August 21, 2019

Ms. Barbara Kunkle
Acting Executive Secretary
Michigan Public Service Commission
7109 W. Saginaw Hwy.
P. O. Box 30221
Lansing, MI 48909

Via E-Filing

RE: MPSC Case No. U-20471

Dear Ms. Kunkle:

The following is attached for paperless electronic filing:

Direct Testimony of Kindra Weid on behalf of Michigan Environmental Council, Natural Resources Defense Council, and Sierra Club

Exhibits MEC-88 through MEC-92

Proof of Service

Sincerely,

Digitally signed by Tracy Jane Andrews
DN: cn=Tracy Jane Andrews, o=Olson, Bzdok & Howard, P.C., ou, email=tjandrews@envlaw.com, c=US
Date: 2019.08.21 19:59:16 -04'00'

Tracy Jane Andrews
tjandrews@envlaw.com

xc: Parties to Case No. U-20471

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of DTE ELECTRIC COMPANY for approval of its Integrated Resource Plan pursuant to MCL 460.6t, and for other relief.	)))))	MPSC Case No. U-20471

DIRECT TESTIMONY

OF

KINDRA WEID

ON BEHALF OF
MICHIGAN ENVIRONMENTAL COUNCIL, NATURAL RESOURCES DEFENSE COUNCIL, AND SIERRA CLUB

August 21, 2019

TABLE OF CONTENTS

I. INTRODUCTION AND QUALIFICATIONS

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

A. My name is Kindra Weid. My business address is 525 W. Main St. Manchester, Michigan 48158. I am the Coalition Coordinator for MI Air MI Health.

Q. On whose behalf is this testimony being offered?

A. I am testifying on behalf of the Michigan Environmental Council ("MEC"), Natural Resources Defense Council ("NRDC"), and Sierra Club ("SC").

Q. Please describe your educational background and professional qualifications.

A. I graduated from the University of Michigan, School of Nursing in 2000 with a Bachelor of Science and Nursing. I also have a Master of Public Health, Biostatistics and Epidemiology, from the University of Nevada, Las Vegas, School of Public Health (2011). I attended the University of Toronto, Dalla Lana School of Public Health from 2012-2015, where I completed all but a dissertation in pursuit of a PhD in Epidemiology. Currently, I am a Registered Nurse (RN) with the Michigan State Board of Nursing and practice as a critical care RN in a medical intensive care unit in Washtenaw County. In this role, I perform direct patient care for some of the at-risk populations impacted by air pollution. I am also the Coalition Coordinator of MI Air MI Health, an alliance of health professionals that believes all people deserve to breathe clean and healthy air. MI Air MI Health advocates for public policy that improves outdoor air quality at the local, state and federal level; we educate legislators on the importance of public health considerations in all policy decisions; and we

educate the public on the health impacts associated with exposure to air pollution. A copy of my Resume is attached as Exhibit MEC-88.

Q. Have you previously testified before the Michigan Public Service Commission?

A. No.

Q. Are you sponsoring any exhibits?

A. Yes, I am sponsoring the following exhibits:

Ex MEC-88:	Resume of Kindra Weid
Ex MEC-89:	WP LKM -5, 6, 7, 8 Emissions Tabs
Ex MEC-90:	Response to MECNRDCSCDE-5.35j
Ex MEC-91:	Response to MECNRDCSCDE-8.47
Ex MEC-92:	Table 1: Population of At-risk Groups: Monroe, St. Clair, and Wayne Counties, Michigan (2019) by DTE coal-fired power plant location

Q. What is the purpose of your testimony?

A. The purposes of my testimony are to:

a. Document DTE's proposed coal plant retirement schedule and share with the Commission the emissions data presented by DTE in this case.

b. Highlight the public health impacts associated with air pollution in Michigan from fossil fuel combustion. In particular, I highlight two public health issues that are exacerbated by fossil fuel electric generation: (a) public health impacts associated with

the exposure to air pollutants, and (b) public health impacts associated with climate change.

c. Demonstrate to the Commission that the public health impacts associated with the continued operation of DTE's coal-fired generating units deserve consideration in the IRP decision-making process.

II. DTE'S COAL PLANTS AND AIR POLLUTANT EMISSIONS

Q. What timeline for retirement has DTE proposed for its coal plants?

A. Although several of DTE's currently operating coal-fired power plants are slated for closure by 2022, there is still a sizable amount of the Company's capacity relying on fossil-fueled power through 2040:[1]

[1] IRP, pp. 25, 56-57, 129, 142, 153; Mikulan pp. 51-61, 87-89; Paul Direct, pp. 13-17; Exhibit A-10.

Fossil-Fueled Generation Units	Year Operational	Summer Capacity Rating (MW)	IRP Treatment	Location
River Rouge Unit 3	1958	272	Coal combustion ends 2020; burn recycled industrial gases until 2022	Wayne County
Trenton Channel Unit 9	1968	495	2022	Wayne County
St. Clair Unit 1	1953	151	2019	St. Clair County
St. Clair Unit 2	1953	154	2022	St. Clair County
St. Clair Unit 6	1961	311	2022	St. Clair County
St. Clair Unit 7	1969	440	2022	St. Clair County
Belle River Unit 1	1984	517	Evaluated 2025 retirement; maintains 2029 retirement	St. Clair County
Belle River Unit 2	1985	517	Evaluated 2026 retirement; maintains 2030 retirement	St. Clair County
Blue Water Energy Center	2022	1,150	Enters into service 2022	St. Clair County
Monroe Unit 1	1971	758	Consider in future IRP	Monroe County
Monroe Unit 2	1973	773	Consider in future IRP	Monroe County
Monroe Unit 3	1973	773	Consider in future IRP	Monroe County
Monroe Unit 4	1974	762	Consider in future IRP	Monroe County
Oil, Gas peaker units	Various	IRP, pp. 56-57	No change	Various

1

Q. Did DTE provide self-reported emissions projections that it provided in this proceeding?

A. Yes. The emissions data that DTE presented in this case is included as Exhibits MEC-89 and MEC-90. Exhibit MEC-89 (WP LKM-5, 6, 7, 8 Emissions Tabs) consists of the information provided in the Emissions Tab from each of the four the work paper provided by DTE witness Mikulan, which was also discussed by DTE witness Marietta.[2] These data show, for each of DTE's fossil generating units, the rate and total volume (in tons) of the following emissions: sulfur dioxide (SO_2); carbon dioxide (CO_2); nitrogen oxide (NOx); particulate matter (PM); and mercury (Hg) (volume, not rate). In addition, in response to a discovery request, DTE provided its projected volume of fine particulates ($PM_{2.5}$) for its fossil fuel generating units, which is presented in Exhibit MEC-90 (MECNRDCSCDE-5.35j).

Q. Did DTE provide self-reported actual emissions in this proceeding?

A. Yes. In response to a discovery request, DTE provided its reported emissions for 2008 through 2018 for each of the pollutants noted above (SO_2, CO_2, NOx, PM, $PM_{2.5}$, and Hg). This data is provided in Exhibit MEC-91 (MECNRDCSCDE-8.47).

[2] Marietta, pp. 14-15.

Q. Did you review the emissions data that DTE provided in this case?

A. Yes, I reviewed both the past data and the projected emissions provided by DTE in the exhibits referenced above.

Q. Based on the DTE emissions projections in Exhibit MEC-89 (LKM-5-8), will the conversion of River Rouge to burning industrial gases reduce emissions levels?

A. No. According to the data provided by DTE related to projected emissions (Ex MEC-89 (WP LKM-5-8 Emissions)), DTE's proposal to convert the River Rouge 3 unit from coal to industrial gases will not result in a reduction in the reported emissions rates for this unit between 2018 rates and 2020 for all reported pollutants.

Q. Is the data DTE has provided in this case sufficient to make an analysis of health impacts associated with DTE's units?

A. No, I do not believe that DTE's emissions data is sufficient to enable either stakeholders or the Commission to consider the health impacts associated with the units.

III. PUBLIC HEALTH IMPACTS ASSOCIATED WITH EXPOSURE TO AIR POLLUTANTS

Q. How does exposure to air emissions from fossil-fuel electric generating units impact human health?

A. Fossil fuel electric generation results in significant emissions of regulated air pollutants, including (among others) particulate matter, ozone-forming compounds, sulfur dioxide,

nitrogen oxides, volatile organic compounds, and others.[3] Research shows that the inhalation of particulate matter (PM) and other criteria pollutants directly impacts the tissue or organ of initial contact (*e.g.,* the respiratory system) while also triggering a cascade of inflammation with indirect systemic effects (*e.g.*, the cardiovascular system).[4] These impacts may be felt more acutely and short-term (*e.g.,* coughing, tearing, shortness of breath, chest pain) or may be more chronic and subtle (*e.g*., atherosclerosis, diabetes, stroke).[5] Broadly speaking, the human health impacts of air pollution are dictated by the size, makeup, duration and concentration of particulate exposure, which makes it paramount that ALL emissions are considered a threat to public health and the environment and require as much reduction as possible. MEC-NRDC-SC witness Dr. George Thurston provides testimony in this case that addresses how the combustion of coal results in emission of several criteria pollutants with well-documented human health impacts.

---

[3] ToxTown, National Library of Medicine, National Institute of Health, *Power Plants* (2017).

[4] Schraufnagel *et al*, *Air Pollution and Noncommunicable Diseases: A review of the Forum of International Societies' Environmental Committee, Part 1: The Damaging Effects of Air Pollution,* CHEST Journal (2018).

[5] *Id;* Schraufnagel *et al*, *Air Pollution and Noncommunicable Diseases: A review of the Forum of International Societies' Environmental Committee, Part 2: Air Pollution and Organ Systems*, CHEST Journal (2018).

Q. How can particulate matter (PM) emissions impact human health?

A. Particulate matter (PM) is one of many by-products of the combustion of fossil fuels for energy, among other sources, but especially among coal-fired power.[6] In a review of scientific studies (2012) performed over the past 30 years, associations between PM exposure and human health were investigated.[7] The authors posited the following conclusions from the literature: "A dose-response relationship between PM exposure and adverse effects has been identified, and improvement in health endpoints is observed when the PM exposures are reduced."[8] The studies included in the review investigated varying levels and duration of PM exposure and the following health endpoints: cardiovascular morbidity and mortality (atherosclerosis, systemic inflammation, coagulation platelet activation, ischemic cardiovascular disease mortality, mortality from arrhythmia, congestive heart failure, and cardiac arrest), respiratory health effects (symptoms, medication use, lung function, health-care utilization, and mortality), and cerebrovascular health effects (e.g., stroke) of which the connection was inconclusive at the time of this study's end; however, since then, scientific research has demonstrated an association between air pollution and systemic cerebrovascular inflammation associated with stroke and other cognitive deficits, such as dementia.[9]

---

[6] ToxTown, National Library of Medicine, National Institute of Health, *Particulate Matter* (2017)

[7] Anderson *et al, Clearing the Air: A Review of the Effects of Particulate Matter Air Pollution on Human Health,* Journal of Medical Toxicology (2012).

[8] *Id.*, p. 172.

[9] *Id.,* see also Peters *et al, Air Pollution and Dementia: A Systematic Review*, Journal of Alzheimer's Disease (2019).

Moreover, the authors concluded that, "Overall, the available evidence suggests a causal association between long- and short-term PM exposure and cardiovascular and respiratory morbidity and mortality."[10] Particulate matter exposure is associated with premature deaths in people with heart or lung conditions, nonfatal heart attacks, irregular heartbeat, exacerbations of asthma, decreased lung function, and increased respiratory symptoms, such as coughing, irritation and/or difficulty breathing.[11]

Q: How can ozone impact human health?

A: Ground-level ozone is the result of a chemical reaction between sunlight, nitrogen oxide (NOx), and volatile organic compounds (VOCs) in the air, which is more prone to occur on high-temperature, sunny days.[12] As referenced below, the precursors to ozone formation (NOx and VOCs) are emitted during fossil-fuel combustion for energy, among other sources.[13] When ozone is inhaled, it serves as a noxious irritant to the mucous membranes of the respiratory system causing localized irritation and systemic inflammation; it has been compared to "getting a bad sunburn" along the nose, throat, and airways.[14] Research has demonstrated a linear relationship between ozone exposure and premature death in older

---

[10] Anderson *et al, Clearing the Air: A Review of the Effects of Particulate Matter Air Pollution on Human Health,* Journal of Medical Toxicology (2012), p. 172.

[11] EPA, *Health and Environmental Effects of Particulate Matter (PM)* (2018).

[12] American Lung Association, *Healthy Air: Ozone* (2018).

[13] See Nitrogen Oxides at https://toxtown.nlm.nih.gov/chemicals-and-contaminants/nitrogen-oxides and Volatile Organic Compounds (VOCS) at https://toxtown.nlm.nih.gov/chemicals-and-contaminants/volatile-organic-compounds-vocs.

[14] *Id.;* see also American Lung Association*, Ozone Pollution* (2016).

adults.[15] Ozone exposure can also cause more immediate effects, such as shortness of breath, wheezing or cough; irritation and/or inflammation of the airways that may lead to an asthma attack or exacerbation of chronic obstructive pulmonary disease (COPD) requiring hospitalization; and an increased susceptibility to pulmonary inflammation and infections.[16] The heart and lungs are uniquely interconnected and anything that impacts the lungs will impact the heart as well and vice versa. Arrhythmias (irregular heartbeats), increased risk of heart attacks, and an increase in hospitalizations and emergency department visits related to cardiovascular disease after exposure to ozone have all been documented in the literature.[17] Witness Thurston also discusses health impacts from ozone exposure in his testimony.

Q: How can sulfur dioxide (SO_2) emissions impact human health?

A: Again, witness Thurston outlines this in his testimony. Sulfur dioxide forms when sulfur-containing fuels are burned and the combustion of fossil fuels by power plants and other industrial facilities are the biggest sources in the United States.[18] Short-term exposure can irritate the mucous membranes of the eyes, nose, throat and lungs, cause difficulty breathing, and inflame lung tissue.[19] Long-term exposure has been associated with structural changes in lung function, infertility in men and women, non-specific symptoms, such as headache,

---

[15] American Lung Association, *Healthy Air: Ozone* (2018); Di *et al*, (2017).

[16] American Lung Association, *Healthy Air: Ozone* (2018); EPA*, Health Effects of Ozone Pollution* (2019).

[17] *Id.*

[18] NASA, *Scientific Visualization Studio: Sulfur Dioxide 2018 Update* (2019).

[19] ToxTown, National Library of Medicine, National Institute of Health: *Sulfur Dioxide* (2017).

dizziness, nausea, and vomiting, and more localized respiratory symptoms, such as bronchitis and shortness of breath.[20] Populations at greatest risk are those who live or work within close proximity to a source, athletes, children, and elderly populations with pre-existing heart and lung conditions.[21]

Q: How can nitrogen oxides (NOx) emissions impact human health?

A: Nitrogen dioxide (NO_2) is one of a group of related nitrous gases commonly referred to as NOx (nitrogen oxides), which are emitted upon combustion of fossil fuels from power plants and for transportation, among other processes.[22] They have direct health impacts on their own as well as when they combine with sunlight and other compounds in a chemical reaction to form ground-level ozone, or smog.[23] Short-term exposure to NOx can irritate the eyes and respiratory system and can trigger asthmatics, resulting in coughing, shortness of breath, wheezing, etc., potentially leading to hospitalization.[24] Long-term exposure has been linked to the development of asthma in children, harmful cardiovascular impacts, lower birth weight, increased risk of premature death, and decreased survival in those with diagnosed lung cancer.[25] As discussed earlier, it is a component of the chemical reaction required for

---

[20] *Id.*

[21] National Park Service, *Sulfur Dioxide Effects on Health: Who is at risk?* (2018).

[22] ToxTown, National Library of Medicine, National Institute of Health: *Nitrogen Oxides* (2017).

[23] *Id.*

[24] EPA, *Basic Information about NO_2* (2016); American Lung Association, *Healthy Air: Nitrogen Dioxide*, (2018).

[25] American Lung Association, *Healthy Air: Nitrogen Dioxide* (2018).

ground-level ozone to develop. Witness Thurston provides additional testimony regarding the connection between NOx emissions and human health.

Q. How can Volatile Organic Compounds (VOCs) emissions impact human health?

A: VOCs are outgassed during the combustion of fossil fuels and from various consumer goods.[26] Similar to other toxic pollutants, short-term exposure can result in irritation to the eyes, nose, throat, and other neurological symptoms (e.g., headache, dizziness, visual and memory problems); long-term exposure can result in more serious impacts like intensified short-term effects, nausea, damage to the kidneys, liver and central nervous system, as well as certain cancers.[27] Alone, VOCs are considered a toxic classification of chemical pollutants; however, they are also a key ingredient in the chemical reaction responsible for ground-level ozone.[28] Decreasing these emissions would help to mitigate the formation of ground-level ozone.

[26] ToxTown, National Library of Medicine, National Institute of Health, *Volatile Organic Compounds* (2017).

[27] *Id.*

[28] American Lung Association, *Healthy Air: Volatile Organic Compounds* (2018).

Q. What is your assessment of the scientific research and resources related to the health impacts associated with exposure to emissions that originate from fossil-fuel power plants?

A. The scientific literature, including the resources cited in my testimony as well as many others, confirm that air pollutants like those emitted from DTE's fossil fuel units cause serious negative health impacts.

IV. MICHIGAN SPECIFIC PUBLIC HEALTH IMPACTS ASSOCIATED WITH EXPOSURE TO AIR POLLUTANTS

Q. How has public health in Michigan been impacted by outdoor concentrations of $PM_{2.5}$?

A. The American Thoracic Society (ATS) estimates that in 2019, Michigan will experience an excess of 41 deaths, 13 cases of lung cancer, and 20 serious illnesses (*e.g*., asthma or COPD exacerbation requiring hospitalization) due to outdoor concentrations of $PM_{2.5}$ greater than recommended values.[29] As discussed by witness Thurston, there are proven methods (*e.g.,* health impact assessments) to quantify the health impacts of $PM_{2.5}$ emissions from DTE's power plants, but, in addition to accurate emissions data from DTE, we would need further information.

[29] American Thoracic Society, *Health of the Air 2019: Health Impacts: Fine Particulate Matter ($PM_{2.5}$)* (2019).

Q. Is this health impact data DTE-specific?

A. No, these numbers represent all of Michigan and all air emissions sources. More detailed data would be needed to do a health impact assessment of DTE sources.

Q: How has public health in Michigan been impacted by outdoor concentrations of ozone?

A: An Air Action! Day in Michigan occurs on sunny, high-temperature days when levels of certain criteria pollutants, particularly ozone and PM, are at levels high enough to make the air unsafe to breath.[30] At-risk populations vary depending upon the ground-level concentration of ozone, but Michigan sees several days each summer in which the air is considered unhealthy for "sensitive groups." Sensitive populations to ozone include children, seniors, people who are active outdoors, and people with pre-existing lung disease (*e.g.*, asthma, COPD, emphysema, lung cancer, etc.); sensitive populations to PM include those with heart or lung disease, older adults and children.[31] As of August 15, the Detroit area had experienced 5 days in 2019 in which the air quality index was elevated to the extent that it was recommended for sensitive groups to limit their exposure to outdoor air.[32]

---

[30] Mich. Dept. Environment, Great Lakes, and Energy, *About Action! Days* (2019).

[31] *Id.*

[32] Mich. Dept. Environment, Great Lakes and Energy, *Action! Days* (2019).

Q. What does the American Thoracic Society estimate in terms of the public health impacts resulting from ozone exposure?

A. The ATS estimates that in 2019, Michigan will experience an excess of 132 deaths, 304 serious illnesses, and 313,447 impact days (*e.g.*, days in which people are not able to carry on with their usual activities of daily living, like school or work, due to the health effects of poor air quality) as a result of outdoor ozone levels above their recommendation of 60 ppb.[33] The NAAQS for ozone is currently 70 ppb.[34]

Q. Is this health impact data DTE-specific?

A. No, these numbers represent all of Michigan and all air emissions sources. More detailed data would be needed to do a health impact assessment of DTE sources.

