Public Comments on the Proposed Wolverine Power Plant
State Registration No. N7867, PTI Application No 317-07

These public comments submitted on behalf of the residents of Michigan and address public health concerns and the degradation of essential food and environmental resources.

We also make reference to numerous comments that have been submitted on the proposed Wolverine facility and similar proposed facilities in Michigan by individuals and groups, including the Environmental Law and Policy Center, the Sierra Club, the Chippewa Ottawa Resource Authority, and numerous other tribal, public health, environmental, and community groups. To avoid redundancy, our comments are not detailed on important issues that are anticipated to be covered by these groups, such increased mercury contamination of fish and the subsequent impacts on communities with high fish consumption, the release of greenhouse gases, and other critical concerns.

Historically, coal fired power plants in the Midwest have released pollutants that caused a wide range of health and environmental problems that reached as far as the Atlantic Ocean and entrained toxic air pollutants in air masses that circle the globe. While the proposed Wolverine plant is engineered to reduce amounts of some pollutants, permitted emissions remain of concern to all people who view the protection of public health as a societal and global responsibility.

The dialogues across state and national borders regarding the protection of people and the land have enabled us to better understand that few boundaries exist in the natural world. It is in that spirit that we submit these comments on behalf of the many people we know in Michigan, and those we have not yet met in that beautiful state. We hope that the bounty of the wind that is so prevalent in Michigan and other clean energy sources will be used, so that further contamination of the land and its people can be avoided.

Respectfully submitted on January 6, 2009

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Background

The proposed Wolverine fossil fuel power plant is located near the shore of Lake Huron in a region shared by Michigan residents and indigenous communities where waterbodies and the land are sources of food for local and national consumption. There are nationally recognized parks and lakes in the vicinity, commercial fishing activities, and a portion of Lake Huron falls under an 1836 treaty with the local indigenous population who rely on Lake Huron for fish in their traditional diet. The proposed plant is near a number of schools and medical care facilities. An electricity-generating wind farm is planned along Lake Huron's shore, near the proposed Wolverine plant. [1]

Comments

I. The Wolverine plant would be a source of pollutants known by the federal government and the State of Michigan to cause cancer, birth defects, and other serious health problems at low levels of exposure.

According to documents on the Michigan Department of Conservation's (DEQ) website, the proposed Wolverine power plant in Rogers City Michigan is expected to release a wide range of highly toxic pollutants as emissions from the boilers and other sources at the facilities. Many of the toxic chemicals in the permitted emissions are persistent and able to bioaccumulate in plants, animals, and people. They include arsenic, mercury, chromium, lead, benzo(a) pyrene, 1,3 butadiene, beryllium, cadmium, dioxin, volatile organic compounds (VOCs), particulate matter (e.g., PM 2.5) and other toxic chemicals and chemical aggregates. These pollutants are listed on the DEQ Wolverine permit website and the DEQ NSR public notice website in documents that DEQ has accepted and in some cases written.[2]

The emissions contain many pollutants recognized by the medical and public health community as being capable of causing cancer and birth defects, and of damaging most other parts of the human body. Many of the hazardous pollutants that would be released from the Wolverine plant according to the DEQ website are highly regulated by the federal government and international agreements due to their high potential for human health damage (www.epa.gov; www.unep.org; www.who.int/en/; www.cdc.gov). Detailed information regarding the individual chemicals and chemical groups, with extensive evidence of harm from toxicological and epidemiological studies is provided by the US Centers for Disease Control in their Toxicological Profiles for each

[1] These comments rely on information provided on the Michigan DEQ permit website for the Wolverine facility, at www.deq.state.mi.us/aps/downloads/permits/CFPP/2007/317-07/317-07.htm and the DEQ NSR public notice website at http://www.deq.state.mi.us/aps/downloads/permits/PubNotice/317-07/317-07.pdf . If there are errors in the entries within the documents on the DEQ websites, they may be unknowingly perpetuated in these comments. If there are typos or other errors in data extraction or presentation in these comments, they are the result of mistakes in processing and will be corrected upon notification.

[2] This information was obtained from two DEQ websites: www.deq.state.mi.us/aps/downloads/permits/CFPP/2007/317-07/317-07.htm, subsequently referred to as the DEQ permit website and http://www.deq.state.mi.us/aps/downloads/permits/PubNotice/317-07/317-07.pdf, which is the NSR Public notice website.

chemical and chemical group, available at www.cdc.gov. Some of these toxic pollutants, including arsenic, already occur at hazardously high levels in Michigan, posing public health risks (http://mi.water.usgs.gov/splan2/sp07800/dwiarsenic.php).

The plant is permitted by DEQ to release a number of federally-recognized high priority chemical air pollutants, including nitrogen oxides (NOx) and sulfur dioxides (SO2). The latter, along with sulfuric acid can form SOx, acid aerosols, and similar hazardous compounds. Federal programs to control release of these National Ambient Air Quality Criteria Pollutants (NAAQS pollutants) are discussed at http://www.epa.gov/ttn/naaqs/, with the extensive scientific and medical evidence of the health damage they cause. These pollutants, along with another hazardous air pollutant, "particulate matter" (PM), are known to cause a range of health problems, including asthma, stroke, cardiovascular disease, COPD, resulting in increases in emergency room visits, hospitalizations, and deaths.

