
20 environmental tobacco smoke and cooking in the kitchen) than from any outdoor
21 exposures. As a result, Time Budget Diary studies were done in the U.S. and all over the
22 world to apportion where people breathe their air. The results of these studies showed
23 that on the average people breathe 80-90% of their air indoors. Around the same time

1 (early 1980's) there were many reports of the "Sick Building Syndrome", illnesses that
2 seemed to be attributable to indoor air exposures. As a result much research has been
3 done in the last 25 years that has shown that for many substances, the public's indoor air
4 exposures are much higher than any exposures they will ever be exposed to outdoors.
5 This can be said definitively for formaldehyde (particle board, rugs and furniture),
6 nitrogen dioxide (gas cooking stoves), carbon monoxide (incomplete combustion,
7 clogged combustion chimney or exhaust), environmental tobacco smoke (ETS- from
8 cigarettes) and radon (seeping into the basement from the rocks underneath home
9 basements) from among the list of most important air pollutants from a public health
10 point of view. The U.S.E.P.A.'s TEAM (Total Exposure Assessment Monitoring) Study
11 of indoor and outdoor air monitoring in more than 1,100 homes spread around the U.S.
12 showed that levels of known or suspected carcinogens, such as chloroform, benzene and
13 others were much higher on the average, indoors, than outdoors. The sources of these
14 carcinogens indoors were apparently from cleaning materials in the kitchen and bathroom
15 and as a byproduct of drinking water chlorination for disinfection.

16 Much of the original impetus for the scientific study of the public health impacts
17 of air pollution was from the extremely dirty outdoor air of the 1940's and 1950's in the
18 U.S. and elsewhere. With the coming of the U.S. Clean Air Act and the formation of the
19 U.S.E.P.A. in 1970, the outdoor (ambient) air of the U.S. has been made much cleaner.
20 Ambitious National Ambient Air Quality Standards for particulates, nitrogen oxides,
21 carbon monoxide, ozone, sulfur oxides and lead have led to implementation plans that
22 include air pollution control devices and have resulted in much cleaner outdoor air in the
23 U.S. At the same time, there has been a greater emphasis put on building new

1 construction tightly for energy conservation reasons. This has resulted in many
2 residences, public and commercial buildings having the potential for buildups of indoor
3 air contaminants, including molds, organic chemicals, small particulates from cigarette
4 smoke, nitrogen dioxides from gas cooking stoves, formaldehyde from particleboard,
5 dust mites, and organic chemicals from cleaning materials in the kitchen and the
6 bathroom among others. Individual continuous monitoring studies have shown that the
7 highest exposure to small particulates of individuals is often in their own kitchen or being
8 in the same indoor space as a cigarette smoker.

9 Thus, the most likely exposure to public health significant levels of air pollution
10 to the citizens of Milwaukee and elsewhere in the U.S. is inside their own homes and
11 businesses, and not outside.

12 **Q. There have been a number of epidemiologic studies implicating small particulates in**
13 **the air as causes of increases in mortality. Will this facility contribute to rates of**
14 **death in S.E. Wisconsin due to small particulate emissions from coal burning?**

15 A. The general answer is no. However, the specific answer is much longer. In the first
16 place, it must be stated firmly that the small variations in overall mortality that are seen in
17 time trend analyses of ambient air pollutants are an extremely minor fraction of death
18 rates as compared to major causes of death, like cigarette smoking, obesity, lack of
19 exercise and bad diets.

20 In the field of air pollution epidemiology, there has been a definite trend to sort
21 out the different fractions of particulates in the air. More and more recent studies are
22 implicating the smaller particles as those that can get deeper in to the lung and as the
23 fraction that is associated with some of the small statistical variations in respiratory and

1 cardiovascular disease and death rates that epidemiologists study over time and place.
2 That is why a number of years ago, the U.S.E.P.A. changed the National Ambient Air
3 Quality Standard from Particulates to PM-10 (Particulates smaller than 10 microns in
4 diameter). Even more recently, studies have pointed to even a smaller sized fraction as
5 the one to focus on; thus the Standard was changed to the PM-2.5 (Particles less than 2.5
6 microns in diameter). Throughout the small particle epidemiology research studies, even
7 though it was consistently clear that the smaller particles were the most important
8 particles from an air pollution epidemiology point of view, it was not clear what the
9 source of the small versus the larger particulates was. Most of the latest research is
10 pointing toward an “automotive factor” as the probable most important source of small
11 particulates in most areas of the U.S. It has long been known that diesel engines are a
12 very important source of small particulates. There are many other important sources of
13 small particulates into the environment, many natural (dust, trees) and many people-made
14 (power plants, municipal incineration, cigarette smoking). The type of electrical
15 generating facility for Oak Creek would not contribute significantly to the load of small
16 particulate exposure to the general population of S.E. Wisconsin.