Q. Is there local-level information available, related to the health impacts from ozone and fine particulates?

A. Michigan currently has 10 counties in nonattainment status for the NAAQS 8-hour ozone standard for 2018-2019: Allegan, Berrien, Livingston, Macomb, Monroe, Muskegon,

---

[33] American Thoracic Society, *Health of the Air 2019: Health Impacts Fine Particulate Matter ($PM_{2.5}$)* (2019).

[34] EPA, *2015 Revision to 2008 Ozone NAAQS Related Documents* (2018).

Oakland, St. Clair, Washtenaw, and Wayne.[35] The tri-city areas of Detroit-Dearborn-Livonia (34 excess deaths) and Warren-Troy-Farmington Hills (48 excess deaths) rank 25th and 15th, respectively, on the list of *Top 25 [US Cities] - Ozone Health Impacts* according to data from the ATS.[36] Detroit-Dearborn-Livonia ranks 15th with an estimated 41 excess deaths on the ATS list of *Top 25 [US Cities] – $PM_{2.5}$ Health Impacts*.[37] When taking excess mortality from both $PM_{2.5}$ *and* ozone exposure into account, the Detroit-Dearborn-Livonia area ranks 18th among *Top 25 [US Cities] - Total Health Impacts* with an estimated 75 deaths.[38]

Q. Are certain populations in Michigan more vulnerable to the health impacts associated with coal-unit emissions?

A. Exposure to outdoor air pollutants, like those emitted from DTE's fossil fueled generating units, is often more detrimental to those with pre-existing conditions, children and seniors, and those living in poverty.[39] The American Lung Association has quantified Michigan's population into at-risk groups by county.[40] This information identifies the scope of risk for

---

[35] EPA, *Michigan Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants* (2019).

[36] American Thoracic Society, *Health of the Air 2019: City Rankings, Top 25- Ozone-Health Impacts Rankings Ozone* (2019);

[37] American Thoracic Society, *Health of the Air 2019: City Rankings, Top 25- $PM_{2.5}$-Health Impacts* (2019).

[38] American Thoracic Society, *Health of the Air 2019: Top 25 – Total Health Impacts* (2019).

[39] American Lung Association, *State of the Air 2019: Key Findings: People at Risk* (2019).

[40] American Lung Association, *State of the Air 2019: Report Card: Michigan* (2019), *Groups at Risk* Tab.

negative health impacts on days with poor air quality. In Exhibit MEC-92 (Table 1), I highlighted the number of people in the at-risk population categories in each Monroe, St. Clair and Wayne Counties to help show the context for the decisions to continue operation of coal-fired power plants, as proposed in DTE's IRP. For example, on a Michigan *Air Action! Day* in Wayne County (excluding those under 18 and those 65 and over because of the unknown health variability within those groups), there are an estimated 297,122 individuals at risk for an exacerbation of their pre-existing lung condition (*i.e.*, pediatric and adult asthma, COPD and lung cancer). This excludes less common lung diseases, such as emphysema, cystic fibrosis, pulmonary fibrosis, etc. but those populations are still considered at-risk, therefore, this is an underestimate of the at-risk group. Sensitive groups are asked to limit their exposure to outdoor air on these occasions making it difficult to carry out activities of daily living, such as working, shopping, attending school and playing.

Q. Is the data in Exhibit MEC-92 (Table 1) DTE-specific?

A. No, the at-risk populations shown in Table 1 would be impacted by all sources of air pollution, both in the respective counties and also from sources further away. More detailed data would be needed to do a health impact assessment of DTE sources.

Q. Please summarize your concerns, based upon your review of the scientific literature discussed above.

A. By approaching this IRP from a more holistic perspective that took health externalities into consideration, the utility and stakeholders, as well as the Commission, could better understand the full costs and benefits of utility resource decisions. It is also imperative to

consider that not all populations are impacted by utility resource decisions equally, and such inequity should be considered as part of a resource-specific health impact assessment. Communities living near fossil fuel generating units will bear the brunt of health costs associated with air pollution emissions, but could also stand to reap larger benefits in terms of improvements to health outcomes from reductions or cessation of emissions of harmful pollution.

V. FOSSIL FUELS AND CLIMATE CHANGE

Q. Please summarize how the combustion of fossil fuels contributes to climate change.

A. According to the EPA, in 2017, the combustion of fossil fuels for energy production contributed 28% of all greenhouse gasses (GHGs) attributed to climate change—second only to the transportation sector (29%).[41]

Q. What are the current and projected impacts of climate change in Michigan and in the Midwest?

A. According to the Great Lakes Climate Change Report (2019) and the National Climate Assessment (2018), climate change in Michigan and the rest of the Midwest will manifest in increased air temperatures, heavier precipitation, flooding, diminished agricultural

[41] EPA, *Sources of Greenhouse Gas Emissions, Overview* (2017).

production, and heat waves.[42] Michigan is projected to see more days with temperatures reaching 90 degrees Fahrenheit and fewer days below 32 degrees Fahrenheit.[43] Key crop production, such as corn and soybeans, will shift north geographically.[44] Spring and winter seasons will experience more precipitation, while summer seasons will experience less rainfall and more drought-like conditions.[45] Smaller and lower-income communities with less infrastructural resilience to these shifts will suffer economically as a result.[46]

In the Midwest region, including Michigan, researchers project that we will experience an increase in water-borne and vector-borne pathogens, heat related illness, and pollen season duration.[47] The National Climate Assessment indicates that the Midwest will be particularly susceptible to an increase in respiratory and cardiovascular diseases, and injuries and premature deaths related to extreme weather events.[48] Scientists and public health officials project the expansion of vector-borne illnesses, such as Lyme disease and West Nile virus,

---

[42] Environmental Law & Policy Center, *An Assessment of the Impacts of Climate Change on the Great Lakes* (2019); US Global Change Research Program, *Fourth National Climate Assessment,* Chapter 21: Midwest (2018).

[43] Environmental Law & Policy Center, *An Assessment of the Impacts of Climate Change on the Great Lakes* (2019).

[44] *Id.*

[45] *Id.*

[46] *Id.*; see also US Global Change Research Program, *Fourth National Climate Assessment*, Chapter 21: Midwest (2018),

[47] *Id.*; US Global Change Research Program, *Fourth National Climate Assessment,* Chapter 21: Midwest (2018).

[48] US Global Change Research Program, *Fourth National Climate Assessment,* Chapter 21: Midwest (2018).

extreme precipitation with increased flooding, and more heat-related illnesses throughout the state.[49] Living with the uncertainty of extreme weather events has been shown to threaten mental health, as well.[50] Researchers have further documented that climate change has contributed to the unpredictability and intensification of extreme weather events like flooding, forest fires, extreme heat events and hurricanes, which all have the potential to trigger "extreme anxiety reactions" or post-traumatic stress disorder.[51]

VI. CONCLUSION

Q. What conclusions do you draw from your review of the DTE data and scientific research that you have discussed in your testimony?

A. I conclude that:

1. DTE proposes to keep a sizable amount of coal online between now and 2040.

[49] NRDC, *Climate Change and Health in Michigan* (2019).

[50] Berry *et al, Climate change and mental health: a causal pathways framework*, International Journal of Public Health (2010).

[51] *Id*

2. The data provided in this IRP by DTE related to its fossil-burning electric generation plants are not sufficient to understand the health impacts associated with its decisions to operate these units.

3. Air pollutants like those emitted from DTE's coal units cause serious negative health impacts.

4. Air pollutants like those emitted from DTE's fossil fuel units exacerbate climate change.

5. The worsening climate crisis will have negative impacts on Michigan and the health of those living in Michigan.

Q. Based on these conclusions, what are your recommendations for the Commission?

A. Going forward, I recommend the Commission ensure that health impacts of resource decisions be considered within the scope of IRPs. The body of evidence presented in this testimony articulates the nexus between fossil fuel energy production, air pollution, climate change, and public health. It makes clear that energy production decisions have vast and far-reaching implications on the health, safety, and wellbeing of families across Michigan. The stated mission of the MPSC is to "protect the public by ensuring safe, reliable, and accessible energy and telecommunications services at reasonable rates for Michigan's residents."[52] Thus, making long term energy resource decisions without considering the impacts of fossil

[52] Michigan Public Service Commission, *About the MPSC* (2019); see also Case No. U-20147, Nov. 21, 2018, Order, p. 36.

fuel generation on human health will hinder the ability of the utility and Commission to fully evaluate how reasonable and prudent those resources are in meeting the needs of the public.

Q. Does this conclude your testimony?

A. Yes.

Appendix A: Works Cited

American Lung Association, *Health Effects of Ozone and Particle Pollution* (2019).

American Lung Association, *Healthy Air: Nitrogen Dioxide* (2018).

American Lung Association, *Healthy Air: Ozone* (2018).

American Lung Association, *Healthy Air: Sulfur Dioxide* (2017).

American Lung Association, *Healthy Air: Volatile Organic Compounds* (2017).

American Lung Association, *Ozone Pollution* (2016).

American Lung Association, *State of the Air 2019: Key Findings: People at Risk* (2019)..

American Lung Association, *State of the Air 2019: Report Card: Michigan* (2019).

American Thoracic Society, *Health of the Air 2019: Michigan, Health Impacts Fine Particulate Matter ($PM_{2.5}$)* (2019).

American Thoracic Society, *Health of the Air 2019: Michigan, Health Impacts Ozone (O3)* (2019).

American Thoracic Society, *Health of the Air 2019: City Rankings, Top 25- Ozone-Health Impacts Rankings Ozone* (2019).

American Thoracic Society, *Health of the Air 2019: City Rankings, Top 25- $PM_{2.5}$-Health Impacts Rankings* (2019). American Thoracic Society, *Health of the Air 2019: City Rankings, Top 25 – Total Health Impacts* (2019).

Anderson, Jonathan, Josef Thundiyil, and Andrew Stolback, *Clearing the Air: A Review of the Effects of Particulate Matter Air Pollution on Human Health,* Journal of Medical Toxicology (2012).

Berry, Helen, Kathryn Bowen, and Tord Kjellstrom, *Climate change and mental health: a causal pathway framework,* International Journal of Public Health (2010).

Di, Qian; Lingzhen Dai, Yun Wang, Antonella Zanobetti, Christine Choirat, Joel Schwartz, and Francesca Dominici, A*ssociation of Short-Term Exposure to Air Pollution with Mortality in Older Adults*, Journal of the American Medical Association (2017).

Environmental Law & Policy Center, *An Assessment of the Impacts of Climate Change on the Great Lakes* (2019).

EPA, *2015 Revision to 2008 Ozone NAAQS Related Documents* (2018).

EPA, *Basic Information about NO2* (2016).

EPA, *Health and Environmental Effects of Particulate Matter (PM)* (2018).

EPA*, Health Effects of Ozone Pollution* (2019).

EPA, *Michigan Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants* (2019).

EPA, *Sources of Greenhouse Gas Emissions, Overview* (2019).

Michigan Dept. of Environment, Great Lakes, and Energy (EGLE), *About Action! Days*

Michigan Dept. of Environment, Great Lakes, and Energy (EGLE), *Action! Days*

Michigan Public Service Commission (MPSC), Case No. U-20147, Nov. 21, 2018, Order, p. 36.

NASA, *Scientific Visualization Studio: Sulfur Dioxide 2018 Update* (2019).

National Park Service, *Sulfur Dioxide Effects on Health: Who is at risk?* (2018).

Natural Resources Defense Council, *Climate Change and Health in Michigan* (2019).

Peters, Ruth, Nicole Ee, Jean Peters, Andrew Booth, Ian Mudway, and Kaarin Anstey; *Air Pollution and Dementia: A Systematic Review*, Journal of Alzheimer's Disease (2019).

Schraufnagel, Dean, John Balmes, Clayton Cowl, Sara De Matteis, Soon-Hee Jung, Kevin Mortimer, Rogelio Perez-Padilla, Mary Rice, Horacio Riojas-Rodriguez, Akshay Sood, George Thurston, Teresa To, Anessa Vanker, Donald Wuebbles, *Air Pollution and Noncommunicable Diseases: A review of the Forum of International Societies' Environmental Committee, Part 1: The Damaging Effects of Air Pollution,* CHEST Journal (2018).

Schraufnagel, Dean, John Balmes, Clayton Cowl, Sara De Matteis, Soon-Hee Jung, Kevin Mortimer, Rogelio Perez-Padilla, Mary Rice, Horacio Riojas-Rodriguez, Akshay Sood, George Thurston, Teresa To, Anessa Vanker, Donald Wuebbles, *Air Pollution and Noncommunicable Diseases: A review of the Forum of International Societies' Environmental Committee, Part 2: Air Pollution and Organ Systems*, CHEST Journal (2018).

ToxTown, National Library of Medicine, National Institute of Health, *Nitrogen Oxides* (2017).

ToxTown, National Library of Medicine, National Institute of Health, *Particulate Matter* (2017).

ToxTown, National Library of Medicine, National Institute of Health, *Power Plants* (2017).

ToxTown, National Library of Medicine, National Institute of Health, *Sulfur Dioxide* (2017).

ToxTown, National Library of Medicine, National Institute of Health, *Volatile Organic Compounds* (2017).

US Global Change Research Program, Fourth National Climate Assessment, Chapter 21: Midwest (2018).

Curriculum Vitae

Kindra Weid, BSN, RN, MPH
525 W. Main Street, Manchester, MI 48158
734-660-3564
kindra@miairmihealth.org

Education:

PhD (Student) Epidemiology, ABD, incomplete
University of Toronto, Dalla Lana School of Public Health, 2012-2016

MPH Master of Public Health, Epidemiology and Biostatistics, 2011
University of Nevada, Las Vegas, School of Community Health Sciences, 2009-2011

BSN Bachelor of Science in Nursing, 2000
University of Michigan, School of Nursing, 1996-2000

Employment and Experience:

St. Joseph Mercy Health System, Chelsea Hospital, December 2015 – present
Registered Nurse, Intensive Care Unit and Radiology (Diagnostic Imaging), Basic Life Support Instructor (AHA), unit scheduler

MI Air MI Health, May 2016- present
Coalition Coordinator, Public Health Advocate and Health Educator

Ecology Center and MI Air MI Health, November 2015 – May 2016
MI Air MI Health, Health Fellow

The University of Toronto Scarborough campus, May 2015 – August 2015
Course Instructor for the Department of Anthropology, Health Studies Discipline
Foundations in Health Studies II, Summer term (2015), undergraduate course

The University of Toronto Scarborough campus, January 2015 – April 2015
Head Teaching Assistant for Dr. Suzanne Sicchia, Foundations in Health Studies I
Winter term (2015), undergraduate course

The University of Toronto Scarborough campus, August 2013 – December 2014
Teaching Assistant for Dr. Suzanne Sicchia, Foundations in Health Studies I
(Fall terms 2013, 2014) & II (Winter term 2013), undergraduate course

The University of Toronto, St. George campus, January 2014 – April 2014
Teaching Assistant for Drs. Jason Garay and Shelly Bolotin, Health Trends & Surveillance (Winter term, 2014), graduate course

The University of Toronto, Dalla Lana School of Public Health, January 2014 – April 2014
Research Assistant for Dr. Dionne Gesink (PhD supervisor), Cancer Care Ontario's Under- and Never-Screened (UNS) cancer screening project

Gap in employment due to completion of MPH in Dec 2011 and relocation to Toronto, Canada to pursue PhD in Epidemiology at the University of Toronto in the fall of 2012
*Please note: There were restrictions on employment until school was initiated due to my immigration status.

Southern Nevada Health District, December 2010 – June 2011
Disease Investigation and Intervention Specialist (influenza), internship
Primary data collection, data entry, telephone interviewing, quantitative analysis

Las Vegas Radiology, March 2010 – December 2010
Cardiology testing RN, cardiac testing, nuclear medicine, patient education and monitoring

Southern Nevada Health District, October 2009 – March 2010
Public Health RN, H1N1 vaccination administrator and health educator
Contracted through Eastridge Workforce Solutions/Healthcare Division

Michigan Heart & Associates, April 2007 – August 2009
Triage RN, health educator, and Wellness Program co-coordinator

Scottsdale Healthcare, August 2005 – March 2007
Critical Care RN, Neurological Intensive Care Unit/Trauma

Illinois Masonic Medical Center, October 2003 – August 2005
Critical Care RN, Surgical Intensive Care Unit (Trauma/Cardiovascular ICU)

Research Experience/Internship:

Research Assistant (RA), Cancer Care Ontario's Under- and Never-Screened (UNS) cancer screening project, conducted focus groups, quantitative and qualitative data analysis with an emphasis on immigrant health and cancer screening practices for breast, cervical, and colorectal cancers

Primary data collector
MPH Thesis Title: *Analysis of the Morbidity and Mortality of Severe Influenza Infection in Clark County, Nevada for the 2010-2011 Influenza Season*

Presentations:

Guest lecturer and press conferences for MI Air MI Health on the negative health impacts of air pollution in Michigan, November 2015 to present
Schools/Colleges of Nursing: Michigan State University, University of Detroit Mercy, University of Michigan and Eastern Michigan University
Capital Building, Lansing, Michigan

Foundations in Health Studies II: Delivered 2 hour lectures weekly as **Course Instructor** on various health topics relating to the social determinants of health to undergraduate audience of approximately 50 students

"Foundations in Health Studies II: Aboriginal Health"
University of Toronto, Scarborough campus, delivered lecture for HLTA03 Foundations in Health Studies II, March 10, 2014

"Immigrant Health in Toronto: A Community-Based Participatory Research Project and Systematic Review"
University of Toronto, Dalla Lana School of Public Health Epidemiology Seminar Series, Toronto, Ontario, December 2013

"Immigrant health in Canada and the 'healthy immigrant effect': Opportunities for research"
University of Toronto, Dalla Lana School of Public Health Epidemiology Seminar Series, Toronto, Ontario, April, 2013

MPH Thesis Prospectus Presentation, University of Nevada, Las Vegas, School of Community Health Sciences, Las Vegas, Nevada, August 2011

MPH Oral Thesis Defense, University of Nevada, Las Vegas, School of Community Health Sciences, Las Vegas, Nevada, October 2011

Publications/Reports:

Researching Under/Never Screened and Hard to Reach Populations
Provincial Project, Final Report (April 30, 2014)

St. Jacques, K., Cruz, P. & Labus, B., (2013) Analysis of the morbidity and mortality of severe influenza infection in Clark County, Nevada for the 2010-2011 influenza season. *Nevada Journal of Public Health, 10* (1), pg. 8 – 16.