The impacts of these air pollutants are especially serious in young children and the elderly. To look at one example, asthma exacerbations and associated loss of work, school absences, the need for rescue medications, emergency room visits, hospitalizations, and deaths increase when levels of PM 2.5 increase (http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html). In spite of the unacceptably high rates of asthma among school children in Michigan, especially in Detroit (http://www.michigan.gov/documents/hospitalizationposter_6793_7.pdfcite ppt), the DEQ is permitting a power generation facility to release particulate matter, a pollutant well known to increase asthma attacks and emergency room visits. The particulate matter will move across the state, depending on conditions, and will potentially impact a very wide range of children.

In the most recent clinical recommendations by the National Heart Lung and Blood Institute, a part of the National Institutes of Health (NIH), the hazards of particulates for patients with asthma are addressed multiple times, and an extensive list of studies provides evidence of the need for public protection in order to preserve public health (NIH guidance document at http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf). The permitting of an additional source of particulate matter and other pollutants that are known to create more health problems for asthmatics and their families does not reflect good public health practice or adequately protective health policies.

The report prepared by ENSR for the Wolverine Power Cooperative (prospective owners of the power plant) in June of 2008 (listed on the DEQ permit website) lists a worst case daily emission rate per boiler of over 600 pounds per day of NOx, SOx, and particulate matter. With two boilers operating that is more than 1,200 pounds PER DAY. This is substantial when you consider that the federal standards for these pollutants are written in terms of micrograms - a millionths of a gram - in order to protect public health (see: www.epa.gov/ttn/naaqs/).

The ENSR estimate does not include emissions from many other on site sources. In addition to emissions from the main boilers, which have been the focus of concern due to large quantities of pollutant releases, there are a large number of other pollution sources that will be releasing chemicals into the air and ultimately on to water and land. These include black start and emergency generators, cooling towers, fire pumps, and other equipment listed in documents on

the Michigan DEQ website. The emissions from these are not trivial because they will release lead, particulate matter NOx, SO2, and other chemicals. For example, in the listed maximum annual emissions, 43,176 pounds of NOx may be released by the black start generator alone, with a wide range between average and maximum reported.

The emissions from hauling equipment on paved roads are also substantial. While a DEQ website document lists controlled emissions at over 1,400 pounds per year on paved roads, the uncontrolled emissions are not explicitly listed. However, they can be calculated from other entries in the table. With 45,456 VMT annually (e.g., VMT referring to miles traveled) and .20 pounds of ash per VMT, that is over 9000 pounds of ash alone. There are many other materials released in addition to ash.

The release of numerous carcinogens permitted by the DEQ is also of high concern. Michigan has a serious cancer problem, with rates that are higher than the national average according to the National Cancer Institute (www.nci.gov). Yet the Michigan DEQ is permitting the release of a wide range of known carcinogens from the Wolverine power plant. Scientists agree on the carcinogenic nature of many of the pollutants, and many have carcinogenic effects that serve as the basis for their control across the United States. For example, arsenic is a carcinogen that is very highly regulated by the federal government, and allowed to be present at only 10 parts per billion in drinking water. Yet it is permitted to be released from the proposed Wolverine facility.

In DEQ's analysis of risk they estimate 5 cancer cases will be caused by plant operations. This estimate does not take into account the full impact on a wide range of areas that will be subjected to the power plants emissions, as described below.

Summary: Emissions permitted by DEQ from the proposed plant include many persistent toxic pollutants that will increase contamination of the air, water, soil, and food supply. Given access to clean power sources (e.g., electricity-generating wind farms in the same area), permitting additional releases of toxic chemicals is contrary to good public health practice and will increase health burdens and accompanying social and economic burdens. DEQ's actions are oppositional to federal and international efforts to provide cleaner and safer communities through movement away from fossil fuels and reliance on cleaner power sources.

2. The potential increase in carcinogenic, cardiovascular, neurological, and other diseases, as well as birth defects and harm to future generations that may occur across the state of Michigan and in other areas where the emissions from the plant will travel have not been described or considered by DEQ.

It is necessary to view the contamination that can result from the proposed Wolverine plant and the related health impacts fully, taking into consideration contamination of air, land, and water in which these pollutants will be found in future years. That has not been done by the DEQ and a full risk assessment of the impacts of emissions permitted by DEQ is not reflected in any of the documents on the DEQ websites. Both the initial and addendum (dated 9/17/08) DEQ-Sills risk assessments were reviewed.

It is clear that chemicals released from plant stacks do not stay in a confined area, but rather become part of the ambient air and water that moves across hundreds of miles and thousands of communities. DEQ chose to consider only a very small area and thereby estimated a small (but still unacceptable) number of cancer cases. But lead, arsenic, mercury and other metals that would come out of the Wolverine plant stacks do not disappear at an imaginary nearby border. They remain in the environment and can cause disease, birth defects, and other severe health problems when encountered. Many are persistent, and are capable of incorporating themselves into a wide range of natural materials that we eat, use, or come into contact with.