17 Most of heart disease and stroke is associated with cigarette smoking, lack of
18 exercise, obesity, high cholesterol, stress, occupation, low socio-economic status, diet,
19 access to health care and other lifestyle and environmental factors. Most cancers (non-
20 skin) are associated with tobacco use, alcohol use, diet, physical inactivity, occupational
21 exposures, low socio-economic factors, and other lifestyle factors. For example, cigarette
22 smoking leads to many thousands of deaths each year in S.E. Wisconsin. For outdoor air
23 pollution involvement in the causal chain of disease and death, we are scientifically

1 debating rates of 1/100,000, where from cigarettes, we know there will be serious
2 diseases in 1/10 smokers at the very least. In the field of epidemiology, it is important to
3 keep a perspective of the overall public health impact of potential causes of disease and
4 death. Thus, even though environmental epidemiologists can sometimes detect very
5 small variations with ambient air pollution, the overwhelming causes of the variation in
6 lung and heart disease rates are due to cigarette smoking, obesity and other causes totally
7 unrelated to air pollution.

8 **Q. Small particulates in the air have been associated with heart attack and overall**
9 **cardiovascular mortality rates in some air pollution epidemiology studies. Will the**
10 **Oak Creek facility contribute to an increase in heart disease and heart attacks?**

11 A. Several aspects of cardiovascular disease epidemiology must be kept in mind. Heart
12 disease is still the leading cause of mortality in the U.S., followed by cancer and stroke.
13 Coronary heart disease and total cerebrovascular disease mortality (including stroke) has
14 been on the decline since the 1950's in the U.S. It is not definitively clear what is
15 responsible for this good news, but generally the decline is attributed to improved diet
16 (less fats, lower cholesterol, more vegetable, fruit and whole grain consumption), decline
17 in cigarette smoking rates (from upwards to 50% of the adult population in parts of the
18 U.S. to 23% of women and 27% of the men in the U.S.) more exercise, improvements in
19 health delivery (especially in emergency medicine and coronary artery treatment),
20 improvements in rehabilitative care after heart attacks (angioplasty, stenting, blood
21 thinners, lipid lowering medicines), decline in excess alcohol consumption, improved
22 medical control of high blood pressure and diabetes, improved medical screening and
23 early detection and other factors. Heart disease epidemiologists do not consider ambient

1 (outdoor) air pollution as an important causative factor in heart disease or stroke as
2 compared to the above listed factors.

3 The studies showing short-term time trend and other statistical associations
4 between sudden death from heart disease are dealing with very few number of cases as
5 compared to the large number of cases that are due to cigarette smoking, obesity, physical
6 inactivity and other factors. Environmental Tobacco Smoke (ETS) is a small factor as
7 compared to individual cigarette smoking, but even that overwhelms ambient air
8 pollution as an attributable risk factor for heart disease.

9 **Q. Will the Oak Creek facility lead to an increase in lung cancer death rates?**

10 A. That is not likely. About 90% of lung cancer deaths in the U.S. are attributable to
11 cigarette smoking. Of the 10% of lung cancers that occur in non-smokers, they are
12 distributed as to causative factors mostly between radon, environmental tobacco smoke
13 and occupational exposures to asbestos, arsenic and other chemicals. There is an urban-
14 rural gradient seen for lung cancer mortality in the U.S. and elsewhere around the world.
15 It is not clear if this gradient is due to urbanization factors associated with air pollution,
16 or the stress of urban living or other lifestyle or selection factors that differentiate country
17 versus city dwellers. Even though the urban-rural gradient is consistently found, there is
18 no definitive epidemiology evidence as to the underlying etiology of this gradient.