Awards and Honors:

Be Remarkable Award, Saint Joseph Mercy Health System, Fall 2018

University of Nevada, Las Vegas, School of Community Health Sciences
Outstanding Thesis Award, 2011

Certifications:

State of Michigan, Registered Nurse License #4704226765 current

BLS/ACLS certification current

Committee Membership/Service to the Department (DLSPH):

2015-2016 Ph.D. Epidemiology Admissions Committee Reviewer (December 2014)

Space and Facilities Committee Member, student representative (October 2014 – present)

Funding Advisory Committee, student representative (January 2013 – April 2013)

Community Service:

Village of Manchester, Parks and Recreation Commission Member, June 2018 - present

Faith in Action, volunteer RN for free public flu clinic, October 2015 – November 2015

Chelsea Senior Center, Meals on Wheels delivery volunteer, weekly from September 2014 to December 2015 - present (holidays only)

Toronto Public Library, adult literacy tutor, March 2012 – December 2012

Community Multicultural Center, adult literacy tutor, September 2009 – August 2011

Washtenaw Literacy, adult literacy tutor, February 2009 – July 2009

DTE Electric Company
WP LKM-5 PCA REF Annual Generation Report PCA A - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 1 of 5

SO2 Tons - SO2 Rate (LBS/MBTU) - CO2 Tons - CO2 Rate (LBS/MBTU)

SO2 Tons

Sum of SO2 Tor Column Labels

Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	10232	6884	10091	7988	10110	8468	10344	10389	8216	9961	8230	4173											
BllRvr 2	10616	10344	8155	10000	8715	11112	10911	8947	10844	8457	10742	10603	4254										
BLRPKR																							
DEAPKR																							
DELPKR																							
FERMI 2																							
Greenwd 1	3	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	11
GRNPKR																							
MnreMI 1	679	792	775	872	773	1041	1180	1156	924	1165	1174	1150	813	1203	1178	1149	911	1164	1166	1136	895	1163	
MnreMI 2	817	827	733	668	904	1067	1071	851	1114	1096	1061	834	957	1099	1056	836	1085	1085	1039	818	1065	1053	
MnreMI 3	785	707	789	766	793	725	800	797	798	698	791	783	805	697	799	779	786	689	791	789	775	760	
MnreMI 4	913	907	719	893	912	878	701	912	911	867	697	904	759	864	691	898	892	851	680	877	870	824	
PK HAN 1																							
PK HAN 2																							
PK NE 1																							
PK NE 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK NORTH	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK OTHER 1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK OTHER 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK SC																							
RENPKR 1																							
RENPKR 2																							
RENPKR 3																							
RENPKR 4																							
RROVER 3																							
RverRge 3	3078	4011	1402																				
StClair 1	2380	15																					
StClair 2	2328	1979	2115	2197	989																		
StClair 3	2015	2153	2160	2200	1002																		
StClair 6	4859	4366	4159	3619	1757																		
StClair 7	6050	4938	4925	4598	1284																		
TrntChnn 9	7819	5368	5925	5669	1933																		
BWEC																							
BWEC-D																							
CC 1x1 (2)																							11
CC 1x1 (3)																							11
CC 1x1 (4)																							11
RR CgBg 3			1201	2390	991																		
RROVER CgBg 3																							

	OVER BY	5%
NSR SO2 Baseline	2018	2019
10,427		
10,973		
6		
	2018	2019
1,189		
17,100		
802		
929		
6,372		
2,610		
2,669		
3,108		
7,845		
11,297		
13,492		

SO2 Rate (LBS/MBTU)

Sum of SO2 Rat Column Labels

Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62											
BllRvr 2	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62										
BLRPKR																							
DEAPKR																							
DELPKR																							
FERMI 2																							
Greenwd 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRNPKR																							
MnreMI 1	0.04	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
MnreMI 2	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 3	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
MnreMI 4	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
PK HAN 1																							
PK HAN 2																							
PK NE 1																							
PK NE 2	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK NORTH	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK OTHER 1	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK OTHER 2	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK SC																							
RENPKR 1																							
RENPKR 2																							
RENPKR 3																							
RENPKR 4																							
RROVER 3																							
RverRge 3	0.61	0.63	0.64																				
StClair 1	0.58	0.58																					
StClair 2	0.58	0.58	0.58	0.58	0.58																		
StClair 3	0.58	0.58	0.58	0.58	0.58																		
StClair 6	0.86	0.72	0.66	0.64	0.65																		
StClair 7	0.66	0.59	0.60	0.59	0.58																		
TrntChnn 9	0.80	0.57	0.57	0.53	0.55																		
BWEC																							
BWEC-D																							
CC 1x1 (2)																							0.00
CC 1x1 (3)																							0.00
CC 1x1 (4)																							0.00
RR CgBg 3			0.87	0.87	0.87																		
RROVER CgBg 3																							

DTE Electric Company
WP LKM-5 PCA REF Annual Generation Report PCA A - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 2 of 5

CO2 Tons

Sum of CO2 Tor	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	3520618	2368751	3472406	2748741	3478653	2913885	3559171	3574770	2827157	3427358	2831937	1435961											
BllRvr 2	3726867	3631612	2863113	3510719	3059445	3901058	3830355	3141082	3807012	2968908	3771159	3722444	1493495.994										
BLRPKR	63355	78850	66229	57509	65628	45291	43740	47655	43438	40467	41432	44147	51458.87857	66574	64357	74109	65807	70585	67254	57825	57235	64850	560724
BWEC					1849999	3116461	3119585	3120472	3083653	3107649	3129173	3135396	3190811.6	3197472	3192897	3179780	3130073	3146873	3105886	3078832	3017218	2975025	3114217
BWEC-D					90897	140141	138964	139130	126915	118709	121733	130402	152408.064	168225	172590	170139	164804	168024	169588	173863	161618	164293	243448
CC 1x1 (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1273806
CC 1x1 (3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1264590
CC 1x1 (4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1237625
DEAPKR	99324	105201	86746	76542	82956	64075	58636	61833	54518	49531	45313	53809	78394.71121	84445	82357	85693	89013	77187	75630	80072	68819	82525	218212
DELPKR	14156	16727	11745	12149	12435	14032	11388	11444	6530	10014	8268	9443	15004.17587	12735	16047	14805	12606	14030	15789	12004	12120	10387	48920
FERMI 2																							
Greenwd 1	282522	232992	252003	229061	197277	284430	259679	306274	279317	273575	303137	258312	329090.9388	329989	367655	398939	387688	396126	413625	447199	425941	385602	1168518
GRNPKR	35445	38336	32214	24914	26522	27234	21570	24823	23889	19215	19282	19517	28571.08418	37206	33554	38149	39249	33967	29557	34250	35226	34267	432676
MnreMI 1	3342610	4110353	4061949	4270452	3332385	4245341	4368547	4280530	3419279	4313943	4344347	4256276	3007570.488	4452945	4361052	4252681	3372557	4310158	4316038	4203857	3312874	4304115	
MnreMI 2	4207386	4358335	4031407	3288647	4122221	4474496	4202101	3339790	4368938	4300250	4160524	3271790	3755101.664	4311960	4143188	3280338	4254895	4255450	4076236	3207553	4178501	4129288	
MnreMI 3	3904090	3619740	4441687	4494953	4345814	3625405	4035672	4018749	4025985	3522107	3989225	3945758	4058572.416	3512506	4027207	3929986	3962777	3472278	3988432	3978149	3906870	3830189	
MnreMI 4	4722286	4723611	3685337	4576617	4672048	4438295	3607287	4690614	4688164	4461216	3587315	4649089	3904955.104	4446410	3556138	4620332	4587013	4379419	3497216	4510026	4477436	4238247	
PK HAN 1	1288	1793	1096	1345	1494	645	796	1493	1743	1244	1646	1144	1593.493965	2620	2247	2664	2179	2366	1146	2354	1050	1449	50392
PK HAN 2	1794	1962	1750	1161	1802	1963	1857	1703	1962	1375	687	1695	2533.598285	1535	2932	1994	3051	1428	2552	2173	2321	2444	61951
PK NE 1	1472	1565	1094	1429	822	1767	1431	1612	1397	1025	1567	957	1767.21222	1970	767	2307	2240	1835	892	1227	1497	1743	49926
PK NE 2	766	777	780	776	777	778	779	776	777	777	780	777	776.999275	777	780	776	777	777	780	776	777	777	779
PK NORTH	795	795	797	795	795	795	797	795	795	795	797	795	795.00699	795	797	847	795	795	797	795	795	795	1071
PK OTHER 1	795	795	797	797	795	795	797	797	800	795	797	795	794.972225	795	797	795	795	795	797	795	795	795	918
PK OTHER 2	835	835	837	834	835	835	837	837	835	835	838	835	834.64332	835	838	834	835	835	838	837	832	835	837
PK SC	957	1025	921	858	904	964	905	934	904	934	709	858	1009.531405	722	1117	903	1001	1070	1087	1039	677	994	15060
RENPKR 1	116440	123305	127457	80746	82800	69855	57699	63810	70328	58770	50323	59013	79753.70684	88497	96494	108266	106824	104953	97174	112017	110208	113346	105937
RENPKR 2	120240	116285	115353	85489	79771	57890	61361	57373	62698	45378	46207	62070	72978.52412	91266	93600	103658	105477	107420	102728	103438	98694	111208	116908
RENPKR 3	116506	117760	110037	80804	86372	59774	60015	56242	56440	48990	42489	51404	67924.71538	84943	92360	99520	100620	100645	101291	104565	96120	110230	119932
RENPKR 4	104699	128477	106452	80796	70144	61059	54402	56373	56736	47537	37313	46739	70800.00575	86988	95577	89293	92508	99180	96817	97454	97643	104827	123776
RR CgBg 3	0	0	389214	774668	321193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RROVER 3	14421	15468	21986																				
RROVER CgBg 3	0	0	2939	31274	8321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RverRge 3	1076382	1337899	463804																				
StClair 1	827324	5086																					
StClair 2	816873	694706	742535	771350	347251																		
StClair 3	713819	763395	765958	780100	355397																		
StClair 6	1125291	1218552	1251747	1129915	538473																		
StClair 7	1901874	1736122	1726819	1627740	461888																		
TrntChnn 9	2079578	2004875	2208356	2269913	748908																		
Grand Total	**32940809**	**31555985**	**31065569**	**31011092**	**28445022**	**27547264**	**27498374**	**26999911**	**27010211**	**26821397**	**26537000**	**25159426**	**20366997.53**	**20982207**	**20405349**	**20456807**	**20483583**	**20746195**	**20162151**	**20211100**	**20065270**	**20668229**	**10210225**

CO2 Rate (LBS/MBTU)

Sum of CO2 Rat	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	213	213	213	213	213	213	213	213	213	213	213	213											
BllRvr 2	217	217	217	217	217	217	217	217	217	217	217	217	217										
BLRPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
DEAPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
DELPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
FERMI 2																							
Greenwd 1	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
GRNPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
MnreMI 1	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 2	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 3	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 4	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
PK HAN 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK HAN 2	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK NE 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK NE 2	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK NORTH	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK OTHER 1	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK OTHER 2	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK SC	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 2	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 3	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 4	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RROVER 3	117	117	117																				
RverRge 3	212	212	212																				
StClair 1	201	201																					
StClair 2	203	203	203	203	203																		
StClair 3	205	205	205	205	205																		
StClair 6	200	200	200	200	200																		
StClair 7	209	209	209	209	209																		
TrntChnn 9	212	212	212	212	212																		
BWEC					118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
BWEC-D					118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
CC 1x1 (2)																							117
CC 1x1 (3)																							117
CC 1x1 (4)																							117
RR CgBg 3			284	284	284																		
RROVER CgBg 3			117	117	117																		

DTE Electric Company
WP LKM-5 PCA REF Annual Generation Report PCA A - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 3 of 5

Nox Tons

Sum of NOx To	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BlRvr 1	3486	2345	3438	2722	3444	2885	3524	3540	2799	3394	2804	1422											
BlRvr 2	3891	3792	2990	3666	3195	4073	4000	3280	3975	3100	3938	3887	1559										
BLRPKR	13	16	14	12	14	9	9	10	9	8	9	9	11	14	13	15	14	15	14	12	12	14	117
DEAPKR	21	22	18	16	17	13	12	13	11	10	9	11	16	18	17	18	19	16	16	17	14	17	46
DELPKR	4	5	3	3	3	4	3	3	2	3	2	3	4	4	4	4	4	4	4	3	3	3	14
FERMI 2																							
Greenwd 1	256	211	228	208	179	258	235	278	253	248	275	234	298	299	333	362	351	359	375	405	386	350	1059
GRNPKR	7	8	7	5	6	6	4	5	5	4	4	4	6	8	7	8	8	7	6	7	7	7	90
MnreMI 1	869	1068	1056	1110	866	1104	1136	1113	889	1121	1129	1106	782	1158	1134	1105	877	1120	1122	1093	861	1119	
MnreMI 2	882	913	845	689	864	937	880	700	915	901	872	685	787	903	868	687	891	892	854	672	875	865	
MnreMI 3	893	828	1016	1028	994	830	923	920	921	806	913	903	929	804	921	899	907	794	913	910	894	876	
MnreMI 4	1264	1264	986	1225	1250	1188	965	1255	1254	1194	960	1244	1045	1190	952	1236	1227	1172	936	1207	1198	1134	
PK HAN 1	3	4	2	3	3	1	2	3	4	3	4	3	4	6	5	6	5	5	3	5	2	3	112
PK HAN 2	11	12	11	7	11	12	11	10	12	8	4	10	16	9	18	12	19	9	16	13	14	15	379
PK NE 1	3	3	2	3	2	4	3	4	3	2	3	2	4	4	2	5	5	4	2	3	3	4	111
PK NE 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
PK NORTH	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5
PK OTHER 1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
PK OTHER 2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
PK SC	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	34
RENPKR 1	24	26	27	17	17	15	12	13	15	12	10	12	17	18	20	23	22	22	20	23	23	24	22
RENPKR 2	25	24	24	18	17	12	13	12	13	9	10	13	15	19	20	22	22	22	21	22	21	23	24
RENPKR 3	24	25	23	17	18	12	13	12	12	10	9	11	14	18	19	21	21	21	21	22	20	23	25
RENPKR 4	22	27	22	17	15	13	11	12	12	10	8	10	15	18	20	19	19	21	20	20	20	22	26
RROVER 3	3	3	5																				
RverRge 3	1234	1534	532																				
StClair 1	1174	7																					
StClair 2	1050	893	955	992	446																		
StClair 3	1051	1124	1128	1148	523																		
StClair 6	733	794	815	736	351																		
StClair 7	1409	1287	1280	1206	342																		
TrntChnn 9	1431	1379	1519	1562	515																		
BWEC					49	82	82	82	81	82	83	83	84	84	84	84	83	83	82	81	80	78	82
BWEC-D					2	4	4	4	3	3	3	3	4	4	5	4	4	4	4	5	4	4	6
CC 1x1 (2)																							66
CC 1x1 (3)																							66
CC 1x1 (4)																							65
RR CgBg 3			112	222	92																		
RROVER CgBg 3			5	7	2																		

NSR NOX Baselines
3,641
4,108
277
1,365
6,563
1,295
1,553
2,892
1,361
1,307
1,632
970
2,055
1,991

NOx Rate (LBS/MBTU)

Sum of NOx Ra	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BlRvr 1	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21											
BlRvr 2	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23										
BLRPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
DEAPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
DELPKR	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
FERMI 2																							
Greenwd 1	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
GRNPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
MnreMI 1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
MnreMI 3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 4	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
PK HAN 1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK HAN 2	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK NE 1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK NE 2	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK NORTH	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK OTHER 1	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK OTHER 2	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK SC	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
RENPKR 1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 3	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RROVER 3	0.02	0.02	0.02																				
RverRge 3	0.24	0.24	0.24																				
StClair 1	0.28	0.28																					
StClair 2	0.26	0.26	0.26	0.26	0.26																		
StClair 3	0.30	0.30	0.30	0.30	0.30																		
StClair 6	0.13	0.13	0.13	0.13	0.13																		
StClair 7	0.15	0.15	0.15	0.15	0.15																		
TrntChnn 9	0.15	0.15	0.15	0.15	0.15																		
BWEC					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BWEC-D					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CC 1x1 (2)																							0.01
CC 1x1 (3)																							0.01
CC 1x1 (4)																							0.01
RR CgBg 3			0.08	0.08	0.08																		
RROVER CgBg 3			0.02	0.02	0.02																		

DTE Electric Company
WP LKM-5 PCA REF Annual Generation Report PCA A - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 4 of 5

PM - Tons (Mbtu*1000*Lb/Mbtu/2000)

																							PM-Lb/MBTu	Hg -Lb/Mbtu
BllRvr 1	11.1	7.4	10.9	8.6	10.9	9.2	11.2	11.2	8.9	10.8	8.9	4.5											0.00067	0.000806
BllRvr 2	15.1	14.7	11.6	14.2	12.4	15.8	15.5	12.7	15.4	12.0	15.3	15.1	6.0										0.0008798	0.00084
BLRPKR																								
DEAPKR																								
DELPKR																								
FERMI 2																								
Greenwd 1	14.9	12.3	13.3	12.1	10.4	15.0	13.7	16.2	14.7	14.4	16.0	13.6	17.4	17.4	19.4	21.1	20.5	20.9	21.8	23.6	22.5	20.4	61.7	0.006873	
GRNPKR																								
MnreMI 1	66.3	81.5	80.5	84.7	66.1	84.2	86.6	84.9	67.8	85.5	86.1	84.4	59.6	88.3	86.5	84.3	66.9	85.5	85.6	83.3	65.7	85.3	0.0	0.0041596	0.000553
MnreMI 2	93.9	97.3	90.0	73.4	92.0	99.9	93.8	74.6	97.5	96.0	92.9	73.0	83.8	96.3	92.5	73.2	95.0	95.0	91.0	71.6	93.3	92.2	0.0	0.0046839	0.000528
MnreMI 3	67.1	62.2	76.3	77.2	74.7	62.3	69.3	69.0	69.2	60.5	68.5	67.8	69.7	60.3	69.2	67.5	68.1	59.6	68.5	68.3	67.1	65.8	0.0	0.0036057	0.00041
MnreMI 4	74.0	74.0	57.7	71.7	73.2	69.5	56.5	73.5	73.4	69.9	56.2	72.8	61.2	69.7	55.7	72.4	71.9	68.6	54.8	70.7	70.1	66.4	0.0	0.0032884	0.000304
PK HAN 1																								
PK HAN 2																								
PK NE 1																								
PK NE 2																								
PK NORTH																								
PK OTHER 1																								
PK OTHER 2																								
PK SC																								
RENPKR 1																								
RENPKR 2																								
RENPKR 3																								
RENPKR 4																								
RROVER 3																								
RverRge 3	30.3	37.7	13.1																					0.0059552	0.000512
StClair 1	6.2	0.0																						0.0015039	0.00073
StClair 2	10.5	9.0	9.6	10.0	4.5																			0.0026141	0.000795
StClair 3	1.1	1.2	1.2	1.2	0.6																			0.0003217	0.000789
StClair 6	11.1	12.1	12.4	11.2	5.3																			0.0019815	0.000789
StClair 7	56.5	51.5	51.3	48.3	13.7																			0.0061965	0.000565
TrntChnn 9	125.2	120.7	132.9	136.6	45.1																			0.0127489	0.000583
BWEC					56.4	95.1	95.2	95.2	94.1	94.8	95.5	95.7	97.3	97.6	97.4	97.0	95.5	96.0	94.8	93.9	92.1	90.8	95.0	0.0036	
BWEC-D					2.8	4.3	4.2	4.2	3.9	3.6	3.7	4.0	4.6	5.1	5.3	5.2	5.0	5.1	5.2	5.3	4.9	5.0	7.4	0.0036	
CC 1x1 (1)																									
CC 1x1 (2)																									
CC 1x1 (3)																									
CC 1x1 (4)			0.0	0.0																					

Hg - Lbs (Mbtu*1000)*(lb/Tbtu*10^6)

																							PM-Lb/MBTu	Hg -Lb/Tbtu
BllRvr 1	26.62	17.91	26.26	20.79	26.30	22.03	26.91	27.03	21.38	25.92	21.41	10.86											0.00067	0.805704
BllRvr 2	27.62	26.92	21.22	26.02	22.68	28.92	28.39	23.28	28.22	22.01	27.95	27.59	11.07										0.0008798	0.805704
BLRPKR																								
DEAPKR																								
DELPKR																								
FERMI 2																								
Greenwd 1																							0.006873	
GRNPKR																								
MnreMI 1	17.62	21.67	21.42	22.51	17.57	22.38	23.03	22.57	18.03	22.74	22.90	22.44	15.86	23.48	22.99	22.42	17.78	22.72	22.75	22.16	17.47	22.69	0.00	0.0041596	0.553051
MnreMI 2	21.19	21.95	20.30	16.56	20.76	22.54	21.16	16.82	22.00	21.66	20.95	16.48	18.91	21.72	20.87	16.52	21.43	21.43	20.53	16.15	21.04	20.80	0.00	0.0046839	0.528319
MnreMI 3	15.26	14.15	17.37	17.57	16.99	14.17	15.78	15.71	15.74	13.77	15.60	15.43	15.87	13.73	15.75	15.36	15.49	13.58	15.59	15.55	15.27	14.97	0.00	0.0036057	0.410317
MnreMI 4	13.67	13.67	10.67	13.24	13.52	12.84	10.44	13.57	13.57	12.91	10.38	13.45	11.30	12.87	10.29	13.37	13.27	12.67	10.12	13.05	12.96	12.27	0.00	0.0032884	0.303724
PK HAN 1																								
PK HAN 2																								
PK NE 1																								
PK NE 2																								
PK NORTH																								
PK OTHER 1																								
PK OTHER 2																								
PK SC																								
RENPKR 1																								
RENPKR 2																								
RENPKR 3																								
RENPKR 4																								
RROVER 3																								
RverRge 3	5.21	6.48	2.25																					0.0059552	0.512412
StClair 1	6.02	0.04																						0.0015039	0.730121
StClair 2	6.41	5.45	5.83	6.06	2.73																			0.0026141	0.795286
StClair 3	5.51	5.89	5.91	6.02	2.74																			0.0003217	0.789121
StClair 6	8.88	9.61	9.87	8.91	4.25																			0.0019815	0.788892
StClair 7	10.30	9.40	9.35	8.82	2.50																			0.0061965	0.565244
TrntChnn 9	11.45	11.04	12.16	12.50	4.12																			0.0127489	0.583159
BWEC																									
BWEC-D																									
CC 1x1 (1)																									
CC 1x1 (2)																									
CC 1x1 (3)																									
CC 1x1 (4)																									