When DEQ chose to rely on locally modeled impacts, they avoided counting the cancer cases and other adverse effects that occur when pollutants are transported beyond the immediate area. They disregarded potential health effects on populations in other parts of the state, the country, and across the border in Canada. Yet the short and long-range transport of emissions from power plants is an international public health problem that has been well recognized by both the US government and the United Nations. There has been extensive work done both in the US and elsewhere to document this dynamic. Many studies have focused specifically on the movement of power plant emissions, including a recent study of plant emissions transported in air from China to the US across the Pacific Ocean (e.g., http://avdc.gsfc.nasa.gov/PDF2/AuraST2008/04TuesdayAfternoon/Krotkov_SO2.ppt#5).

This is a well-recognized problem, addressed in multiple conferences, meetings, and documents. But in spite of this, Michigan is allowing the proposed Wolverine plant to in effect "dump" most of it's pollutants over it's borders, without attempting to quantify the impacts of the proposed plant. This shows extreme disregard for the people and land that are in harm's way. Given the prevailing winds and location of the proposed plant, most emissions will probably quickly move beyond Michigan's borders. But ignoring the existence of damaging pollution that travels beyond the Michigan borders does an injustice to the rest of the world, and raises serious questions about why the Michigan DEQ determined a comprehensive evaluation was not necessary.

It is critical that Michigan acknowledge and fully evaluate contamination and health risks, as well as respecting an increasing need for global responsibility regarding pollution. The alternative to local risk assessment and resulting underestimates is clear. In the case of persistent chemicals that are carcinogens (e.g., the metals lead, mercury, arsenic, cadmium, chromium), the full emission quantities could be used to obtain an upper bound (screening) estimate of potential contamination and health impacts now and in the future. Such an approach would reflect a protective and responsible policy regarding environmental pollution. It would capture the reality that metals released from the plant would contaminate land, water, food, and the public in locations we cannot fully predict, and implicitly acknowledge that human interaction with and exposure to the toxic emissions are highly likely at some point in the future. Clearly this approach would result in a substantially higher estimates of contamination and health risks.

To illustrate the basic concept of this approach, we used the emissions listed in the document titled "Wolverine Power Supply Cooperative, Inc. DRAFT September 9, 2008 Permit No. 317-07". It is available to the public on the NSR Public Notice DEQ website that covers the proposed Wolverine plant. We confirmed today, January 6th, 2009, that the values provided in

that report were what we should rely upon in spite of the "draft" designation through contacting the listed DEQ contact, Melissa Byrnes. She confirmed that was the correct source, but indicated that the PM 2.5 numbers may change.

The document raises questions about assertions of low cancer impacts. It describes conditions of operation and emissions limits, including hose of the two main boilers. The boilers have a maximum heat input of 3,030 million Btu per hour. On page 24 of the document, emissions limits are listed for major categories of pollutants, expressed in relation to the input MMBtu". We calculated the daily maximum emissions that could occur, based on the emissions data on page 24 and on an assumption of 3,000 MMBtu/hour. This is slightly less than the maximum, and yields a daily total MMBtu of 144,000 for both boilers.

The resulting emissions in pounds per day are as follows:[3]

Pollutant	Pounds released per day at an input of 3000 MMBtu/hour
PM 10	3,744
NOx	10,080
CO	21,600 (assuming optimal emission rate)
SO2	8,640 (assuming optimal emission rate)
VOCs	432
lead	1.872
Sulfuric acid	432
Hydrogen chloride	158.4
Hydrogen fluoride	43.2
Arsenic	3.6

Mercury emissions were expressed in terms of gross output and so a daily release was not calculated. Emissions above do not include releases from other facility sources including cooling towers, generators, transport vehicles and other sources. These generate substantial emissions, as noted above.

The amount of toxic pollution that is permitted, as listed above, is substantial. Many are very toxic even at very low exposure levels. To illustrate, arsenic can be considered based on its cancer risk. USEPA's "cancer potency value" is 1.5 cases per milligram of daily arsenic exposure/kg body weight, representing a simple probability equation describing cancer resulting from exposure. If we assume that all arsenic released from the proposed plant will eventually result in human exposure (e.g., ingestion via water, crops, fish) and that there is no wasted dose, this worst case scenario can be used to consider the potential harm that would results over a broad geographic area. The release of over 1,300 pounds of arsenic a years could results in thousands of cancer cases, occurring over a period extending long into the future (assuming plant operation continues for decades).

While this is <u>not</u> an actual projection of risk, due to the inherent assumptions, it does give some sense of the cancer potency of arsenic. It also illustrates the extreme care which must be taken when considering the releases of this and other toxic and persistent heavy metals into the

[3] The values listed in the document are stated to exclude start up and shut down.

environment. Most importantly, the arsenic example illustrates the essential requirement that the distribution and impact of emissions from the plant beyond the immediate area of Rogers City be considered. The DEQ addendum risk assessment (9/17/08) lists a cancer probability of only 2.2 in one million for arsenic emissions (Table 3). They rely on the DEC/AQD's modeled impacts.