19 **Q. Will mercury emissions from the Elm Road facility be toxic to the public of**
20 **Wisconsin?**

21 A. As environmental health scientists, we have been concerned for many years about the
22 potential public health impact of mercury releases to the environment. In Wisconsin, we
23 have been concerned especially about methyl mercury contamination of fish in many

1 small lakes. The mercury has been deposited in the lakes from geologic times and from
2 fallout due to the worldwide circulation of mercury in the atmosphere from numerous
3 industrial sources and coal burning for power production. Methyl mercury is a
4 neurotoxin (as is lead) and we do want to minimize exposure. I was the Principal
5 Investigator of a research project to measure the blood mercury levels in the various
6 Chippewa bands, because of their concern that they might have elevated levels due to
7 spearfishing and consumption of walleye from lakes on tribal lands. We found
8 measurable, but very low levels in the blood of the sampled 350 Chippewa. It was
9 apparent that tribal leaders and the Great Lakes Fish and Wildlife Commission (the
10 Chippewa environmental governmental body) had done a careful job in educating
11 spearfishing party leaders as to the lakes with fish with higher levels of mercury
12 contamination. Since then, there have been other research projects to measure mercury in
13 Wisconsin residents. We are encouraged that levels are generally very low and most
14 exposure appears to come from grocery store canned tuna fish.

15 The burning of coal for electric power production does contribute to the general
16 worldwide circulation of mercury in the air. It is not a local problem however.
17 Emissions go high into the atmosphere and circulate around the world. Ultimately
18 deposition can occur in lakes and bodies of water all over the world.

19 This does not absolve industries and power companies from trying to keep
20 emissions as low as possible. The U.S. Environmental Protection Agency lowered the
21 recommended level of safe intake of mercury from consumption of fish in 1997 because
22 of public health concerns. The epidemiology studies on highly exposed populations like
23 the Seychelle and Faroe Islanders are mixed. The EPA recommended safe intake level

1 of 0.1 microgram methyl mercury/kg body weight/day is often exceeded by consumption
2 of one 7 oz. can of tuna fish. The public has been concerned over mercury amalgams in
3 dental fillings and the safety of mercury preservatives used in many vaccine preparations
4 routinely given to infants. There is no hard scientific evidence that those exposures are
5 harmful, but many people in the public are concerned about possible connections to
6 autism and other possible adverse effects such as emotional conditions. Scientists
7 concerned over mercury in the environment give no credence to these theories.

8 In December 2000, EPA stated an intention to further regulate emissions of
9 mercury from coal and oil-fired electric utility steam generation power plants. EPA
10 intends to propose regulations by the end of 2003 and issue final regulations by the end of
11 2004. The EPA motivation is again not because of a concern over local air levels of
12 mercury, but concern over the worldwide circulation of mercury that ultimately can end
13 up with elevated levels of methyl mercury in fish. In general, like for lead, another
14 neurotoxin, over time the scientific community has realized that we should lower our
15 public health levels of concern especially for children and the developing fetus. This is a
16 national and worldwide issue, but not a local problem, and the Elm Road facility will
17 keep mercury emissions to the ambient air as low as possible.

18 **Q. Do you have an opinion, to a reasonable degree of scientific certainty, based on your**
19 **knowledge of the plan for the Elm Road facility and your knowledge and experience**
20 **of the science of environmental epidemiology, whether the projected emissions from**
21 **the proposed Elm Road facility will cause adverse human health impacts?**

22 A. Early in my career at the U.W.-Madison, as a new Assistant Professor, I was part of a
23 large team that did a series of environmental studies to assess the potential impacts of the

1 then, new Portage Columbia coal burning power plant. A large interdisciplinary team of
2 scientists was assembled and studies were done that ranged from respiratory function
3 studies of Portage population members to studies of the effects on potentially sensitive
4 vegetation around the plant. We could not find any effects from such a modern well-
5 designed and well-run plant that burned “clean” (low sulfur) coal. Remember Portage,
6 Wisconsin was a “clean” city in the Harvard Six Cities Study of Air Pollution and Human
7 Health, with its large coal burning power plant. The new Elm Road facility is going to be
8 even “cleaner,” as it includes many improvements from 20 years of engineering
9 improvements and study of how to build a “clean” coal burning electric generating power
10 plant. The important fact to remember here is the level of strict controls that are to be in
11 place on the Oak Creek facility will lead to only very small increases in potentially toxic
12 air pollutants in the ambient air. The most basic principle of toxicology is: "All substances
13 are poisons; there is none which is not a poison. The right dose differentiates a poison and a
14 remedy." -- Paracelsus (1493-1541). Everything, including table salt is potentially toxic, if
15 a high enough dose gets into the body. Conversely, substances that can be toxic at certain
16 doses, can be of no problem at low doses. Since the exposure doses in the ambient air
17 from the Elm Road Generating Station will be so low, the risk, if any, to the public health
18 from a modern state-of-the-art coal burning power plant, such as the one planned for Oak
19 Creek, will be negligible.

20 **Q. Does this conclude your pre-filed direct testimony?**

21 A. Yes, it does.

22

23