DTE Electric Company
WP LKM-6 PCA REF Annual Generation Report PCA B - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 1 of 7

SO2 Tons - SO2 Rate (LBS/MBTU) - CO2 Tons - CO2 Rate (LBS/MBTU)

SO2 Tons

Sum of SO2 T	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	10232	6884	10091	7988	10110	8468	10344	10389	8217	9963	8232	4175											
BllRvr 2	10616	10344	8155	10000	8715	11112	10911	8947	10844	8458	10744	10608	4256										
BLRPKR																							
DEAPKR																							
DELPKR																							
FERMI 2																							
Greenwd 1	3	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	3	3	4	4	4	3	12
GRNPKR																							
MnreMI 1	679	792	775	872	773	1041	1180	1156	924	1166	1174	1150	810	1197	1168	1142	901	1146	1149	1126	885	1151	
MnreMI 2	817	827	733	668	904	1067	1071	851	1114	1096	1061	834	954	1088	1049	827	1074	1074	1030	807	1054	1040	
MnreMI 3	785	707	789	766	793	725	800	797	798	699	791	783	802	686	792	771	776	678	782	778	764	750	
MnreMI 4	913	907	719	893	912	878	701	912	911	867	697	904	755	858	683	890	881	843	670	864	858	813	
PK HAN 1																							
PK HAN 2																							
PK NE 1																							
PK NE 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK NORTH	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK OTHER 1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK OTHER 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK SC																							
RENPKR 1																							
RENPKR 2																							
RENPKR 3																							
RENPKR 4																							
RROVER 3																							
RverRge 3	3078	4011	1402																				
StClair 1	2380	15																					
StClair 2	2328	1979	2115	2197	989																		
StClair 3	2015	2153	2160	2200	1002																		
StClair 6	4859	4366	4159	3619	1757																		
StClair 7	6050	4938	4925	4598	1284																		
TrntChnn 9	7819	5368	5925	5669	1933																		
BWEC																							
BWEC-D																							
CC 1x1 (1)													6	11	11	11	11	11	10	10	10	10	11
CC 1x1 (2)																							11
CC 1x1 (3)																							10
CC 1x1 (4)																							10
RR CgBg 3			1201	2390	991																		
RROVER CgBg																							

	NSR SO2 Baseline	OVER BY 2018	OVER BY 5% 2019
	10,427		
	10,973		
	6		
		2018	2019
	1,189		
	17,100		
	802		
	929		
	6,372		
	2,610		
	2,669		
	3,108		
	7,845		
	11,297		
	13,492		

DTE Electric Company
WP LKM-6 PCA REF Annual Generation Report PCA B - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 2 of 7

SO2 Rate (LBS/MBTU)

Sum of SO2 R Column Labels																							
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62											
BllRvr 2	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62										
BLRPKR																							
DEAPKR																							
DELPKR																							
FERMI 2																							
Greenwd 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRNPKR																							
MnreMI 1	0.04	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
MnreMI 2	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 3	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
MnreMI 4	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
PK HAN 1																							
PK HAN 2																							
PK NE 1																							
PK NE 2	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK NORTH	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK OTHER 1	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK OTHER 2	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK SC																							
RENPKR 1																							
RENPKR 2																							
RENPKR 3																							
RENPKR 4																							
RROVER 3																							
RverRge 3	0.61	0.63	0.64																				
StClair 1	0.58	0.58																					
StClair 2	0.58	0.58	0.58	0.58	0.58																		
StClair 3	0.58	0.58	0.58	0.58	0.58																		
StClair 6	0.86	0.72	0.66	0.64	0.65																		
StClair 7	0.66	0.59	0.60	0.59	0.58																		
TrntChnn 9	0.80	0.57	0.57	0.53	0.55																		
BWEC																							
BWEC-D																							
CC 1x1 (1)													0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CC 1x1 (2)																							0.00
CC 1x1 (3)																							0.00
CC 1x1 (4)																							0.00
RR CgBg 3			0.87	0.87	0.87																		
RROVER CgBg																							

DTE Electric Company
WP LKM-6 PCA REF Annual Generation Report PCA B - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 3 of 7

CO2 Tons

Sum of CO2 T	Column Labels																					
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	3520618	2368751	3472406	2748741	3478653	2913885	3559171	3574770	2827429	3428074	2832475	1436708											
BllRvr 2	3726867	3631612	2863113	3510719	3059445	3901058	3830355	3141082	3807084	2969167	3771923	3724115	1494030.161										
BLRPKR	63355	78850	66229	57509	65628	45291	43740	47655	43463	40524	41591	44219	47909.2047	56843	53383	62518	54876	55071	57444	45380	47599	52941	88865
BWEC					1849999	3116461	3119585	3120472	3084039	3108075	3131093	3136393	3179471.648	3161441	3150920	3140404	3080423	3098130	3057361	3026479	2959552	2913921	3071062
BWEC-D					90897	140141	138964	139130	126948	118828	121953	130562	148856.776	155704	161915	159412	153469	154582	157957	160783	149681	150454	230404
CC 1x1 (1)	0	0	0	0	0	0	0	0	0	0	0	0	749810.936	1284778	1280376	1273649	1239174	1252273	1218922	1214327	1183692	1167041	1260309
CC 1x1 (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1258255
CC 1x1 (3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1228300
CC 1x1 (4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1225569
DEAPKR	99324	105201	86746	76542	82956	64075	58636	61833	54574	49581	45417	53793	71666.4565	70854	68353	72898	73636	59288	63167	60754	55324	66273	87689
DELPKR	14156	16727	11745	12149	12435	14032	11388	11444	6536	10032	8290	9468	14058.38463	10458	13905	13785	10522	11195	13205	9401	9357	8845	11815
FERMI 2																							
Greenwd 1	282522	232992	252003	229061	197277	284430	259679	306274	279443	273938	303062	258849	318329.7599	298742	319458	356071	340956	338182	356658	379888	371669	336224	1223717
GRNPKR	35445	38336	32214	24914	26522	27234	21570	24823	23917	19248	19350	19550	26558.4951	31250	28496	32827	33183	27054	23814	25370	28361	29341	38268
MnreMI 1	3342610	4110353	4061949	4270452	3332385	4245341	4368547	4280530	3419340	4314440	4345021	4256445	2998957.536	4432352	4322590	4227895	3335641	4240186	4251705	4168415	3274181	4260404	
MnreMI 2	4207386	4358335	4031407	3288647	4122221	4474496	4202101	3339790	4369068	4300464	4160619	3272379	3740987.456	4267340	4116122	3243615	4210898	4213136	4039963	3164239	4133844	4080880	
MnreMI 3	3904090	3619740	4441687	4494953	4345814	3625405	4035672	4018749	4026200	3522356	3989995	3946183	4045170.192	3460457	3996017	3885274	3912443	3417540	3943710	3922085	3850756	3781899	
MnreMI 4	4722286	4723611	3685337	4576617	4672048	4438295	3607287	4690614	4688194	4461336	3587516	4649420	3886808.8	4415174	3512475	4579785	4531185	4337519	3444798	4446859	4414492	4181555	
PK HAN 1	1288	1793	1096	1345	1494	645	796	1493	1743	1244	1646	1144	1593.495525	2482	2094	2541	1963	2113	947	2203	1013	1344	61194
PK HAN 2	1794	1962	1750	1161	1802	1963	1857	1703	1962	1375	691	1695	2549.93182	1525	2672	1802	2657	1215	2141	1903	2090	2507	76122
PK NE 1	1472	1565	1094	1429	822	1767	1431	1612	1398	1025	1567	957	1822.39182	1970	757	2172	2188	1488	780	970	1295	1700	88579
PK NE 2	766	777	780	776	777	778	779	776	777	777	780	777	776.96036	777	780	776	777	777	780	776	777	777	779
PK NORTH	795	795	797	795	795	795	797	795	795	795	797	795	794.97488	795	797	797	795	795	797	795	795	795	973
PK OTHER 1	795	795	797	797	795	795	797	797	800	795	797	795	795.020815	795	797	795	795	795	797	795	795	795	918
PK OTHER 2	835	835	837	834	835	835	837	837	835	835	838	835	834.69155	835	838	834	835	835	838	837	832	835	837
PK SC	957	1025	921	858	904	964	905	934	904	934	709	858	1009.533265	692	1057	873	934	934	963	969	689	968	19788
RENPKR 1	116440	123305	127457	80746	82800	69855	57699	63810	70350	58722	50454	59165	77614.33736	83088	91179	102046	99004	100025	90985	103012	103669	103323	62017
RENPKR 2	120240	116285	115353	85489	79771	57890	61361	57373	62738	45479	46291	62274	71140.39848	85236	85939	96796	95994	98925	94403	93033	91128	99827	70274
RENPKR 3	116506	117760	110037	80804	86372	59774	60015	56242	56460	49090	42558	51494	66015.69655	79201	84243	91548	91836	90706	91169	95114	87156	97086	70705
RENPKR 4	104699	128477	106452	80796	70144	61059	54402	56373	56771	47568	37415	46856	68531.23429	79406	86060	80637	81635	87274	85325	87787	87250	90099	68408
RR CgBg 3	0	0	389214	774668	321193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RROVER 3	14421	15468	21986																				
RROVER CgBg	0	0	22939	31274	8321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RverRge 3	1076382	1337899	463804																				
StClair 1	827324	5086																					
StClair 2	816873	694706	742535	771350	347251																		
StClair 3	713819	763395	765958	780100	355397																		
StClair 6	1125291	1218552	1251747	1129915	538473																		
StClair 7	1901874	1736122	1726819	1627740	461888																		
TrntChnn 9	2079578	2004875	2208356	2269913	748908																		
Grand Total	**32940809**	**31555985**	**31065569**	**31011092**	**28445022**	**27547264**	**27498374**	**26999911**	**27011768**	**26824702**	**26542847**	**25165729**	**21016094.47**	**21982195**	**21381221**	**21429752**	**21355818**	**21590033**	**20998628**	**21012174**	**20855998**	**21429833**	**10244848**

DTE Electric Company
WP LKM-6 PCA REF Annual Generation Report PCA B - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 4 of 7

CO2 Rate (LBS/MBTU)

Sum of CO2 R	Column Labels																					
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	213	213	213	213	213	213	213	213	213	213	213	213											
BllRvr 2	217	217	217	217	217	217	217	217	217	217	217	217	217										
BLRPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
DEAPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
DELPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
FERMI 2																							
Greenwd 1	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
GRNPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
MnreMI 1	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 2	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 3	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 4	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
PK HAN 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK HAN 2	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK NE 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK NE 2	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK NORTH	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK OTHER 1	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK OTHER 2	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK SC	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 2	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 3	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 4	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RROVER 3	117	117	117																				
RverRge 3	212	212	212																				
StClair 1	201	201																					
StClair 2	203	203	203	203	203																		
StClair 3	205	205	205	205	205																		
StClair 6	200	200	200	200	200																		
StClair 7	209	209	209	209	209																		
TrntChnn 9	212	212	212	212	212																		
BWEC					118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
BWEC-D					118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
CC 1x1 (1)													117	117	117	117	117	117	117	117	117	117	117
CC 1x1 (2)																							117
CC 1x1 (3)																							117
CC 1x1 (4)																							117
RR CgBg 3			284	284	284																		
RROVER CgBg			117	117	117																		

DTE Electric Company
WP LKM-6 PCA REF Annual Generation Report PCA B - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 5 of 7

Nox Tons

Sum of NOx T Column Labels																								
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	NSR NOX Baselines
BllRvr 1	3486	2345	3438	2722	3444	2885	3524	3540	2800	3394	2805	1423												3,641
BllRvr 2	3891	3792	2990	3666	3195	4073	4000	3280	3975	3100	3938	3889	1560											4,108
BLRPKR	13	16	14	12	14	9	9	10	9	8	9	9	10	12	11	13	11	11	12	9	10	11	19	
DEAPKR	21	22	18	16	17	13	12	13	11	10	9	11	15	15	14	15	15	12	13	13	12	14	18	
DELPKR	4	5	3	3	3	4	3	3	2	3	2	3	4	3	4	4	3	3	4	3	3	2	3	
FERMI 2																								
Greenwd 1	256	211	228	208	179	258	235	278	253	248	275	235	289	271	290	323	309	307	323	344	337	305	1109	277
GRNPKR	7	8	7	5	6	6	4	5	5	4	4	4	6	7	6	7	7	6	5	5	6	6	8	
MnreMI 1	869	1068	1056	1110	866	1104	1136	1113	889	1122	1129	1106	780	1152	1124	1099	867	1102	1105	1084	851	1108		1,365
MnreMI 2	882	913	845	689	864	937	880	700	915	901	872	686	784	894	862	680	882	883	846	663	866	855		6,563
MnreMI 3	893	828	1016	1028	994	830	923	920	921	806	913	903	926	792	914	889	895	782	902	897	881	865		1,295
MnreMI 4	1264	1264	986	1225	1250	1188	965	1255	1254	1194	960	1244	1040	1181	940	1225	1212	1161	922	1190	1181	1119		1,553
PK HAN 1	3	4	2	3	3	1	2	3	4	3	4	3	4	6	5	6	4	5	2	5	2	3	136	
PK HAN 2	11	12	11	7	11	12	11	10	12	8	4	10	16	9	16	11	16	7	13	12	13	15	466	
PK NE 1	3	3	2	3	2	4	3	4	3	2	3	2	4	4	2	5	5	3	2	2	3	4	197	
PK NE 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
PK NORTH	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
PK OTHER 1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
PK OTHER 2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
PK SC	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	44	
RENPKR 1	24	26	27	17	17	15	12	13	15	12	11	12	16	17	19	21	21	21	19	21	22	22	13	
RENPKR 2	25	24	24	18	17	12	13	12	13	9	10	13	15	18	18	20	20	21	20	19	19	21	15	
RENPKR 3	24	25	23	17	18	12	13	12	12	10	9	11	14	17	18	19	19	19	19	20	18	20	15	
RENPKR 4	22	27	22	17	15	13	11	12	12	10	8	10	14	17	18	17	17	18	18	18	18	19	14	
RROVER 3	3	3	5																					
RverRge 3	1234	1534	532																					2,892
StClair 1	1174	7																						1,361
StClair 2	1050	893	955	992	446																			1,307
StClair 3	1051	1124	1128	1148	523																			1,632
StClair 6	733	794	815	736	351																			970
StClair 7	1409	1287	1280	1206	342																			2,055
TrntChnn 9	1431	1379	1519	1562	515																			1,991
BWEC					49	82	82	82	81	82	83	83	84	83	83	83	81	82	81	80	78	77	81	
BWEC-D					2	4	4	4	3	3	3	3	4	4	4	4	4	4	4	4	4	4	6	
CC 1x1 (1)													39	67	67	66	65	65	64	63	62	61	66	
CC 1x1 (2)																							66	
CC 1x1 (3)																							64	
CC 1x1 (4)																							64	
RR CgBg 3			112	222	92																			
RROVER CgBg			5	7	2																			

DTE Electric Company
WP LKM-6 PCA REF Annual Generation Report PCA B - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 6 of 7

NOx Rate (LBS/MBTU)

Sum of NOx R	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21											
BllRvr 2	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23										
BLRPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
DEAPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
DELPKR	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
FERMI 2																							
Greenwd 1	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
GRNPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
MnreMI 1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
MnreMI 3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 4	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
PK HAN 1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK HAN 2	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK NE 1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK NE 2	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK NORTH	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK OTHER 1	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK OTHER 2	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK SC	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
RENPKR 1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 3	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RROVER 3	0.02	0.02	0.02																				
RverRge 3	0.24	0.24	0.24																				
StClair 1	0.28	0.28																					
StClair 2	0.26	0.26	0.26	0.26	0.26																		
StClair 3	0.30	0.30	0.30	0.30	0.30																		
StClair 6	0.13	0.13	0.13	0.13	0.13																		
StClair 7	0.15	0.15	0.15	0.15	0.15																		
TrntChnn 9	0.15	0.15	0.15	0.15	0.15																		
BWEC					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BWEC-D					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CC 1x1 (1)													0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
CC 1x1 (2)																							0.01
CC 1x1 (3)																							0.01
CC 1x1 (4)																							0.01
RR CgBg 3			0.08	0.08	0.08																		
RROVER CgBg			0.02	0.02	0.02																		

DTE Electric Company
WP LKM-6 PCA REF Annual Generation Report PCA B - Emissions Tab
Emissions

PM - Tons (Mbtu*1000*Lb/Mbtu/2000)

																							PM-Lb/MBT	Hg -Lb/Mbtu
BllRvr 1	11.1	7.4	10.9	8.6	10.9	9.2	11.2	11.2	8.9	10.8	8.9	4.5											0.00067	0.00081
BllRvr 2	15.1	14.7	11.6	14.2	12.4	15.8	15.5	12.7	15.4	12.0	15.3	15.1	6.0										0.00088	0.00084
BLRPKR																								
DEAPKR																								
DELPKR																								
FERMI 2																								
Greenwd 1	14.9	12.3	13.3	12.1	10.4	15.0	13.7	16.2	14.8	14.5	16.0	13.7	16.8	15.8	16.9	18.8	18.0	17.9	18.8	20.1	19.6	17.7	64.6	0.006873	
GRNPKR																								
MnreMI 1	66.3	81.5	80.5	84.7	66.1	84.2	86.6	84.9	67.8	85.5	86.1	84.4	59.5	87.9	85.7	83.8	66.1	84.1	84.3	82.6	64.9	84.5	0.0	0.00416	0.00055
MnreMI 2	93.9	97.3	90.0	73.4	92.0	99.9	93.8	74.6	97.5	96.0	92.9	73.1	83.5	95.3	91.9	72.4	94.0	94.1	90.2	70.6	92.3	91.1	0.0	0.004684	0.00053
MnreMI 3	67.1	62.2	76.3	77.2	74.7	62.3	69.3	69.0	69.2	60.5	68.5	67.8	69.5	59.4	68.6	66.7	67.2	58.7	67.7	67.4	66.1	65.0	0.0	0.003606	0.00041
MnreMI 4	74.0	74.0	57.7	71.7	73.2	69.5	56.5	73.5	73.4	69.9	56.2	72.8	60.9	69.2	55.0	71.7	71.0	68.0	54.0	69.7	69.2	65.5	0.0	0.003288	0.0003
PK HAN 1																								
PK HAN 2																								
PK NE 1																								
PK NE 2																								
PK NORTH																								
PK OTHER 1																								
PK OTHER 2																								
PK SC																								
RENPKR 1																								
RENPKR 2																								
RENPKR 3																								
RENPKR 4																								
RROVER 3																								
RverRge 3	30.3	37.7	13.1																				0.005955	0.00051
StClair 1	6.2	0.0																					0.001504	0.00073
StClair 2	10.5	9.0	9.6	10.0	4.5																		0.002614	0.0008
StClair 3	1.1	1.2	1.2	1.2	0.6																		0.000322	0.00079
StClair 6	11.1	12.1	12.4	11.2	5.3																		0.001982	0.00079
StClair 7	56.5	51.5	51.3	48.3	13.7																		0.006197	0.00057
TrntChnn 9	125.2	120.7	132.9	136.6	45.1																		0.012749	0.00058
BWEC					56.4	95.1	95.2	95.2	94.1	94.8	95.5	95.7	97.0	96.5	96.1	95.8	94.0	94.5	93.3	92.3	90.3	88.9	93.7	0.0036	
BWEC-D					2.8	4.3	4.2	4.2	3.9	3.6	3.7	4.0	4.5	4.8	4.9	4.9	4.7	4.7	4.8	4.9	4.6	4.6	7.0	0.0036	
CC 1x1 (1)																								
CC 1x1 (2)																								
CC 1x1 (3)																								
CC 1x1 (4)																								