The difference in projections of harm when you consider widespread distribution of arsenic that will unquestionably occur over many years, as we described above illustrates the very wide variations that can be obtained in risk projections, depending on assumptions. Failing to consider a wider range of distribution and a close approximation to potential cancer risks that would result from such considerations results in a severely underestimated assessment of the potential health risks for arsenic and many other permitted emissions.

Summary: The state should undertake a full analysis of the harm that may result from emissions from the proposed Wolverine plant. They should rely on all available current science and consider specific issues related to state and international boundaries and regional efforts to control hazardous pollutants..

3. Impacts on the Great Lakes and other waterbodies as well as regional lands are not considered, leading to an underestimate of impacts.

As indicated above, transport of pollutants, especially persistent and bioaccumulating pollutants, is essential to evaluating the potential health and environmental impacts of any pollution source, but is especially important when a large facility is proposed. Lake Huron is the 2nd largest of the Great Lakes and the 3rd largest fresh water lake in the world. With a surface area of over 23,000 square miles and the longest shoreline of the Great Lakes, it is a critical resource to the US and Canada. In the region of the proposed plant, Lake Huron is also used as a source of many other types of fish, including Salmon, Steelhead, Muskie, Rainbow Trout, Lake Trout, and Smallmouth Bass are also caught in Lake Huron. Saginaw Bay, Michigan (about 2 hours from Rogers City) and Great Lake Huron are major vacation areas, often focused on the highly regarded walleye.

The Great Lakes, inextricably linked to Lake Huron, are also drinking water sources for millions of people, and a means of transport and recreation for many. Lake Huron and the other Great Lakes were formerly treated as large waste ponds by government and industry who disposed of human and animal waste, industrial waste, and other materials in the lakes. In a study released in 2008, Lake Huron was found, along with the other Great Lakes, to have areas where pollution jeopardized public health, according to a study by the US Centers for Disease Control (CDC) (http://www.atsdr.cdc.gov/grtlakes/2008.html). In recent decades the importance of the lakes has been recognized and these practices have been curtailed, but the CDC report indicates that there is still substantial work to be done and that protections are far from adequate. Substantial damage remains, and there are ongoing state, federal, and international efforts ongoing to identify, and prevent further degradation of the waters, their inhabitants, and related waterways. The Michigan DEQ chose not to comprehensively evaluate the impact of the proposed Wolverine plant on Lake Huron or on many other waterbodies in the region. This is a serious limitation in their risk assessment and in their overall approach to the proposed power plant.

Their actions do not reflect the interests of the state in these resources. Michigan is surrounded on three sides by the Great Lakes and there is clearly an awareness on the part of most residents that the lakes are tremendous resources that serve a great many people. The recreational, economic, food, drinking water, and other benefits are key advantages that Michigan residents rely on. To locate a pollution generating facility along the shore of Lake Huron and to ignore the need to model and fully characterize the impacts it may cause simply does not make sense.

The tribal rights to the portion of Lake Huron that guarantee access to a clean and undegraded lake, are also of great concern and merit full consideration by the State of Michigan. They are being addressed by other commenters. They are referred to here because the lack of attention to these rights by the DEQ is part of a pattern of omitting impacts and affected people when permitting the Wolverine plant. The impact of their actions is described more fully below.

The potential of the proposed plant to cause greater contamination of the lands and water in other parts of Michigan and the region is of special concern regarding arsenic emissions. Arsenic is a carcinogen that can also cause neurotoxicity, cardiovascular health problems, birth defects, and many other serous health problems (see www.cdc.gov "Toxicological Profile for Arsenic"). Any increase in arsenic contamination may exacerbate existing well water contamination problems that exist due to arsenic deposits in parts of Michigan (see USGS on this issue at: http://mi.water.usgs.gov/splan2/sp07800/dwiarsenic.php).

As previously noted, arsenic is so toxic that it is more highly regulated than most other drinking water contaminants, allowable at only 10 parts per billion. If arsenic is released into the air by the Wolverine, it can be carried to <u>any</u> part of the state, depending on wind direction and other factors. It could deposit on water or land, be incorporated into food, or be inhaled by anyone in the vicinity that the arsenic reaches, including those areas that already have dangerously high levels of arsenic in their water and soil. The added contamination would impose an additional burden that is both unhealthy and unnecessary, given the availability of non-polluting clean power-generating options in the area.

Summary: Emissions from the proposed Wolverine plant will result in additional levels of toxic chemicals reaching Lake Huron and other water bodies. These are critical resources for Michigan, the US, and Canada that must be protected from further degradation. Plant emissions of arsenic will deposit across the state, including areas where elevated levels already create public health problems.

4. A full exposure assessment, taking into consideration susceptible subpopulations and important natural resources, has not been adequately carried out.

It is well established in risk assessment that consideration of the range of water, food, and air that will likely be contaminated should be considered (see USEPA guidance on this at www.epa.gov). That includes contamination of the soil and plants that grow in them, contamination of waterways where the cancer causing chemicals will reach, and the presence of the carcinogens in the air over wide ranging areas. Failure to consider the multiple exposure

pathways over the length of time that many of the toxic pollutants will persist leads to substantial underestimation of the harm that would be caused.

An example of this can be found with mercury, which is well known to bioaccumulate in fish tissue and other food sources. The numerous pathways by which mercury exposure may occur, especially among populations that have high fish intakes, must be explicitly considered using relevant information. The measured levels of mercury in fish in the area of the plant, as well as in other areas where transport will carry mercury, should be considered. Michigan has submitted data to the federal government (www.epa.gov) on mercury in fish in the region of the state where the proposed plant would be located, and so it is clear that local data exist. These data should be used, along with more recent data, if available (see www.epa.gov for USEPA's national fish tissue database).

The consumption rates of fish by groups with higher-than-average consumption, as well as their consumption of other flora and fauna that would likely be contaminated with mercury (in this example) in the area are all relevant. The need to consider all sources is clearly described in the USEPA's federal guidance on establishing risk management and conducting risk assessment for contaminants in fish (see www.epa.gov).

There are relevant studies of tribal fish consumption patterns for the upper Midwest that indicate a higher fish consumption rate than is used by the DEQ. Taking all exposure sources into account would yield a substantially different estimate of the potential for harm. This is addressed by tribal groups and other organizations that are commenting on the proposed Wolverine plant and those comments are directly relevant to public health considerations. This is an important environmental justice issue and according to federal guidelines it should be considered in environmental activities that fall under federal (USEPA) review and jurisdiction.

There are other susceptible subgroups in the vicinity of the power plant, including children who live in Rogers City and those who attend the numerous schools located relatively close to the proposed power plant. Table 1 lists schools with their addresses and estimated distance to the plant (due to the size of the facility, this is a rough approximation). As noted above, children with asthma and other respiratory disorders are particularly susceptible to particulate matter, SOx, and NOx.

Table 1. Schools and Health Care Facilities in Rogers City & Their Distance to Proposed Wolverine Power Plant

School Type	Name	Address in Rogers City	Estimated Distance to Plant
Elementary	Rogers City Elementary School	532 W Erie St	1.5 miles
High School	Rogers City High School	1033 W Huron Ave	1.8 miles
Montessori	Rogers City Montessori	719 N Bradley Hwy	2.5 miles
Catholic	St. Ignatius Catholic School	545 S 3rd St	.6 miles
Lutheran	St. Michael Lutheran	5932 County Rd 451	6.5 miles
Lutheran	St. John's Lutheran School	145 N Fifth St	1.3 miles
Catholic	St. Ignatius Parish School	585 S 3rd St	.6 miles
Pre-School	Tots Aboard Co-Op Preschool	251 W Huron Ave	1.4 miles
Head Start	Head Start	251 W Huron Ave	1.4 miles
Athletic Field	Rogers City High School	681 S Third St	.5 miles
Health Care			
Nursing Home	Tendercare Health Center	555 N Bradley Hwy	2.2 miles
Hospital	Alpena General Hospital Rehab	201 S Bradley Hwy # 6	2.0 miles
Hospital	Northern Michigan Hospital	573 N Bradley Hwy	2.2 miles
Hospital	Rogers City Rehab Hospital	555 N Bradley Hwy # C	2.2 miles

There are health care facilities and a nursing home approximately 2 miles from the proposed plant. These house more susceptible populations with various health conditions that can be aggravated by the pollutants permitted by the DEQ. For example, many elderly people have COPD, emphysema, and other respiratory disorders. Exposure to particulate matter, NOx, SO2 and other plant emissions are all well-documented to aggravate these health conditions. Studies have shown that exposure to these pollutants can result in medical emergencies and even death for people with respiratory health problems (see extensive documentation in the NAAQS technical support documents that list specific studies at http://www.epa.gov/ttn/naaqs/).

It would be appropriate to identify all day care centers and other facilities that serve children and the elderly in the area, but we did not locate that information. Undoubtedly it could be located by the State of Michigan. The proximity of all highly sensitive receptors is typically evaluated when the regular release of hazardous chemicals is planned, as is the case for the Wolverine plant. This is especially important when there is the potential for system failure (see Comment 6 below).

The importance of childhood exposures is critical because children are more susceptible to toxic chemicals than adults during both their prenatal development and after they are born. This is due to the fact that they take in more air and water in relation to their body weight than adults, and many other factors. In particular, EPA notes that childhood may be a lifestage of greater susceptibility for a number of reasons: rapid growth and development that occurs prenatally and

after birth, differences related to an immature metabolic system, and differences in diet and behavior patterns that may increase exposure." (see www.epa.gov). In addition, US EPA has stated that children may be susceptible to the effects of most carcinogens (see children's cancer risk assessment guidance at www.epa.gov).

An international consensus statement was developed recently by scientists, pediatricians, and others at an international conference on fetal programming and development. The "Faroes Statement" named after the location of the conference held in May of this year, begins by stating that:

> "Fetal life and early infancy are periods of remarkable susceptibility to environmental hazards. Toxic exposures to chemical pollutants during these windows of increased susceptibility can cause disease and disability in children and across the entire span of human life." [4]

The lack of a comprehensive evaluation of potential impacts on children, especially with respect to the full burden of neurotoxic chemicals (discussed below) provides an incomplete assessment of their potential health impacts. Given the vulnerability of this population, and the very high value that is place on protecting children and insuring their health, this gap is of high concern.