Hg - Lbs (Mbtu*1000)*(lb/Tbtu*10^6)

																							PM-Lb/MBT	Hg -Lb/Tbtu
BllRvr 1	26.62	17.91	26.26	20.79	26.30	22.03	26.91	27.03	21.38	25.92	21.42	10.86											0.00067	0.8057
BllRvr 2	27.62	26.92	21.22	26.02	22.68	28.92	28.39	23.28	28.22	22.01	27.96	27.60	11.07										0.00088	0.8057
BLRPKR																								
DEAPKR																								
DELPKR																								
FERMI 2																								
Greenwd 1																							0.006873	
GRNPKR																								
MnreMI 1	17.62	21.67	21.42	22.51	17.57	22.38	23.03	22.57	18.03	22.75	22.91	22.44	15.81	23.37	22.79	22.29	17.59	22.36	22.42	21.98	17.26	22.46	0.00	0.00416	0.55305
MnreMI 2	21.19	21.95	20.30	16.56	20.76	22.54	21.16	16.82	22.00	21.66	20.95	16.48	18.84	21.49	20.73	16.34	21.21	21.22	20.35	15.94	20.82	20.55	0.00	0.004684	0.52832
MnreMI 3	15.26	14.15	17.37	17.57	16.99	14.17	15.78	15.71	15.74	13.77	15.60	15.43	15.82	13.53	15.62	15.19	15.30	13.36	15.42	15.33	15.06	14.79	0.00	0.003606	0.41032
MnreMI 4	13.67	13.67	10.67	13.24	13.52	12.84	10.44	13.57	13.57	12.91	10.38	13.46	11.25	12.78	10.16	13.25	13.11	12.55	9.97	12.87	12.78	12.10	0.00	0.003288	0.30372
PK HAN 1																								
PK HAN 2																								
PK NE 1																								
PK NE 2																								
PK NORTH																								
PK OTHER 1																								
PK OTHER 2																								
PK SC																								
RENPKR 1																								
RENPKR 2																								
RENPKR 3																								
RENPKR 4																								
RROVER 3																								
RverRge 3	5.21	6.48	2.25																				0.005955	0.51241
StClair 1	6.02	0.04																					0.001504	0.73012
StClair 2	6.41	5.45	5.83	6.06	2.73																		0.002614	0.79529
StClair 3	5.51	5.89	5.91	6.02	2.74																		0.000322	0.78912
StClair 6	8.88	9.61	9.87	8.91	4.25																		0.001982	0.78889
StClair 7	10.30	9.40	9.35	8.82	2.50																		0.006197	0.56524
TrntChnn 9	11.45	11.04	12.16	12.50	4.12																		0.012749	0.58316
BWEC																								
BWEC-D																								
CC 1x1 (1)																								
CC 1x1 (2)																								
CC 1x1 (3)																								
CC 1x1 (4)																								

DTE Electric Company
WP LKM-7 PCA REF Annual Generation Report PCA C - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 1 of 5

SO2 Tons - SO2 Rate (LBS/MBTU) - CO2 Tons - CO2 Rate (LBS/MBTU)

SO2 Tons

Sum of SO2 Tons	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	10232	6884	10091	7988	10124	8493	10376	10437	8252	10077	8316	4280											
BllRvr 2	10616	10344	8155	9999	8720	11147	10922	8959	10929	8503	10858	10749	4299										
BLRPKR																							
DEAPKR																							
DELPKR																							
FERMI 2																							
Greenwd 1	3	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	5	4	4	13
GRNPKR																							
MnreMI 1	679	792	775	872	773	1041	1182	1156	924	1176	1184	1154	815	1207	1185	1153	918	1179	1183	1147	906	1176	
MnreMI 2	817	827	733	668	904	1069	1072	854	1115	1102	1066	843	964	1109	1064	843	1097	1096	1051	828	1077	1066	
MnreMI 3	785	707	789	766	793	726	802	800	801	701	798	788	811	706	806	785	794	698	802	797	784	767	
MnreMI 4	913	907	719	893	913	878	701	912	911	868	700	908	762	870	699	904	900	860	689	890	883	836	
PK HAN 1																							
PK HAN 2																							
PK NE 1																							
PK NE 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK NORTH	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK OTHER 1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK OTHER 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK SC																							
RENPKR 1																							
RENPKR 2																							
RENPKR 3																							
RENPKR 4																							
RROVER 3																							
RverRge 3	3078	4011	1402																				
StClair 1	2380	15																					
StClair 2	2328	1979	2115	2198	990																		
StClair 3	2015	2153	2160	2201	1004																		
StClair 6	4859	4366	4159	3619	1758																		
StClair 7	6050	4938	4925	4599	1285																		
TrntChnn 9	7819	5368	5925	5670	1935																		
BWEC																							
BWEC-D																							
CC 1x1 (2)																							11
CC 1x1 (3)																							11
CC 1x1 (4)																							11
RR CgBg 3			1201	2390	991																		
RROVER CgBg 3																							

	OVER BY	5%
NSR SO2 Baselines	2018	2019
10,427		
10,973		
6		
	2018	2019
1,189		
17,100		
802		
929		
6,372		
2,610		
2,669		
3,108		
7,845		
11,297		
13,492		

SO2 Rate (LBS/MBTU)

Sum of SO2 Rate	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62											
BllRvr 2	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62										
BLRPKR																							
DEAPKR																							
DELPKR																							
FERMI 2																							
Greenwd 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRNPKR																							
MnreMI 1	0.04	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
MnreMI 2	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 3	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
MnreMI 4	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
PK HAN 1																							
PK HAN 2																							
PK NE 1																							
PK NE 2	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK NORTH	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK OTHER 1	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK OTHER 2	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK SC																							
RENPKR 1																							
RENPKR 2																							
RENPKR 3																							
RENPKR 4																							
RROVER 3																							
RverRge 3	0.61	0.63	0.64																				
StClair 1	0.58	0.58																					
StClair 2	0.58	0.58	0.58	0.58	0.58																		
StClair 3	0.58	0.58	0.58	0.58	0.58																		
StClair 6	0.86	0.72	0.66	0.64	0.65																		
StClair 7	0.66	0.59	0.60	0.59	0.58																		
TrntChnn 9	0.80	0.57	0.57	0.53	0.55																		
BWEC																							
BWEC-D																							
CC 1x1 (2)																							0.00
CC 1x1 (3)																							0.00
CC 1x1 (4)																							0.00
RR CgBg 3			0.88	0.87	0.87																		
RROVER CgBg 3																							

DTE Electric Company
WP LKM-7 PCA REF Annual Generation Report PCA C - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 2 of 5

CO2 Tons

Sum of CO2 Tons	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	3520618	2368757	3472406	2748486	3483478	2922284	3570456	3591140	2839395	3467546	2861465	1472768											
BllRvr 2	3726867	3631528	2863114	3510385	3061140	3913350	3834341	3145328	3836973	2985071	3811832	3773467	1509186.554										
BLRPKR	63355	78857	66229	57729	65823	46820	45245	48269	45356	43713	44449	47130	53714.67673	70267	68552	77082	69614	74163	71597	61223	60424	66180	266557
BWEC					1853994	3137166	3129413	3132890	3113222	3142144	3161227	3162536	3206263.68	3214573	3217622	3210847	3186503	3194267	3185771	3150788	3103479	3071930	3174987
BWEC-D					91478	142642	140814	142141	131068	124393	128806	135585	156617.441	175522	177108	176306	173279	175380	178543	181306	169002	170531	251856
CC 1x1 (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1297997
CC 1x1 (3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1297177
CC 1x1 (4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1277549
DEAPKR	99324	105186	86746	76420	84073	66083	60000	64581	59287	52051	51258	57711	83173.64804	90917	91076	92488	93454	80404	82195	81727	73914	84362	323241
DELPKR	14156	16727	11745	12149	12623	13974	11293	12064	7966	11493	8881	9437	15431.78978	13825	17632	15951	13137	15154	17800	14098	12852	11247	64392
FERMI 2																							
Greenwd 1	282522	232940	252003	229029	199247	288874	264070	313527	286063	282898	316314	270269	330719.5232	347239	375636	410267	408750	415093	435440	463042	444427	399807	1355456
GRNPKR	35445	38361	32214	24847	26594	27669	21673	25878	26576	21847	21410	19802	29705.00932	40313	37886	41607	40854	36295	31798	37873	37651	36217	100790
MnreMI 1	3342610	4110353	4061949	4270589	3333065	4245385	4376040	4280530	3420871	4351256	4380936	4270701	3015411.012	4467265	4387803	4266179	3399141	4364831	4380301	4244750	3353484	4354227	
MnreMI 2	4207386	4358315	4031407	3288531	4123862	4483660	4204149	3347975	4372798	4323601	4181980	3306906	3779920.592	4349592	4175226	3308134	4302257	4300699	4123587	3248867	4224880	4180762	
MnreMI 3	3904090	3619761	4441687	4494951	4347795	3628861	4044174	4032843	4038125	3533600	4024717	3975237	4088726.544	3559717	4062485	3960188	4003532	3519133	4041888	4018873	3951220	3866936	
MnreMI 4	4722286	4723583	3685337	4576536	4675368	4439052	3607953	4691350	4688078	4463413	3603413	4673524	3922375.408	4475158	3593674	4651872	4630599	4423559	3547165	4579019	4542208	4303062	
PK HAN 1	1288	1793	1096	1345	1494	645	796	1493	1843	1244	1610	1144	1643.36975	2691	2344	2691	2279	2549	1255	2508	1344	1494	33902
PK HAN 2	1794	1962	1750	1161	1802	1963	1857	1748	2069	1375	682	1695	2588.36141	1695	3068	2048	3182	1527	2819	2336	2638	2657	44521
PK NE 1	1472	1565	1094	1429	822	1767	1431	1632	1430	1025	1567	957	1834.72278	2037	824	2239	2307	1936	894	1294	1767	1919	44395
PK NE 2	766	777	780	776	777	778	779	776	777	777	780	777	776.945015	777	780	776	777	777	780	776	777	777	779
PK NORTH	795	795	797	795	795	795	797	795	795	795	797	795	794.9563	795	797	797	795	795	797	795	795	795	1041
PK OTHER 1	795	795	797	797	795	795	797	797	800	795	797	795	795.01345	795	797	795	795	795	797	795	795	795	918
PK OTHER 2	835	835	837	834	835	835	837	837	835	835	838	835	834.67221	835	838	834	835	835	838	837	832	835	837
PK SC	957	1025	921	858	904	949	905	967	919	949	709	858	1009.498655	737	1148	903	1013	1081	1178	1085	692	1040	11423
RENPKR 1	116440	123326	127457	80677	83401	70543	59368	66023	71278	60187	52877	60126	80676.13654	89996	97812	109519	108318	106488	100588	115346	112496	115438	171536
RENPKR 2	120240	116302	115353	85866	80277	58687	62086	58574	64002	46552	49047	63710	74351.20693	92884	94743	106249	107619	108299	107288	105064	99897	112574	178629
RENPKR 3	116506	117812	110037	80924	87080	61379	61080	56791	58124	50772	44384	52415	69747.31783	87172	93483	101262	102287	100971	105819	106645	98414	112830	182756
RENPKR 4	104699	128463	106452	81042	70583	61985	55280	56812	59071	50116	39262	48159	71952.96947	90107	97192	91783	94849	101284	100023	100583	100274	105885	191567
RR CgBg 3	0	0	389214	774668	321193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RROVER 3	14421	15468	21986																				
RROVER CgBg 3	0	0	22939	31410	8521	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RverRge 3	1076382	1337899	463804																				
StClair 1	827324	5086																					
StClair 2	816873	694699	742535	771464	347527																		
StClair 3	713819	763430	765958	780171	355998																		
StClair 6	1125291	1218526	1251747	1129951	538759																		
StClair 7	1901874	1736056	1726819	1628110	462351																		
TrntChnn 9	2079578	2004887	2208356	2270110	749508																		
Grand Total	**32940809**	**31555869**	**31065569**	**31012037**	**28471961**	**27616941**	**27555635**	**27075763**	**27127720**	**27018447**	**26790035**	**25407339**	**20498251.05**	**21174910**	**20598525**	**20630815**	**20746175**	**21026314**	**20519161**	**20519629**	**20394263**	**21002299**	**10272306**

CO2 Rate (LBS/MBTU)

Sum of CO2 Rate	Column Labels																						
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	213	213	213	213	213	213	213	213	213	213	213	213											
BllRvr 2	217	217	217	217	217	217	217	217	217	217	217	217	217										
BLRPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
DEAPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
DELPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
FERMI 2																							
Greenwd 1	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
GRNPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
MnreMI 1	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 2	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 3	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 4	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
PK HAN 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK HAN 2	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK NE 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK NE 2	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK NORTH	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK OTHER 1	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK OTHER 2	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK SC	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 2	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 3	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 4	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RROVER 3	117	117	117																				
RverRge 3	212	212	212																				
StClair 1	201	201																					
StClair 2	203	203	203	203	203																		
StClair 3	205	205	205	205	205																		
StClair 6	200	200	200	200	200																		
StClair 7	209	209	209	209	209																		
TrntChnn 9	212	212	212	212	212																		
BWEC					118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
BWEC-D					118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
CC 1x1 (2)																							117
CC 1x1 (3)																							117
CC 1x1 (4)																							117
RR CgBg 3			284	284	284																		
RROVER CgBg 3			117	117	117																		

DTE Electric Company
WP LKM-7 PCA REF Annual Generation Report PCA C - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 3 of 5

Nox Tons

Sum of NOx Ton Column Labels

Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	NSR NOX Baselines
BllRvr 1	3486	2345	3438	2721	3449	2893	3535	3556	2811	3433	2833	1458												3,641
BllRvr 2	3891	3792	2990	3665	3196	4086	4004	3284	4006	3117	3980	3940	1576											4,108
BLRPKR	13	16	14	12	14	10	9	10	9	9	9	10	11	15	14	16	15	15	15	13	13	14	56	
DEAPKR	21	22	18	16	18	14	13	13	12	11	11	12	17	19	19	19	19	17	17	17	15	18	67	
DELPKR	4	5	3	3	4	4	3	3	2	3	2	3	4	4	5	4	4	4	5	4	4	3	18	
FERMI 2																								
Greenwd 1	256	211	228	208	181	262	239	284	259	256	287	245	300	315	341	372	371	376	395	420	403	362	1229	277
GRNPKR	7	8	7	5	6	6	5	5	6	5	4	4	6	8	8	9	9	8	7	8	8	8	21	
MnreMI 1	869	1068	1056	1110	866	1104	1138	1113	889	1131	1139	1110	784	1161	1141	1109	884	1135	1139	1103	872	1132		1,365
MnreMI 2	882	913	845	689	864	939	881	701	916	906	876	693	792	911	875	693	901	901	864	681	885	876		6,563
MnreMI 3	893	828	1016	1028	995	830	925	923	924	809	921	910	936	814	930	906	916	805	925	920	904	885		1,295
MnreMI 4	1264	1264	986	1225	1251	1188	965	1255	1254	1194	964	1251	1050	1197	962	1245	1239	1184	949	1225	1215	1151		1,553
PK HAN 1	3	4	2	3	3	1	2	3	4	3	4	3	4	6	5	6	5	6	3	6	3	3	75	
PK HAN 2	11	12	11	7	11	12	11	11	13	8	4	10	16	10	19	13	19	9	17	14	16	16	272	
PK NE 1	3	3	2	3	2	4	3	4	3	2	3	2	4	5	2	5	5	4	2	3	4	4	99	
PK NE 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
PK NORTH	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	
PK OTHER 1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
PK OTHER 2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
PK SC	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	3	2	2	2	25	
RENPKR 1	24	26	27	17	17	15	12	14	15	13	11	13	17	19	20	23	23	22	21	24	23	24	36	
RENPKR 2	25	24	24	18	17	12	13	12	13	10	10	13	16	19	20	22	22	23	22	22	21	23	37	
RENPKR 3	24	25	23	17	18	13	13	12	12	11	9	11	15	18	19	21	21	21	22	22	21	24	38	
RENPKR 4	22	27	22	17	15	13	12	12	12	10	8	10	15	19	20	19	20	21	21	21	21	22	40	
RROVER 3	3	3	5																					
RverRge 3	1234	1534	532																					2,892
StClair 1	1174	7																						1,361
StClair 2	1050	893	955	992	447																			1,307
StClair 3	1051	1124	1128	1148	524																			1,632
StClair 6	733	794	815	736	351																			970
StClair 7	1409	1287	1280	1207	343																			2,055
TrntChnn 9	1431	1379	1519	1562	516																			1,991
BWEC					49	83	83	83	82	83	83	83	85	85	85	85	84	84	84	83	82	81	84	
BWEC-D					2	4	4	4	3	3	3	4	4	5	5	5	5	5	5	5	4	4	7	
CC 1x1 (2)																							68	
CC 1x1 (3)																							68	
CC 1x1 (4)																							67	
RR CgBg 3			112	222	92																			
RROVER CgBg 3			5	7	2																			

NOx Rate (LBS/MBTU)

Sum of NOx Rat Column Labels

Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21											
BllRvr 2	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23										
BLRPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
DEAPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
DELPKR	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
FERMI 2																							
Greenwd 1	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
GRNPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
MnreMI 1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
MnreMI 3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 4	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
PK HAN 1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK HAN 2	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK NE 1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK NE 2	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK NORTH	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK OTHER 1	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK OTHER 2	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK SC	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
RENPKR 1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 3	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RROVER 3	0.02	0.02	0.02																				
RverRge 3	0.24	0.24	0.24																				
StClair 1	0.28	0.28																					
StClair 2	0.26	0.26	0.26	0.26	0.26																		
StClair 3	0.30	0.30	0.30	0.30	0.30																		
StClair 6	0.13	0.13	0.13	0.13	0.13																		
StClair 7	0.15	0.15	0.15	0.15	0.15																		
TrntChnn 9	0.15	0.15	0.15	0.15	0.15																		
BWEC					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BWEC-D					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CC 1x1 (2)																							0.01
CC 1x1 (3)																							0.01
CC 1x1 (4)																							0.01
RR CgBg 3			0.08	0.08	0.08																		
RROVER CgBg 3			0.02	0.02	0.02																		

DTE Electric Company
WP LKM-7 PCA REF Annual Generation Report PCA C - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 4 of 5