Natural resources are a critical aspect of Michigan's economy and a source in many cases of foods such as fish, game, and naturally growing fruits and vegetables. Rogers City is a major fishing destination for nearby residents and tourists from across the United States. On the city's web site they claim some of the best fishing in Michigan (see http://www.rogerscitychamber.com/fishing_with_mv.htm). The marina on Lake Huron at Rogers City is an important tourist attraction, offering fishing charters which boast some of the highest salmon catches in Michigan. Another attraction is diving lessons to search for the ships that sank off the coast of Lake Huron and other local lakes. One of the diving school's most popular Roger's City dive sites is only 4 miles from the proposed coal plant. The already degraded water in much of the state require limited intake of fish, and increased pollution from the Wolverine plant will result in deposition on both Lake Huron and other waterbodies, ultimately increasing levels of contamination in fish. Lack of consideration of Lake Huron (and many other waterbodies in the region) allows DEQ to ignore not just the health impacts, but also economic, social, and other important impacts.

The effects of increased pollutant releases from Wolverine may also impact land and water-based cultural patterns and residents' enjoyment of local community resources. While intangible, this is an important aspect of the quality of life for many people. For example, about 45 miles Southwest of Rogers City is Alpena where Michigan has voted the Brown Trout Festival the best small town festival in the state. Every July people from the town of Alpena and other parts of Michigan attend the week long festival of "fishing and family fun" (http://www.alpenami-browntrout.com/29th%20Annual/WelcomePage.htm) Freshwater trout mercury levels are of concern to many people for health reasons. Increased mercury levels that could result from the proposed plant would further limit enjoyment of this resource, and could pose a serious health risk to people who consume large amounts of fish during festivals and celebrations.

[4] Available at: www.pptox.dk/Consensus/tabid/72/Default.aspx

5. A comprehensive cumulative risk assessment of human health impacts was not performed, contrary to DEQ claims.

The US EPA has established clear guidelines for conducting risk assessments that involve multiple chemical exposures. Their Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures on the USEPA website at http://www.epa.gov/NCEA/raf/pdfs/chem_mix/chem_mix_08_2001.pdf . See also http://es.epa.gov/ncer/childrenscenters/chemical.html. The guidelines require that risk assessments consider cumulative exposures to multiple chemicals and are based on human and toxicological studies. This is a necessary step in risk assessment and is directly relevant to the proposed Wolverine Power Plant because it will release a range of chemicals, as stated in numerous documents submitted to and developed by the State of Michigan.

Chemicals that are able to cause harm frequently damage multiple organ systems (e.g., cardiovascular, reproductive, neurocognitive, renal, hepatic) and cause different types of damage depending on the amount of exposure that occurs. When people are exposed to multiple chemicals that target the same organ(s), it is necessary to look at the chemical exposures in aggregate in order to determine whether harm will occur. Clearly exposure to multiple chemicals that act in the same way and target the same system are more damaging than exposure to only one of those chemicals. Yet, the DEQ did not provide an assessment of the combination of emissions that are known to cause neurotoxicity, cardiovascular system toxicity and a host of other types of damage.

The importance of carrying out cumulative risk assessment is documented in numerous scientific studies, and is underscored by a recent study addressing mercury, one of the proposed Wolverine plants permitted pollutants:

> "Single metals and metal mixtures at low levels not considered to be toxic can alter immune system function in human cells. The response is dependent on the cell type. Mercury is the most toxic of the metals tested. Levels of mercury in human blood in various human populations could affect immune function. Lymphocytes and specialized natural killer cells were most sensitive to the effects of mercury; neutrophils were not affected. Mercury toxicity was increased by lead and cadmium at low levels."

Source: *http://www.hc-sc.gc.ca/sr-sr/finance/tsri-irst/proj/metals-metaux/tsri-44-eng.php*

While there are numerous studies of the importance of considering chemicals together with respect to neurotoxicity, even in the relatively unstudied area of immunotoxicity addressed in the text above, the combined effects are noteworthy. It is not a dynamic that should be ignored under any circumstances. DEQ's consideration of the group of PAHs is insufficient and does not approach the larger problem of the many toxic metals they expect to be released from the proposed plant.

The National Academy of Sciences recently released a report titled "Science and decisions: Advancing Risk Assessment" that further emphasized the need for comprehensive evaluations of risk. This includes the following important and highly relevant text:

> "There is a need for cumulative risk assessments as defined by EPA (EPA 2003) - assessments that include combined risks posed by aggregate exposure to multiple agents or stressors; aggregate exposure includes all routes, pathways, and sources of exposure to given agent or stressor. Chemical, biological, radiologic, physical, and psychologic stressors are considered in this definition..."

Source: National Academy of Sciences website at: http://books.nap.edu/catalog/1209.html)

The state risk assessment does not comply with federal guidelines or with generally accepted scientific practice because it does not address the issue of multiple agents and stressors, or similarly acting chemicals. Most of the toxic metals referred to previously in these comments target the same organs (e.g., nervous system, cardiovascular system, endocrine system, reproductive system) and must be evaluated together in order to determine if the combination of chemicals may result in harm that would not occur if a single chemical were involved.

Neurological effects in children are of especially high concern due to their potential to cause lifelong damage. Mercury, lead, cadmium, and other toxic metals can cause developmental neurotoxicity when exposures occur during pregnancy or in childhood. These impacts can result in a very wide range of neurological problems, including reduced intellectual capabilities, abnormal brain function, perceptual and behavioral deficits, and other cognitive problems. The Centers for Disease Control's Toxicological Profiles provide highly detailed information on the hundreds of studies that have been carried out on the toxic metals and the types of health problems that can occur. They can be accessed at: http://www.atsdr.cdc.gov/toxpro2.html where each chemical has an extensive document listed.

When each of the expected pollutants is considered individually the analysis provides a fragmented and inaccurate description of the potential harm that can occur. It is comparable to considering the impact of a car hitting a building by only considering each component of the car individually - the steering wheel, the hood, and so on. The results of this type of analysis do not reflect reality and would never be acceptable in evaluating damage. Likewise, the damage caused by multiple neurotoxic chemicals is not just represented poorly by a fragmented approach - it yields inaccurate results. The IEUBK document on the DEQ website considers whether children live in houses with or without lead paint, but does not take into account the other neurotoxins that would come from the plant, providing an assessment that is incomplete and inaccurate.

Related to this, the CDC data regarding the body burdens of toxic chemicals in women of childbearing age (see the NHANES study at: http://www.cdc.gov/nchs/nhanes.htm) show that a substantial percentage of women already have a number of toxic metals in their bodies. Mercury levels in many women are sufficiently high that they are known by CDC to pose health risks to their unborn children (www.cdc.gov). Consequently, the addition of ANY neurotoxic heavy

metals is harmful to those women and their children. For those who have not reached a level of toxic metals that is harmful, the addition of lead, cadmium, mercury, and other neurotoxins is an unnecessary and potentially harmful risk.

The levels of lead, mercury and other neurotoxins that are known to cause harm have been consistently revised to reflect scientific awareness that even exceedingly small amounts of neurotoxic metals are harmful to the fetus. Many pediatric researchers have determined that there is not a "safe" level of exposure to these toxic metals during development, meaning that any additional exposure may incur some harm. It is advisable from a public health perspective to minimize or eliminate exposures of women of childbearing age and their children to neurotoxins such as lead and mercury, to the degree possible.

Among the tribal populations this is a particularly difficult problem. Some rely on locally caught fish as an important protein source, and during pregnancy there is considerable emphasis on adequate protein intake. There are also cultural patterns and festivals that involve substantial fish intake. Recreational fishers also often enjoy a higher consumption of fish than the average person. Yet in many parts of Michigan the levels of contamination have resulted in advisories to limit fish consumption due to health risks. The risks to pregnant women and children are particularly problematic. Yet the proposed Wolverine plant would add additional toxic metals and other pollutants to the waterbodies in the state, increasing the amount that is found in fish and other aquatic foods, as well as air and water. This was insufficiently modeled for the plant, with no consideration of the cumulative neurological impacts of multiple heavy metals.

In adults, impacts of the cumulative exposure to toxic heavy metals are also important. Most impact the cardiovascular system and can cause heart attacks, stroke, and other cardiovascular diseases with sufficient exposure. Due to the similar mechanisms of action of many of the metals, they should be considered together, but were not.

The listed emissions include many endocrine disruptors. This type of health damage is of very high concern now due to increased awareness of the harm that can be caused to the developing fetus, and the potential risks over a lifetime. Details on the specific nature of endocrine disruption that has been demonstrated for the various permitted pollutants can be found in the Toxicological Profiles for the chemicals at www.cdc.gov.

Summary: DEQ has not provided a sufficient risk assessment incorporating cumulative risk evaluations of many emissions that target the same organs. Aggregate exposure and risk evaluations that consider the range of potential exposure sources and all reasonable consequences are needed to fully characterize risk.

6. Documentation does not appear to fully address minor or catastrophic failures analysis, or the use of a probabilistic risk assessment (PRA) approach.

Probabilistic risk assessment (PRA) is a systematic and comprehensive methodology to evaluate risks that may results from complex engineered systems. It has been applied to large industrial and power facilities as a means to identify areas where problems can arise and what their consequences may be (http://www.hq.nasa.gov/office/codeq/qnews/pra.pdf). While not explicitly required in many cases, the use of PRA is especially important when a large facility is located in a community with very limited medical and emergency response resources. According to local medical care providers, the closest full service hospital is approximately 45 minutes away. Consequently, carefully outlining the various types of catastrophic failures that can occur, as well as the nature of responses needed is important. The essentially involves fully considering the potential human, material, and mechanical errors, their spectrum of consequences, and how they would be addressed. In many cases this process leads to improvements in safety and operations that prevent serious events.

Minor system and human error failures are also of high concern, though there were some aspects of that addressed in the documentation on the DEQ websites. The operational histories of large industrial and power facilities across the country indicate fairly routine "excursions" of pollutant releases above what is operationally optimal or expected. Other types of incidents occur routinely at large facilities and require pre-planning.