PM - Tons	(Mbtu*1000*Lb/Mbtu/2000																							PM-Lb/MBTu	Hg -Lb/Mbtu
BlRvr 1	11.1	7.4	10.9	8.6	11.0	9.2	11.2	11.3	8.9	10.9	9.0	4.6												0.000669961	0.0008057
BlRvr 2	15.1	14.7	11.6	14.2	12.4	15.8	15.5	12.7	15.5	12.1	15.4	15.3	6.1											0.000879762	0.0008403
BLRPKR																									
DEAPKR																									
DELPKR																									
FERMI 2																									
Greenwd 1	14.9	12.3	13.3	12.1	10.5	15.2	13.9	16.6	15.1	14.9	16.7	14.3	17.5	18.3	19.8	21.7	21.6	21.9	23.0	24.4	23.5	21.1	71.6	0.006873026	
GRNPKR																									
MnreMI 1	66.3	81.5	80.5	84.7	66.1	84.2	86.8	84.9	67.8	86.3	86.9	84.7	59.8	88.6	87.0	84.6	67.4	86.5	86.8	84.2	66.5	86.3	0.0	0.004159623	0.0005531
MnreMI 2	93.9	97.3	90.0	73.4	92.1	100.1	93.9	74.7	97.6	96.5	93.4	73.8	84.4	97.1	93.2	73.9	96.1	96.0	92.1	72.5	94.3	93.3	0.0	0.004683889	0.0005283
MnreMI 3	67.1	62.2	76.3	77.2	74.7	62.3	69.5	69.3	69.4	60.7	69.1	68.3	70.2	61.2	69.8	68.0	68.8	60.5	69.4	69.0	67.9	66.4	0.0	0.003605735	0.0004103
MnreMI 4	74.0	74.0	57.7	71.7	73.2	69.5	56.5	73.5	73.4	69.9	56.5	73.2	61.4	70.1	56.3	72.9	72.5	69.3	55.6	71.7	71.2	67.4	0.0	0.003288405	0.0003037
PK HAN 1																									
PK HAN 2																									
PK NE 1																									
PK NE 2																									
PK NORTH																									
PK OTHER 1																									
PK OTHER 2																									
PK SC																									
RENPKR 1																									
RENPKR 2																									
RENPKR 3																									
RENPKR 4																									
RROVER 3																									
RverRge 3	30.3	37.7	13.1																					0.005955238	0.0005124
StClair 1	6.2	0.0																						0.001503906	0.0007301
StClair 2	10.5	9.0	9.6	10.0	4.5																			0.002614149	0.0007953
StClair 3	1.1	1.2	1.2	1.2	0.6																			0.000321735	0.0007891
StClair 6	11.1	12.1	12.4	11.2	5.3																			0.00198151	0.0007889
StClair 7	56.5	51.5	51.3	48.3	13.7																			0.006196523	0.0005652
TrntChnn 9	125.2	120.7	132.9	136.6	45.1																			0.012748879	0.0005832
BWEC					56.6	95.7	95.5	95.6	95.0	95.9	96.4	96.5	97.8	98.1	98.2	98.0	97.2	97.5	97.2	96.1	94.7	93.7	96.9	0.0036	
BWEC-D					2.8	4.4	4.3	4.3	4.0	3.8	3.9	4.1	4.8	5.4	5.4	5.4	5.3	5.4	5.4	5.5	5.2	5.2	7.7	0.0036	
CC 1x1 (1)																									
CC 1x1 (2)																									
CC 1x1 (3)																									
CC 1x1 (4)			0.0	0.0																					

Hg - Lbs	(Mbtu*1000)*(lb/Tbtu*10^6)																							PM-Lb/MBTu	Hg -Lb/Tbtu
BlRvr 1	26.62	17.91	26.26	20.78	26.34	22.10	27.00	27.16	21.47	26.22	21.64	11.14												0.000669961	0.8057044
BlRvr 2	27.62	26.92	21.22	26.02	22.69	29.01	28.42	23.31	28.44	22.13	28.25	27.97	11.19											0.000879762	0.8057044
BLRPKR																									
DEAPKR																									
DELPKR																									
FERMI 2																									
Greenwd 1																								0.006873026	
GRNPKR																									
MnreMI 1	17.62	21.67	21.42	22.52	17.57	22.38	23.07	22.57	18.04	22.94	23.10	22.52	15.90	23.55	23.13	22.49	17.92	23.01	23.09	22.38	17.68	22.96	0.00	0.004159623	0.5530511
MnreMI 2	21.19	21.95	20.30	16.56	20.77	22.58	21.17	16.86	22.02	21.78	21.06	16.65	19.04	21.91	21.03	16.66	21.67	21.66	20.77	16.36	21.28	21.06	0.00	0.004683889	0.528319
MnreMI 3	15.26	14.15	17.37	17.57	17.00	14.19	15.81	15.77	15.79	13.82	15.74	15.54	15.99	13.92	15.88	15.48	15.65	13.76	15.80	15.71	15.45	15.12	0.00	0.003605735	0.4103168
MnreMI 4	13.67	13.67	10.67	13.24	13.53	12.85	10.44	13.58	13.57	12.92	10.43	13.52	11.35	12.95	10.40	13.46	13.40	12.80	10.27	13.25	13.14	12.45	0.00	0.003288405	0.3037237
PK HAN 1																									
PK HAN 2																									
PK NE 1																									
PK NE 2																									
PK NORTH																									
PK OTHER 1																									
PK OTHER 2																									
PK SC																									
RENPKR 1																									
RENPKR 2																									
RENPKR 3																									
RENPKR 4																									
RROVER 3																									
RverRge 3	5.21	6.48	2.25																					0.005955238	0.5124122
StClair 1	6.02	0.04																						0.001503906	0.7301208
StClair 2	6.41	5.45	5.83	6.06	2.73																			0.002614149	0.795286
StClair 3	5.51	5.89	5.91	6.02	2.75																			0.000321735	0.7891214
StClair 6	8.88	9.61	9.87	8.91	4.25																			0.00198151	0.7888923
StClair 7	10.30	9.40	9.35	8.82	2.50																			0.006196523	0.5652439
TrntChnn 9	11.45	11.04	12.16	12.50	4.13																			0.012748879	0.5831594
BWEC																									
BWEC-D																									
CC 1x1 (1)																									
CC 1x1 (2)																									
CC 1x1 (3)																									
CC 1x1 (4)																									

DTE Electric Company
WP LKM-8 PCA REF Annual Generation Report PCA D - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 1 of 5

SO2 Tons - SO2 Rate (LBS/MBTU) - CO2 Tons - CO2 Rate (LBS/MBTU)

SO2 Tons

Sum of SO2 Ton: Column Labels																							
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	10232	6884	10091	7988	10126	8497	10376	10444	8262	10105	8336	4305											
BllRvr 2	10616	10344	8155	10000	8720	11154	10922	8962	10951	8509	10885	10795	4318										
BLRPKR																							
DEAPKR																							
DELPKR																							
FERMI 2																							
Greenwd 1	3	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	12
GRNPKR																							
MnreMI 1	679	792	775	872	773	1041	1182	1156	924	1176	1185	1154	815	1205	1182	1150	915	1168	1173	1143	900	1168	
MnreMI 2	817	827	733	668	905	1069	1072	854	1115	1103	1067	845	963	1104	1060	840	1090	1090	1046	822	1072	1058	
MnreMI 3	785	707	789	766	793	726	802	800	802	702	800	791	810	701	801	780	788	693	797	792	778	762	
MnreMI 4	913	907	719	893	913	878	701	912	911	869	701	909	762	867	694	900	895	855	685	885	877	829	
PK HAN 1																							
PK HAN 2																							
PK NE 1																							
PK NE 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK NORTH	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK OTHER 1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK OTHER 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PK SC																							
RENPKR 1																							
RENPKR 2																							
RENPKR 3																							
RENPKR 4																							
RROVER 3																							
RverRge 3	3078	4011	1402																				
StClair 1	2380	15																					
StClair 2	2328	1979	2115	2197	991																		
StClair 3	2015	2153	2160	2200	1005																		
StClair 6	4859	4366	4159	3619	1758																		
StClair 7	6050	4938	4925	4598	1288																		
TrntChnn 9	7819	5368	5925	5669	1936																		
BWEC																							
BWEC-D																							
CC 1x1 (1)													6	11	11	11	11	11	11	11	11	11	11
CC 1x1 (2)																							11
CC 1x1 (3)																							11
CC 1x1 (4)																							11
RR CgBg 3			1201	2390	991																		
RROVER CgBg 3																							

	OVER BY	5%
NSR SO2 Baselines	2018	2019
10,427		
10,973		
6		
	2018	2019
1,189		
17,100		
802		
929		
6,372		
2,610		
2,669		
3,108		
7,845		
11,297		
13,492		

SO2 Rate (LBS/MBTU)

Sum of SO2 Rate: Column Labels																							
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62											
BllRvr 2	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62										
BLRPKR																							
DEAPKR																							
DELPKR																							
FERMI 2																							
Greenwd 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRNPKR																							
MnreMI 1	0.04	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
MnreMI 2	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 3	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
MnreMI 4	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
PK HAN 1																							
PK HAN 2																							
PK NE 1																							
PK NE 2	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK NORTH	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK OTHER 1	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK OTHER 2	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
PK SC																							
RENPKR 1																							
RENPKR 2																							
RENPKR 3																							
RENPKR 4																							
RROVER 3																							
RverRge 3	0.61	0.63	0.64																				
StClair 1	0.58	0.58																					
StClair 2	0.58	0.58	0.58	0.58	0.58																		
StClair 3	0.58	0.58	0.58	0.58	0.58																		
StClair 6	0.86	0.72	0.66	0.64	0.65																		
StClair 7	0.66	0.59	0.60	0.59	0.58																		
TrntChnn 9	0.80	0.57	0.57	0.53	0.55																		
BWEC																							
BWEC-D																							
CC 1x1 (1)													0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CC 1x1 (2)																							0.00
CC 1x1 (3)																							0.00
CC 1x1 (4)																							0.00
RR CgBg 3			0.87	0.87	0.87																		
RROVER CgBg 3																							

DTE Electric Company
WP LKM-8 PCA REF Annual Generation Report PCA D - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 2 of 5

CO2 Tons

Sum of CO2 Ton Column Labels																							
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	3520618	2368751	3472406	2748741	3484112	2923799	3570456	3593748	2842880	3477217	2868438	1481420											
BllRvr 2	3726867	3631612	2863113	3510719	3061463	3915723	3834341	3146410	3844628	2987101	3821335	3789640	1515944.161										
BLRPKR	63355	78850	66229	57509	65636	46984	45245	48451	45351	44466	45865	47935	51877.42047	63806	62841	68852	63010	63940	65746	52823	53636	58913	54612
BWEC					1854313	3139703	3129413	3138835	3121616	3148886	3165666	3172915	3203240.288	3202731	3204898	3198330	3165479	3173520	3160860	3130429	3080414	3046468	3151327
BWEC-D					91497	142995	140814	142516	131792	125939	130206	138625	155839.41	168537	172127	170143	165333	167336	170340	173607	161505	161528	245028
CC 1x1 (1)	0	0	0	0	0	0	0	0	0	0	0	0	757821.24	1300508	1300729	1298958	1286680	1291538	1273075	1270752	1247730	1233715	1295221
CC 1x1 (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1294386
CC 1x1 (3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1273381
CC 1x1 (4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1275310
DEAPKR	99324	105201	86746	76542	84077	66153	60000	64905	59765	53002	53140	58894	79259.38504	82931	82189	83651	84319	71952	72807	71462	64162	74898	55367
DELPKR	14156	16727	11745	12149	12685	13925	11293	12262	8013	11681	9181	9624	15100.06214	12501	16738	15417	12276	13647	16023	12549	10997	10525	8014
FERMI 2																							
Greenwd 1	282522	232992	252003	229061	199470	286912	264070	314528	289623	283440	321359	276828	326656.8799	326894	348393	383287	377744	382568	396505	425050	410316	360768	1210416
GRNPKR	35445	38336	32214	24914	26614	27713	21673	26365	26919	22251	22615	20588	28704.96109	36859	34929	37286	37833	32856	28112	33175	33689	33578	25594
MnreMI 1	3342610	4110353	4061949	4270452	3333226	4245385	4376040	4280530	3421355	4353805	4386596	4271810	3016288.064	4461233	4373660	4258230	3385557	4323283	4341612	4230441	3332716	4324991	
MnreMI 2	4207386	4358335	4031407	3288647	4125041	4485048	4204148	3348419	4374623	4327886	4185008	3314913	3776437.264	4329142	4157031	3295278	4277417	4275072	4101842	3224959	4206329	4149631	
MnreMI 3	3904090	3619740	4441687	4494953	4347044	3629120	4044173	4032505	4042371	3541766	4031556	3988556	4084309.264	3533445	4039445	3933868	3974050	3494592	4016351	3991507	3921437	3842478	
MnreMI 4	4722286	4723611	3685337	4576617	4675020	4439085	3607953	4691396	4688479	4469499	3604628	4676245	3921375.024	4462927	3571819	4632815	4605059	4400835	3521691	4550646	4509758	4264419	
PK HAN 1	1288	1793	1096	1345	1494	645	796	1493	1793	1244	1696	1144	1593.46121	2641	2344	2641	2144	2468	1246	2346	1185	1494	65081
PK HAN 2	1794	1962	1750	1161	1802	1963	1857	1748	1988	1425	689	1695	2549.91701	1541	3033	2008	3031	1416	2664	2033	2498	2657	80922
PK NE 1	1472	1565	1094	1429	822	1767	1431	1632	1430	1025	1567	957	1834.681885	2032	824	2239	2265	1846	959	1294	1700	1862	94054
PK NE 2	766	777	780	776	777	778	779	776	777	777	780	777	776.9697	777	780	776	777	777	780	776	777	777	779
PK NORTH	795	795	797	795	795	795	797	795	795	795	797	795	794.98063	795	797	797	795	795	797	795	795	795	875
PK OTHER 1	795	795	797	797	795	795	797	797	800	795	797	795	794.954625	795	797	795	795	795	797	795	795	795	837
PK OTHER 2	835	835	837	834	835	835	837	837	835	835	838	835	834.655875	835	838	834	835	835	838	837	832	835	837
PK SC	957	1025	921	858	904	964	905	979	904	949	724	858	1009.51819	707	1120	888	994	1070	1132	1024	677	1009	20605
RENPKR 1	116440	123305	127457	80746	83128	70212	59368	66001	71912	60994	55283	61187	79404.45121	85516	93470	105665	102988	103241	96012	110155	108220	108445	35880
RENPKR 2	120240	116285	115353	85489	80209	58553	62086	58358	64363	47411	50214	64774	73422.80916	87482	89071	102067	101834	103724	101875	98589	95952	105355	39371
RENPKR 3	116506	117760	110037	80804	87099	61392	61080	56871	58291	51726	45963	53471	69107.5188	81972	88180	97335	97806	96542	99822	102512	93119	104428	40301
RENPKR 4	104699	128477	106452	80796	70654	61948	55280	56975	59680	50228	40929	49502	71221.62596	83018	91930	85571	88387	95151	92960	95204	93401	97127	42110
RR CgBg 3	0	0	389214	774668	321193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RROVER 3	14421	15468	21986																				
RROVER CgBg 3	0	0	22939	31274	8547	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RverRge 3	1076382	1337899	463804																				
StClair 1	827324	5086																					
StClair 2	816873	694706	742535	771350	348013																		
StClair 3	713819	763395	765958	780100	356358																		
StClair 6	1125291	1218552	1251747	1129915	538759																		
StClair 7	1901874	1736122	1726819	1627741	463116																		
TrntChnn 9	2079578	2004875	2208356	2269913	749847																		
Grand Total	**32940809**	**31555985**	**31065569**	**31011093**	**28475343**	**27623194**	**27555633**	**27088133**	**27160983**	**27065141**	**26845871**	**25484784**	**21236198.97**	**22329623**	**21737983**	**21777731**	**21837407**	**22099797**	**21564847**	**21583760**	**21432639**	**21987493**	**10310307**

CO2 Rate (LBS/MBTU)

Sum of CO2 Rate Column Labels																							
Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	213	213	213	213	213	213	213	213	213	213	213	213											
BllRvr 2	217	217	217	217	217	217	217	217	217	217	217	217	217										
BLRPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
DEAPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
DELPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
FERMI 2																							
Greenwd 1	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
GRNPKR	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
MnreMI 1	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 2	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 3	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
MnreMI 4	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
PK HAN 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK HAN 2	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK NE 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
PK NE 2	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK NORTH	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK OTHER 1	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK OTHER 2	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
PK SC	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 1	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 2	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 3	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RENPKR 4	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
RROVER 3	117	117	117																				
RverRge 3	212	212	212																				
StClair 1	201	201																					
StClair 2	203	203	203	203	203																		
StClair 3	205	205	205	205	205																		
StClair 6	200	200	200	200	200																		
StClair 7	209	209	209	209	209																		
TrntChnn 9	212	212	212	212	212																		
BWEC					118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
BWEC-D					118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
CC 1x1 (1)													117	117	117	117	117	117	117	117	117	117	117
CC 1x1 (2)																							117
CC 1x1 (3)																							117
CC 1x1 (4)																							117
RR CgBg 3			284	284	284																		
RROVER CgBg 3			117	117	117																		

Nox Tons

Sum of NOx Ton / Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	NSR NOX Baselines
BllRvr 1	3486	2345	3438	2722	3450	2895	3535	3558	2815	3443	2840	1467												3,641
BllRvr 2	3891	3792	2990	3666	3197	4089	4004	3285	4014	3119	3990	3957	1583											4,108
BLRPKR	13	16	14	12	14	10	9	10	9	9	10	10	11	13	13	14	13	13	14	11	11	12	11	
DEAPKR	21	22	18	16	18	14	13	14	12	11	11	12	17	17	17	17	18	15	15	15	13	16	12	
DELPKR	4	5	3	3	4	4	3	3	2	3	3	3	4	3	5	4	3	4	4	3	3	3	2	
FERMI 2																								
Greenwd 1	256	211	228	208	181	260	239	285	263	257	291	251	296	296	316	347	342	347	359	385	372	327	1097	277
GRNPKR	7	8	7	5	6	6	5	5	6	5	5	4	6	8	7	8	8	7	6	7	7	7	5	
MnreMI 1	869	1068	1056	1110	866	1104	1138	1113	889	1132	1140	1110	784	1160	1137	1107	880	1124	1129	1100	866	1124		1,365
MnreMI 2	882	913	845	689	864	940	881	702	917	907	877	695	791	907	871	690	896	896	859	676	881	869		6,563
MnreMI 3	893	828	1016	1028	995	830	925	923	925	810	922	913	935	808	924	900	909	800	919	913	897	879		1,295
MnreMI 4	1264	1264	986	1225	1251	1188	965	1255	1255	1196	965	1251	1049	1194	956	1240	1232	1178	942	1218	1207	1141		1,553
PK HAN 1	3	4	2	3	3	1	2	3	4	3	4	3	4	6	5	6	5	5	3	5	3	3	145	
PK HAN 2	11	12	11	7	11	12	11	11	12	9	4	10	16	9	19	12	19	9	16	12	15	16	495	
PK NE 1	3	3	2	3	2	4	3	4	3	2	3	2	4	5	2	5	5	4	2	3	4	4	209	
PK NE 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
PK NORTH	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
PK OTHER 1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
PK OTHER 2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
PK SC	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	46	
RENPKR 1	24	26	27	17	17	15	12	14	15	13	12	13	17	18	19	22	21	22	20	23	23	23	7	
RENPKR 2	25	24	24	18	17	12	13	12	13	10	10	14	15	18	19	21	21	22	21	21	20	22	8	
RENPKR 3	24	25	23	17	18	13	13	12	12	11	10	11	14	17	18	20	20	20	21	21	19	22	8	
RENPKR 4	22	27	22	17	15	13	12	12	12	10	9	10	15	17	19	18	18	20	19	20	19	20	9	
RROVER 3	3	3	5																					
RverRge 3	1234	1534	532																					2,892
StClair 1	1174	7																						1,361
StClair 2	1050	893	955	992	447																			1,307
StClair 3	1051	1124	1128	1148	525																			1,632
StClair 6	733	794	815	736	351																			970
StClair 7	1409	1287	1280	1206	343																			2,055
TrntChnn 9	1431	1379	1519	1562	516																			1,991
BWEC					49	83	83	83	82	83	84	84	85	84	85	84	84	84	83	83	81	80	83	
BWEC-D					2	4	4	4	3	3	3	4	4	4	5	4	4	4	4	5	4	4	6	
CC 1x1 (1)													40	68	68	68	67	67	66	66	65	64	68	
CC 1x1 (2)																							68	
CC 1x1 (3)																							66	
CC 1x1 (4)																							67	
RR CgBg 3			112	222	92																			
RROVER CgBg 3			5	7	2																			

NOx Rate (LBS/MBTU)

Sum of NOx Rat / Row Labels	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BllRvr 1	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21											
BllRvr 2	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23										
BLRPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
DEAPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
DELPKR	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
FERMI 2																							
Greenwd 1	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
GRNPKR	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
MnreMI 1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
MnreMI 3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
MnreMI 4	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
PK HAN 1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK HAN 2	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK NE 1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK NE 2	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
PK NORTH	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK OTHER 1	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK OTHER 2	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
PK SC	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
RENPKR 1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 3	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RENPKR 4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
RROVER 3	0.02	0.02	0.02																				
RverRge 3	0.24	0.24	0.24																				
StClair 1	0.28	0.28																					
StClair 2	0.26	0.26	0.26	0.26	0.26																		
StClair 3	0.30	0.30	0.30	0.30	0.30																		
StClair 6	0.13	0.13	0.13	0.13	0.13																		
StClair 7	0.15	0.15	0.15	0.15	0.15																		
TrntChnn 9	0.15	0.15	0.15	0.15	0.15																		
BWEC					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BWEC-D					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CC 1x1 (1)													0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
CC 1x1 (2)																							0.01
CC 1x1 (3)																							0.01
CC 1x1 (4)																							0.01
RR CgBg 3			0.08	0.08	0.08																		
RROVER CgBg 3			0.02	0.02	0.02																		

DTE Electric Company
WP LKM-8 PCA REF Annual Generation Report PCA D - Emissions Tab
Emissions

Case No.: U-20471
Witness: L.K. Mikulan
Page: 4 of 5

PM - Tons	(Mbtu*1000*Lb/Mbtu/2000																							PM-Lb/MBTu	Hg -Lb/Mbtu
BllRvr 1	11.1	7.4	10.9	8.6	11.0	9.2	11.2	11.3	8.9	10.9	9.0	4.7												0.000669961	0.0008057
BllRvr 2	15.1	14.7	11.6	14.2	12.4	15.8	15.5	12.7	15.6	12.1	15.5	15.3	6.1											0.000879762	0.0008403
BLRPKR																									
DEAPKR																									
DELPKR																									
FERMI 2																									
Greenwd 1	14.9	12.3	13.3	12.1	10.5	15.1	13.9	16.6	15.3	15.0	17.0	14.6	17.2	17.3	18.4	20.2	19.9	20.2	20.9	22.4	21.7	19.0	63.9	0.006873026	
GRNPKR																									
MnreMI 1	66.3	81.5	80.5	84.7	66.1	84.2	86.8	84.9	67.8	86.3	87.0	84.7	59.8	88.5	86.7	84.4	67.1	85.7	86.1	83.9	66.1	85.8	0.0	0.004159623	0.0005531
MnreMI 2	93.9	97.3	90.0	73.4	92.1	100.1	93.9	74.8	97.7	96.6	93.4	74.0	84.3	96.7	92.8	73.6	95.5	95.4	91.6	72.0	93.9	92.6	0.0	0.004683889	0.0005283
MnreMI 3	67.1	62.2	76.3	77.2	74.7	62.3	69.5	69.3	69.4	60.8	69.3	68.5	70.2	60.7	69.4	67.6	68.3	60.0	69.0	68.6	67.4	66.0	0.0	0.003605735	0.0004103
MnreMI 4	74.0	74.0	57.7	71.7	73.2	69.5	56.5	73.5	73.5	70.0	56.5	73.3	61.4	69.9	56.0	72.6	72.1	68.9	55.2	71.3	70.7	66.8	0.0	0.003288405	0.0003037
PK HAN 1																									
PK HAN 2																									
PK NE 1																									
PK NE 2																									
PK NORTH																									
PK OTHER 1																									
PK OTHER 2																									
PK SC																									
RENPKR 1																									
RENPKR 2																									
RENPKR 3																									
RENPKR 4																									
RROVER 3																									
RverRge 3	30.3	37.7	13.1																					0.005955238	0.0005124
StClair 1	6.2	0.0																						0.001503906	0.0007301
StClair 2	10.5	9.0	9.6	10.0	4.5																			0.002614149	0.0007953
StClair 3	1.1	1.2	1.2	1.2	0.6																			0.000321735	0.0007891
StClair 6	11.1	12.1	12.4	11.2	5.3																			0.00198151	0.0007889
StClair 7	56.5	51.5	51.3	48.3	13.8																			0.006196523	0.0005652
TrntChnn 9	125.2	120.7	132.9	136.6	45.1																			0.012748879	0.0005832
BWEC					56.6	95.8	95.5	95.8	95.2	96.1	96.6	96.8	97.7	97.7	97.8	97.6	96.6	96.8	96.4	95.5	94.0	92.9	96.1	0.0036	
BWEC-D					2.8	4.4	4.3	4.3	4.0	3.8	4.0	4.2	4.8	5.1	5.3	5.2	5.0	5.1	5.2	5.3	4.9	4.9	7.5	0.0036	
CC 1x1 (1)																									
CC 1x1 (2)																									
CC 1x1 (3)																									
CC 1x1 (4)																									

Hg - Lbs	(Mbtu*1000)*(lb/Tbtu*10^6)																							PM-Lb/MBTu	Hg -Lb/Tbtu
BllRvr 1	26.62	17.91	26.26	20.79	26.35	22.11	27.00	27.18	21.50	26.29	21.69	11.20												0.000669961	0.8057044
BllRvr 2	27.62	26.92	21.22	26.02	22.69	29.02	28.42	23.32	28.50	22.14	28.32	28.09	11.24											0.000879762	0.8057044
BLRPKR																									
DEAPKR																									
DELPKR																									
FERMI 2																									
Greenwd 1																								0.006873026	
GRNPKR																									
MnreMI 1	17.62	21.67	21.42	22.51	17.57	22.38	23.07	22.57	18.04	22.95	23.13	22.52	15.90	23.52	23.06	22.45	17.85	22.79	22.89	22.30	17.57	22.80	0.00	0.004159623	0.5530511
MnreMI 2	21.19	21.95	20.30	16.56	20.78	22.59	21.17	16.86	22.03	21.80	21.08	16.70	19.02	21.80	20.94	16.60	21.54	21.53	20.66	16.24	21.18	20.90	0.00	0.004683889	0.528319
MnreMI 3	15.26	14.15	17.37	17.57	17.00	14.19	15.81	15.77	15.80	13.85	15.76	15.59	15.97	13.81	15.79	15.38	15.54	13.66	15.70	15.61	15.33	15.02	0.00	0.003605735	0.4103168
MnreMI 4	13.67	13.67	10.67	13.24	13.53	12.85	10.44	13.58	13.57	12.93	10.43	13.53	11.35	12.92	10.34	13.41	13.33	12.74	10.19	13.17	13.05	12.34	0.00	0.003288405	0.3037237
PK HAN 1																									
PK HAN 2																									
PK NE 1																									
PK NE 2																									
PK NORTH																									
PK OTHER 1																									
PK OTHER 2																									
PK SC																									
RENPKR 1																									
RENPKR 2																									
RENPKR 3																									
RENPKR 4																									
RROVER 3																									
RverRge 3	5.21	6.48	2.25																					0.005955238	0.5124122
StClair 1	6.02	0.04																						0.001503906	0.7301208
StClair 2	6.41	5.45	5.83	6.06	2.73																			0.002614149	0.795286
StClair 3	5.51	5.89	5.91	6.02	2.75																			0.000321735	0.7891214
StClair 6	8.88	9.61	9.87	8.91	4.25																			0.00198151	0.7888923
StClair 7	10.30	9.40	9.35	8.82	2.51																			0.006196523	0.5652439
TrntChnn 9	11.45	11.04	12.16	12.50	4.13																			0.012748879	0.5831594
BWEC																									
BWEC-D																									
CC 1x1 (1)																									
CC 1x1 (2)																									
CC 1x1 (3)																									
CC 1x1 (4)																									

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-5.35j
Respondent:	B. J. Marietta
Page:	1 of 1

Question: Refer to your response to MECNRDCSCDE-2.24 and to the Emissions Tab on WP LKM- 5 PCA REF Annual Generation Report PCA A.

j. Please provide the annual emissions (rate and tons) for each generating unit for fine particulates (PM2.5) through 2040.

Answer: See attachment.

Attachments: The document listed below is available for download at the following hyperlink:
https://dteenergy.sharepoint.com/sites/DiscoveryPortal/Elec/U-20471-2019IRPPublic/default.aspx

U-20471 MECNRDCSCDE-5.35j-01 PM2.5 Projection

DTE Electric Company
3. MECNRDCSCDE-5.35j-01 PM2.5 Projection
Sheet2

Case No.: U-20471
Respondent: B. J. Marietta
Page: 1 of 1

PM2.5 (tons)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
BR1	244.4	193.5	244.9	205.1	250.5	251.6	199.0	241.3	199.3	101.1											
BR2	197.5	242.2	211.1	269.2	264.3	216.7	262.7	204.8	260.2	256.8	103.0										
BR PKR	8.5	7.4	8.4	5.8	5.6	6.1	5.6	5.2	5.3	5.7	6.6	8.5	8.2	9.5	8.4	9.0	8.6	7.4	7.3	8.3	71.8
Dean PKR	11.1	9.8	10.6	8.2	7.5	7.9	7.0	6.3	5.8	6.9	10.0	10.8	10.6	11.0	11.4	9.9	9.7	10.3	8.8	10.6	28.0
Del PKR	1.5	1.6	1.6	1.8	1.5	1.5	0.8	1.3	1.1	1.2	1.9	1.6	2.1	1.9	1.6	1.8	2.0	1.5	1.6	1.3	6.3
GW1	29.0	26.4	22.7	32.8	29.9	35.3	32.2	31.5	34.9	29.8	37.9	38.0	42.4	46.0	44.7	45.6	47.7	51.5	49.1	44.4	134.6
GW PKR	4.1	3.2	3.4	3.5	2.8	3.2	3.1	2.5	2.5	2.5	3.7	4.8	4.3	4.9	5.0	4.4	3.8	4.4	4.5	4.4	55.4
MON1	290.4	305.3	238.3	303.5	312.3	306.0	244.5	308.4	310.6	304.3	215.0	318.4	311.8	304.1	241.1	308.2	308.6	300.6	236.9	307.7	
MON2	288.2	235.1	294.7	319.9	300.4	238.8	312.4	307.5	297.5	233.9	268.5	308.3	296.2	234.5	304.2	304.3	291.4	229.3	298.7	295.2	
MON3	317.4	321.2	310.6	259.1	288.4	287.2	287.7	251.7	285.1	282.0	290.0	251.0	287.8	280.8	283.2	248.1	285.0	284.3	279.2	273.7	
MON4	263.4	327.1	333.9	317.2	257.8	335.2	335.0	318.8	256.4	332.2	279.1	317.7	254.1	330.2	327.8	313.0	249.9	322.3	320.0	302.9	
PK HAN 1	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.1	0.3	0.1	0.2	6.5
PK HAN 2	0.2	0.1	0.2	0.3	0.2	0.2	0.3	0.2	0.1	0.2	0.3	0.2	0.4	0.3	0.4	0.2	0.3	0.3	0.3	0.3	7.9
PK NE 1	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.3	0.1	0.3	0.3	0.2	0.1	0.2	0.2	0.2	6.4
PK NE 2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PK NORTH	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PK OTHER 1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PK OTHER 2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PK SC	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.9
RENPKR 1	16.3	10.3	10.6	8.9	7.4	8.2	9.0	7.5	6.4	7.6	10.2	11.3	12.4	13.9	13.7	13.4	12.4	14.4	14.1	14.5	13.6
RENPKR 2	14.8	11.0	10.2	7.4	7.9	7.4	8.0	5.8	5.9	8.0	9.3	11.7	12.0	13.3	13.5	13.8	13.2	13.3	12.6	14.2	15.0
RENPKR 3	14.1	10.4	11.1	7.7	7.7	7.2	7.2	6.3	5.4	6.6	8.7	10.9	11.8	12.8	12.9	12.9	13.0	13.4	12.3	14.1	15.4
RENPKR 4	13.6	10.4	9.0	7.8	7.0	7.2	7.3	6.1	4.8	6.0	9.1	11.1	12.2	11.4	11.9	12.7	12.4	12.5	12.5	13.4	15.9
RR3	59.2	45.0	18.1																		
SC2	55.0	57.1	25.7																		
SC3	56.2	57.2	26.1																		
SC6	93.9	84.7	40.4																		
SC7	124.1	117.0	33.2																		
TC9	156.4	160.8	53.0																		
BWEC			77.3	129.7	129.8	129.8	127.9	128.5	129.5	130.1	133.2	134.1	134.0	133.4	131.2	132.0	130.5	129.6	126.6	125.0	133.7

PM2.5 emissions are based on the rate of 0.015 lb/mmbtu for units other than BWEC; BWEC PM2.5 emissions are based on a rate of 0.0047 lb/mmbtu

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-8.47
Respondent:	B. J. Marietta
Page:	1 of 1

Question: Refer to the Emissions tab on workpapers LKM-5 through LKM-8 and to MECNRDCSCDE-5.35j-01 PM2.5 Projection. Please provide the Company's actual emissions, both rate and tons, and for each unit for each year 2008 through 2018. Please include SO2, CO2, NOx, PM, PM2.5, Hg for each unit.

Answer: See attachment.

Attachments: The documents listed below are available for download at the following hyperlink:
https://dteenergy.sharepoint.com/sites/DiscoveryPortal/Elec/U20471201 9IRPPublic/default.aspx
U-20471 MECNRDCSCDE-8.47-01 2008-2018 Emissions Summary

DTE Electric Company
MECNRDCSCDE-8.47-01 2008-2018 Emissions Summary
SO2

Case No. U-20471
Respondent: B. J. Marietta
Page: 1 of 6

SO2 (tons)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	7886	11066	10576	8826	10685	8752	9517	10172	7518	10414	9267
BR2	11523	11783	9954	12199	9557	11424	10399	9089	9436	7949	10287
CCK	0.4										
GW1	150	47	36	40	4	2	1	1	2	2	3
HB	1629	1044	1391	1434	588	308					
MON1	31485	24956	27635	23839	25270	18189	383	410	530	954	1071
MON2	29198	27221	18852	23730	22865	24377	4654	373	275	573	1056
MON3	31096	22961	494	956	619	509	621	544	800	707	808
MON4	26605	10761	621	564	405	691	629	916	738	843	919
RR2	6639	7481	7456	5894	3705	4355	3700	2309			
RR3	7854	7464	6966	4758	4497	4859	6023	4087	2806	2504	2118
SC1	3685	2382	3159	2535	2750	2336	2493	2455	2387	2443	2433
SC2	2751	2608	3389	2583	2848	2329	2627	2305	1765	2294	2274
SC3	5468	2630	3233	2939	2917	2579	2518	2046	1780	2374	2342
SC4	3412	2509	3397	2690	3219	2746	2600	2698	1769		
SC6	8653	7457	10519	10539	5487	9477	7970	6263	3019	5974	4203
SC7	14303	11346	11564	13377	10988	10643	9248	8938	5602	1274	6106
TC9	18200	17926	15181	16422	16999	16254	12300	11656	9393	6178	3114
TCHP	9422	7517	8288	6299	5427	3738	3213	2801	549		

SO2 (lb/mmbtu)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	0.56	0.58	0.59	0.64	0.63	0.61	0.60	0.61	0.60	0.62	0.60
BR2	0.57	0.59	0.60	0.62	0.63	0.63	0.62	0.61	0.61	0.61	0.60
CCK	0.00										
GW1	0.09	0.05	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HB	1.26	1.27	1.36	1.40	1.16	1.09					
MON1	1.28	1.18	1.15	1.12	1.21	1.05	0.02	0.02	0.04	0.04	0.06
MON2	1.28	1.18	1.17	1.12	1.22	1.16	0.32	0.02	0.02	0.04	0.05
MON3	1.28	1.00	0.02	0.05	0.03	0.03	0.03	0.04	0.03	0.03	0.04
MON4	1.25	0.43	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04
RR2	0.83	0.87	0.81	0.86	0.75	0.71	0.88	0.70			
RR3	0.84	0.87	0.83	0.75	0.68	0.85	0.84	0.68	0.44	0.45	0.45
SC1	0.79	0.61	0.74	0.72	0.77	0.70	0.77	0.71	0.68	0.59	0.62
SC2	0.59	0.63	0.77	0.68	0.76	0.69	0.74	0.70	0.64	0.59	0.61
SC3	1.09	0.61	0.80	0.77	0.82	0.69	0.78	0.62	0.67	0.57	0.63
SC4	0.79	0.62	0.75	0.72	0.86	0.66	0.70	0.66	0.77		
SC6	1.12	1.06	1.23	1.33	1.15	1.15	1.22	1.13	0.90	1.05	0.90
SC7	1.07	1.04	1.21	1.41	1.02	0.93	1.11	0.95	1.00	0.94	0.70
TC9	1.31	1.24	1.29	1.22	1.22	1.18	1.16	1.14	0.94	0.59	0.50
TCHP	1.38	1.39	1.41	1.29	1.16	0.79	0.93	1.29	1.30		

-- BR1 & BR2 emissions include only DTE portion; MPPA emissions are excluded
-- Units operating in 2008, but since retired are included (CCK, HB, RR2, SC1, SC4, TCHP)
-- SO2 emissions data from continuous emissions monitoring system (CEMS) data

DTE Electric Company
MECNRDCSCDE-8.47-01 2008-2018 Emissions Summary
CO2

CO2 (tons)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	2912212	4012856	3750129	2907339	3533141	2994852	3350251	3515799	2624144	3522106	3224464
BR2	4198971	4190088	3477247	4094363	3170849	3823792	3530534	3116707	3268027	2739385	3592923
CCK	84303.8										
GW1	198132	108191	291095	201951	385754	159470	120452	105370	235129	278442	422964
HB	270303	172033	224508	214613	106545	59138					
MON1	5139759	4448262	5020511	4459382	4368268	3633780	4927871	4568317	3086357	4467416	3860240
MON2	4771253	4852350	3389600	4436565	3918064	4412026	3052858	4210707	3702779	3286872	4778441
MON3	5055165	4792835	5464390	3746017	4914098	4014917	4699100	3159946	5109720	4528776	4652410
MON4	4437531	5282601	5641131	4785019	3438752	4831172	3876568	4980778	3455643	4679255	4642114
RR2	1625778	1741140	1822494	1387921	991270	1240116	846194	701725			
RR3	1883486	1776422	1728464	1290736	1332963	1165911	1476587	1321116	1382455	1101465	903451
SC1	972235	823040	899849	734399	745746	697438	681303	729016	731290	864954	820796
SC2	965775	870338	924559	801492	789747	705122	745509	687335	577923	821822	782697
SC3	1042179	909502	850644	798004	745039	788253	681530	695253	555919	870313	785040
SC4	895156	847629	950714	782980	787878	788252	783357	854686	484365		
SC6	1603347	1482251	1798538	1661930	1003025	1721213	1375519	1160385	707028	1197866	974666
SC7	2764445	2282730	1999435	1993549	2254986	2403470	1747854	1970089	1172074	284374	1834490
TC9	2903900	3021101	2468180	2822241	2916194	2879808	2218529	2151273	2103241	2194166	1301856
TCHP	1424474	1135055	1234801	1024811	984016	995979	728096	456950	88467		