In the context of risk assessment, consideration of the impacts of unscheduled but not catastrophic releases that are likely to occur (based on experiences of similar facilities and an evaluation of human and mechanical reliability issues adds to baseline risk estimates. Some analysis of this was carried out, but it was not clear if the spectrum of potential (even likely) events, and their acute health risks (e.g., asthma attacks, strokes, etc) were considered. Given the nature of materials at the proposed plant and the permitted emissions, including PM and other irritants, epidemiological evidence in multiple federally-sponsored studies of air pollution and hospital admissions and deaths suggest that consideration of the impacts of high exposure days is relevant and necessary. System failures and human errors that are not catastrophic may also increase chronic health risks and the potential for cancer, birth defects, as well as the contamination of land, water, air, flora, and fauna and the amount that moves into other states/countries jurisdictions.

Summary: It is important to clearly delineate in document that targets these issue the approach that has been taken to evaluate both catastrophic and minor failures, the reasonable estimated risks these will generate over time, and the steps taken to address public protection.

Conclusions:

- The DEQ has not adequately characterized the extent of pollutant distribution or related contamination of air, land, water, and food.

- Cumulative risk was not considered, as defined by current science, sensitive populations were not fully considered, and a comprehensive risk analysis of system and human error-derived failures appears to be lacking.

- Consequently, there is an incomplete and therefore inaccurate assessment of potential health risks that may result from the Wolverine plant operation.

- The proposed facility will impose an additional toxic burden on residents of Michigan and other areas that could be avoided through the use of wind and other clean energy technologies that are available in Michigan.

These comments are also being forwarded to the following individuals and organizations:

Governor Jennifer Granholm
Steven Chester, Michigan Department of Environmental Quality
Ken DeBeaussaert, Michigan Office of the Great Lakes
Rebecca Humphries, Department of Natural Resources
John Persell, Minnesota State Assembly
Senator Edward Kennedy
Sally Burns, Lansing Michigan
Mary Burns, Lansing Michigan
For brevity, only affiliations are listed for the following:
Michigan Department of Community Health
Michigan Department of Environmental Quality
Michigan Department of Agriculture
Michigan Department of Natural Resources
Michigan House Standing Committee on Natural Resources, Great Lakes, Land Use, and Environment
Michigan House Standing Committee on Tourism, Outdoor Recreation and Natural Resources
Michigan House Standing Committee on Great Lakes and Environment
Michigan Senate Standing Committee on Economic Development and Regulatory Reform
Michigan Senate Standing Committee on Energy Policy and Public Utilities
Michigan Senate Standing Committee on Hunting Fishing and Outdoor Recreations
Michigan Senate Standing Committee on Natural Resources and Environmental Affairs
Michigan Senate Standing Committee on Commerce and Tourism
Michigan Senate Standing Committee on Agriculture
US EPA Assistant Administrator for Enforcement and Compliance Assurance
US EPA Assistant Administrator for Air and Radiation
USEPA Office of Children
USEPA Assistant Administrator for Water

USEPA Administrator for International Affairs
US EPA Office of the General Counsel, Office of Ethics
US Dept. of Justice, Environmental Enforcement Division
Environment Canada, Regional Administrator, Ontario
Health Canada, Regional Administrator, Ontario
Clean Air Canada
United Nations Environment Program
United Nations Human Rights Commission
Region 5 USEPA Regional Administrator
Region 5 USEPA Office of Civil Rights.
Region 5 USEPA Indian Environmental Office
Region 5 USEPA Office of Enforcement and Compliance Assurance
Region 5 USEPA Air and Radiation Division
Region 5 USEPA Great Lakes National Program Office
Region 5 USEPA Water Division
United States House of Representatives, Select Committee on Energy Independence & Global Warming
United States House of Representatives, Committee on Science and Technology
United States House of Representatives, Committee on Energy and Commerce
United States House of Representatives, Committee on Natural Resources
United States Senate, Committee on Energy Science and Technology
United States Senate, Committee on Nutrition and Food Assistance, Sustainable and Organic Agriculture and General legislation
United States Senate, Committee on Rural Revitalization, Conservation, Forestry, and Credit
United States Senate, Committee on Environment and Public Work
United States Senate, Committee on Energy and Natural Resources Development
United States Senate, Committee on Interior, Environment, and Related Agencies
United States Senate, Committee on Foreign Relations
United States Senate, Committee on Health Education and Pensions
United States Senate, Committee on Indian Affairs
United States Senate, Committee on Interior, Environment, and Related Agencies
Environmental Law and Policy Center
Chippewa Valley Sustainable Energy Association
Saginaw Chippewa Indian Tribe
Chippewa Ottawa Resource Authority,
Sierra Club, Washington DC
Sierra Club, Lansing Michigan
Earth Justice, Washington D.C.
Clean Water Action
Clean Energy Now
Physicians for Social Responsibility
Natural Resources Defense Counsel
Water keepers Alliance, Inc.
Isaac Walton League of America
Conservation Law Foundation
American Nurses Foundation