SO2 (lb/mmbtu)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	208.3	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8
BR2	208.7	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8
CCK	188.3										
GW1	121.8	121.1	119.1	119.4	118.6	118.6	118.6	118.6	118.6	118.6	118.6
HB	208.3	209.8	220.0	210.1	209.8	209.8					
MON1	208.8	209.8	209.8	209.9	209.6	209.8	209.8	209.8	209.8	209.8	209.8
MON2	208.6	209.8	209.8	209.9	209.8	209.8	209.8	209.8	209.8	209.8	209.8
MON3	208.6	209.8	209.8	209.8	209.8	209.8	209.9	209.9	209.9	209.9	209.9
MON4	209.0	209.8	209.8	209.8	209.8	209.8	209.9	209.9	209.9	209.9	209.9
RR2	203.1	202.2	198.8	201.6	199.6	202.7	201.4	213.4			
RR3	200.3	206.2	205.3	202.9	202.4	204.8	204.9	219.4	216.7	199.9	193.1
SC1	208.5	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8
SC2	208.7	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8
SC3	207.4	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8
SC4	208.4	209.8	209.8	209.8	209.6	190.7	209.8	209.8	209.8		
SC6	207.6	209.8	209.8	209.5	209.8	209.8	209.8	209.8	209.8	209.8	209.8
SC7	207.7	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8
TC9	208.5	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8
TCHP	208.3	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8		

-- BR1 & BR2 emissions include only DTE portion; MPPA emissions are excluded
-- Units operating in 2008, but since retired are included (CCK, HB, RR2, SC1, SC4, TCHP)
-- CO2 emissions data from continuous emissions monitoring system (CEMS) data

DTE Electric Company
MECNRDCSCDE-8.47-01 2008-2018 Emissions Summary
NOx

Case No. U-20471
Respondent: B. J. Marietta
Page: 3 of 6

NOx (tons)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	3327	4334	3979	2926	3851	3327	3451	3570	2477	3394	3140
BR2	4150	4160	3456	4146	3007	4161	3941	3157	3219	2885	3578
CCK	55.3										
GW1	192	104	270	203	373	172	131	117	270	308	462
HB	925	460	584	628	280	149					
MON1	11213	6668	6957	5751	5234	5436	1192	1419	999	1310	1319
MON2	10396	8205	5638	6494	5394	7834	4634	1084	761	921	1460
MON3	6970	2515	1999	1079	1476	1009	1451	866	1221	1317	1434
MON4	5859	2987	2198	1878	1206	1154	1018	1625	1129	1366	1514
RR2	2120	1461	1456	1527	843	963	780	565			
RR3	3319	2878	2914	1934	1701	2045	2888	2031	1860	1506	1361
SC1	1825	1474	1318	1000	1122	1102	1308	1195	1282	1455	1439
SC2	1770	1626	1755	1439	1346	1248	1281	1124	920	1163	1165
SC3	2277	1772	1617	1550	1462	1661	1397	1212	914	1538	1326
SC4	1519	1318	1530	1262	1194	1206	1185	1150	697		
SC6	1216	1193	1356	1322	855	1276	1051	859	600	1011	831
SC7	2481	1997	1783	1801	1870	2019	1681	1652	1049	233	1353
TC9	2503	2636	2208	2453	2442	2319	1876	1864	1766	1802	1075
TCHP	2819	2526	2993	2750	2046	1702	1231	776	181		

NOx (lb/mmbtu)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	0.24	0.23	0.22	0.21	0.23	0.23	0.22	0.21	0.20	0.20	0.20
BR2	0.21	0.21	0.21	0.21	0.20	0.23	0.23	0.21	0.21	0.22	0.21
CCK	0.12										
GW1	0.12	0.12	0.11	0.12	0.11	0.13	0.13	0.13	0.14	0.13	0.13
HB	0.71	0.56	0.57	0.61	0.55	0.53					
MON1	0.46	0.31	0.29	0.27	0.25	0.31	0.05	0.07	0.07	0.06	0.07
MON2	0.45	0.35	0.35	0.31	0.29	0.37	0.32	0.05	0.04	0.06	0.06
MON3	0.29	0.11	0.08	0.06	0.06	0.05	0.06	0.06	0.05	0.06	0.06
MON4	0.28	0.12	0.08	0.08	0.07	0.05	0.06	0.07	0.07	0.06	0.07
RR2	0.26	0.17	0.16	0.22	0.17	0.16	0.19	0.17			
RR3	0.35	0.33	0.35	0.30	0.26	0.36	0.40	0.34	0.29	0.27	0.29
SC1	0.39	0.38	0.31	0.29	0.32	0.33	0.40	0.34	0.37	0.35	0.37
SC2	0.38	0.39	0.40	0.38	0.36	0.37	0.36	0.34	0.33	0.30	0.31
SC3	0.45	0.41	0.40	0.41	0.41	0.44	0.43	0.37	0.34	0.37	0.35
SC4	0.35	0.33	0.34	0.34	0.32	0.29	0.32	0.28	0.30		
SC6	0.16	0.17	0.16	0.17	0.18	0.16	0.16	0.16	0.18	0.18	0.18
SC7	0.19	0.18	0.19	0.19	0.17	0.18	0.20	0.18	0.19	0.17	0.15
TC9	0.18	0.18	0.19	0.18	0.18	0.17	0.18	0.18	0.18	0.17	0.17
TCHP	0.41	0.47	0.51	0.56	0.44	0.36	0.35	0.36	0.43		

-- BR1 & BR2 emissions include only DTE portion; MPPA emissions are excluded
-- Units operating in 2008, but since retired are included (CCK, HB, RR2, SC1, SC4, TCHP)
--NOx emissions data from continuous emissions monitoring system (CEMS) data

DTE Electric Company
MECNRDCSCDE-8.47-01 2008-2018 Emissions Summary
PM

Case No. U-20471
Respondent: B. J. Marietta
Page: 4 of 6

PM (tons)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	82	35	25	14	24	6	13	3	11	16	7
BR2	66	35	21	18	5	16	33	9	14	14	17
CCK	3.1										
GW1	118	8	22	19	27	10	7	6	14	16	25
HB	77	22	35	34	15	7					
MON1	555	451	487	418	366	311	117	93	60	88	85
MON2	505	487	324	412	308	373	137	84	78	86	129
MON3	490	402	77	54	67	115	112	62	80	74	79
MON4	434	179	81	67	48	207	111	87	42	81	73
RR2	35	68	97	80	7	32	68	45			
RR3	130	153	29	25	18	40	71	69	21	18	11
SC1	23	7	2	5	3	2	5	4	5	8	6
SC2	23	25	27	25	6	17	11	6	8	12	11
SC3	1	5	14	1	1	1	1	1	1	0.4	5
SC4	0.2	4	7	18	1	1	1	0.4	0.3		
SC6	13	1	13	22	6	25	17	13	5	12	9
SC7	302	252	258	80	71	119	82	51	65	2	34
TC9	287	356	268	228	232	257	242	189	115	87	65
TCHP	167	169	213	146	80	102	66	43	10		

PM (lb/mmbtu)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	0.006	0.002	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.001	0.000
BR2	0.003	0.002	0.001	0.001	0.000	0.001	0.002	0.001	0.001	0.001	0.001
CCK	0.007										
GW1	0.073	0.009	0.009	0.011	0.008	0.007	0.007	0.007	0.007	0.007	0.007
HB	0.059	0.027	0.034	0.033	0.030	0.025					
MON1	0.023	0.021	0.020	0.020	0.018	0.018	0.005	0.004	0.004	0.004	0.005
MON2	0.022	0.021	0.020	0.019	0.016	0.018	0.009	0.004	0.004	0.005	0.006
MON3	0.020	0.018	0.003	0.003	0.003	0.006	0.005	0.004	0.003	0.003	0.004
MON4	0.020	0.007	0.003	0.003	0.003	0.009	0.006	0.004	0.003	0.004	0.003
RR2	0.004	0.008	0.011	0.012	0.001	0.005	0.016	0.014			
RR3	0.014	0.018	0.003	0.004	0.003	0.007	0.010	0.011	0.003	0.003	0.002
SC1	0.005	0.002	0.000	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.002
SC2	0.005	0.006	0.006	0.007	0.002	0.005	0.003	0.002	0.003	0.003	0.003
SC3	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
SC4	0.000	0.001	0.002	0.005	0.000	0.000	0.000	0.000	0.000		
SC6	0.002	0.000	0.002	0.003	0.001	0.003	0.003	0.002	0.001	0.002	0.002
SC7	0.023	0.023	0.027	0.008	0.007	0.010	0.010	0.005	0.012	0.002	0.004
TC9	0.021	0.025	0.023	0.017	0.017	0.019	0.023	0.018	0.011	0.008	0.010
TCHP	0.024	0.031	0.036	0.030	0.017	0.021	0.019	0.020	0.024		

-- BR1 & BR2 emissions include only DTE portion; MPPA emissions are excluded
-- Units operating in 2008, but since retired are included (CCK, HB, RR2, SC1, SC4, TCHP)
-- PM emissions calculated from coal and operational data for all plants other than Monroe;
Monroe PM data since PM monitors were installed is from monitored data

DTE Electric Company
MECNRDCSCDE-8.47-01 2008-2018 Emissions Summary
PM2.5

Case No. U-20471
Respondent: B. J. Marietta
Page: 5 of 6

PM2.5 (tons)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	5.57	2.65	1.84	0.11	1.79	0.41	0.99	0.20	0.15	3.37	0.55
BR2	4.74	2.42	1.69	1.40	0.37	1.18	1.00	0.64	0.68	3.05	3.87
CCK	3.36										
GW1	11.34	7.46	21.54	15.62	27.44	9.53	6.90	5.88	13.11	15.59	23.82
HB	4.65	1.51	1.98	2.07	0.77	0.43					
MON1	28.89	26.90	29.29	29.29	21.75	18.28	0.10	5.58	3.31	5.31	5.15
MON2	26.58	29.37	19.67	19.67	18.61	22.67	8.25	5.09	4.11	5.14	7.74
MON3	27.28	21.93	4.70	4.70	4.22	6.84	6.76	5.74	5.43	4.45	4.21
MON4	24.25	10.79	4.85	4.85	2.95	12.53	6.65	5.43	3.37	4.89	3.91
RR2	2.62	3.97	5.73	4.65	0.38	1.91	3.98	2.09			
RR3	7.61	8.70	1.49	1.50	1.03	1.83	4.68	4.10	3.60	2.88	1.58
SC1	1.34	0.38	0.18	0.07	0.28	0.11	0.35	0.24	0.25	1.31	1.21
SC2	1.23	1.46	1.68	0.47	0.53	0.96	0.81	0.36	0.29	1.84	0.64
SC3	0.00	0.30	0.89	1.48	0.01	0.03	0.11	0.05	0.03	0.07	0.79
SC4	0.09	0.34	0.39	0.61	0.14	0.00	0.05	0.03	0.01		
SC6	0.72	0.11	0.91	2.38	0.36	1.49	0.96	0.53	0.35	1.38	0.83
SC7	18.12	14.53	13.14	4.77	4.27	7.23	3.59	3.27	2.03	0.18	4.92
TC9	20.73	20.63	15181.37	13.87	13.06	15.23	18.25	11.00	8.77	12.70	7.52
TCHP	14.25	10.60	8287.98	8.72	4.58	6.06	3.96	2.50	0.16		

PM2.5 (lb/mmbtu)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	0.00040	0.00014	0.00010	0.00001	0.00011	0.00003	0.00006	0.00001	0.00001	0.00020	0.00004
BR2	0.00024	0.00012	0.00010	0.00007	0.00002	0.00006	0.00006	0.00004	0.00004	0.00023	0.00023
CCK	0.00750										
GW1	0.00697	0.00834	0.00882	0.00924	0.00843	0.00709	0.00679	0.00662	0.00661	0.00664	0.00668
HB	0.00358	0.00184	0.00194	0.00203	0.00151	0.00154					
MON1	0.00117	0.00127	0.00122	0.00138	0.00104	0.00106	0.00000	0.00026	0.00023	0.00025	0.00028
MON2	0.00116	0.00127	0.00122	0.00093	0.00100	0.00108	0.00057	0.00025	0.00023	0.00033	0.00034
MON3	0.00113	0.00096	0.00018	0.00026	0.00018	0.00036	0.00030	0.00038	0.00022	0.00021	0.00019
MON4	0.00114	0.00043	0.00018	0.00021	0.00018	0.00054	0.00036	0.00023	0.00020	0.00022	0.00018
RR2	0.00033	0.00046	0.00062	0.00067	0.00008	0.00031	0.00095	0.00063			
RR3	0.00081	0.00101	0.00018	0.00024	0.00016	0.00032	0.00065	0.00068	0.00056	0.00052	0.00034
SC1	0.00029	0.00010	0.00004	0.00002	0.00008	0.00003	0.00011	0.00007	0.00007	0.00032	0.00031
SC2	0.00027	0.00035	0.00038	0.00012	0.00014	0.00029	0.00023	0.00011	0.00011	0.00047	0.00017
SC3	0.00000	0.00007	0.00022	0.00039	0.00000	0.00001	0.00003	0.00002	0.00001	0.00002	0.00021
SC4	0.00002	0.00009	0.00009	0.00016	0.00004	0.00000	0.00001	0.00001	0.00001		
SC6	0.00009	0.00002	0.00011	0.00030	0.00007	0.00018	0.00015	0.00010	0.00010	0.00024	0.00018
SC7	0.00136	0.00133	0.00138	0.00050	0.00040	0.00063	0.00043	0.00035	0.00036	0.00013	0.00056
TC9	0.00149	0.00143	1.29020	0.00103	0.00094	0.00111	0.00173	0.00107	0.00087	0.00121	0.00121
TCHP	0.00208	0.00196	1.40793	0.00178	0.00098	0.00128	0.00114	0.00115	0.00038		

-- BR1 & BR2 emissions include only DTE portion; MPPA emissions are excluded
-- Units operating in 2008, but since retired are included (CCK, HB, RR2, SC1, SC4, TCHP)
-- PM2.5 data from Michigan Air Emission Reporting System (MAERS) data

DTE Electric Company
MECNRDCSCDE-8.47-01 2008-2018 Emissions Summary
Hg

Case No. U-20471
Respondent: B. J. Marietta
Page: 6 of 6

Hg (lbs)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	155.0	160.6	174.8	182.6	148.4	140.9	148.0	215.2	27.6	26.7	21.0
BR2	223.3	167.1	159.1	257.3	130.5	177.4	155.0	184.9	34.3	21.8	28.6
CCK	0.2										
GW1		0.5	1.2	0.9	1.7	0.7	0.5	0.5	1.0	1.2	1.8
HB	12.9	5.6	8.8	8.5	5.3	2.5					
MON1	307.1	203.7	270.0	291.8	271.7	262.4	29.0	34.3	13.5	21.9	15.2
MON2	282.6	222.4	180.9	290.1	241.0	331.3	64.0	28.9	25.7	15.8	16.6
MON3	294.7	212.1	103.0	44.2	35.2	33.7	30.0	13.7	17.4	17.7	15.2
MON4	261.9	234.4	105.9	81.1	47.5	39.6	20.0	29.1	15.6	13.5	11.5
RR2	78.9	76.7	79.6	72.4	53.2	78.6	44.9	30.6			
RR3	84.7	76.6	70.4	78.2	85.1	59.6	67.8	44.1	11.6	4.1	3.3
SC1	43.2	30.7	31.3	19.8	15.0	24.7	26.7	49.6	6.9	6.1	6.0
SC2	43.0	31.3	20.3	21.2	17.6	18.0	22.7	22.2	5.4	6.3	5.3
SC3	44.9	33.6	22.0	23.9	18.8	29.6	18.5	33.2	4.6	6.6	5.3
SC4	40.1	31.9	25.1	22.5	18.0	28.5	23.6	44.5	3.2		
SC6	74.3	61.3	65.8	96.6	50.7	78.6	111.0	52.8	6.3	9.1	7.3
SC7	119.3	91.2	74.4	75.6	98.7	103.5	132.9	80.4	27.8	1.6	11.0
TC9	152.6	132.6	105.7	165.6	186.8	90.4	70.0	92.8	25.5	12.3	6.9
TCHP	76.5	52.4	56.6	61.5	69.6	55.0	32.0	19.2	3.7		

Hg (lb/Tbtu)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BR1	5.54	4.20	4.89	6.59	4.41	4.93	4.63	6.42	1.10	0.79	0.68
BR2	5.55	4.18	4.80	6.59	4.32	4.86	4.60	6.22	1.10	0.83	0.83
CCK	0.25										
GW1	0.00	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
HB	4.98	3.44	4.31	4.17	5.22	4.43					
MON1	6.24	4.80	5.64	6.87	6.52	7.57	0.62	0.79	0.46	0.51	0.41
MON2	6.18	4.81	5.60	6.86	6.45	7.88	2.20	0.72	0.73	0.50	0.36
MON3	6.08	4.64	1.98	1.24	0.75	0.88	0.67	0.46	0.36	0.41	0.34
MON4	6.17	4.65	1.97	1.78	1.45	0.86	0.54	0.61	0.47	0.30	0.26
RR2	4.93	4.45	4.34	5.26	5.36	6.43	5.34	4.65			
RR3	4.50	4.45	4.18	6.14	6.46	5.23	4.70	3.66	0.91	0.37	0.36
SC1	4.63	3.91	3.65	2.83	2.11	3.71	4.11	7.13	0.99	0.73	0.77
SC2	4.64	3.77	2.30	2.78	2.33	2.68	3.19	3.38	0.98	0.80	0.71
SC3	4.46	3.87	2.71	3.14	2.65	3.94	2.85	5.00	0.87	0.80	0.71
SC4	4.67	3.95	2.77	3.02	2.40	3.44	3.16	5.46	0.69		
SC6	4.81	4.34	3.84	6.09	5.30	4.79	8.46	4.77	0.93	0.80	0.78
SC7	4.48	4.19	3.90	3.98	4.59	4.52	7.97	4.28	2.49	0.60	0.63
TC9	5.48	4.60	4.49	6.16	6.72	3.29	3.31	4.53	1.27	0.59	0.56
TCHP	5.59	4.84	4.81	6.29	7.42	5.79	4.61	4.41	4.39		

-- BR1 & BR2 emissions include only DTE portion; MPPA emissions are excluded
-- Units operating in 2008, but since retired are included (CCK, HB, RR2, SC1, SC4, TCHP)
-- Hg data through 2016 from toxic release inventory (TRI) reporting; Hg data for 2017 & 2018 from sorbent trap monitoring system data; emission factor from EPA AP-42 used for CCK & GW

Table 1: Population of At-risk Groups: Monroe, St. Clair, and Wayne Counties,* † Michigan (2019) by DTE coal-fired power plant location [1]

				Lung Diseases						
County *(DTE coal plant(s) located in county)*	**Total pop.**	**Under 18**	**65 & Over**	**Pediatric Asthma**	**Adult Asthma**	**COPD**	**Lung Cancer**	**Cardiovascular Disease**	**Diabetes**	**Poverty**
Monroe *(Monroe)*	149,649	32,208	26,266	2,822	12,663	10,681	95	12,930	13,677	17,416
St. Clair *(St. Clair)* *(Belle River)*	159,350	33,599	29,085	2,944	13,533	11,644	101	14,181	14,994	19,533
Wayne *(Trenton Channel)* *(River Rouge)*	1,753,616	416,178	265,150	36,465	145,113	114,437	1,107	135,536	143,598	392,205
Michigan (Population totals)	7,474,222	1,660,107	1,184,993	145,455	630,222	499,691	4,724	595,065	629,146	1,049,964

* Monroe, St. Clair and Wayne Counties are all in nonattainment for 8-hour ozone standards for 2018-2019 according to NAAQS.[2]

† St. Clair and Wayne Counties are in nonattainment for SO2 standards for 2018-2019 according to NAAQS.[2]

[1] American Lung Association, *State of the Air 2019: Report Card: Michigan* (2019), available at: https://www.lung.org/our-initiatives/healthy-air/sota/city-rankings/states/michigan/.

[2] EPA, *Michigan Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants* (2019), available at: https://www3.epa.gov/airquality/greenbook/anayo_mi.html.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of **DTE Electric Company** for approval of its integrated resource plan pursuant to MCL 460.6t, and for other relief.	Case No. U-20471 ALJ Sally L. Wallace

---

PROOF OF SERVICE

On the date below, an electronic copy of **Direct Testimony of Kindra Weid on behalf of Michigan Environmental Council, Natural Resources Defense Council and Sierra Club along with Exhibits MEC-88 through MEC-92** was served on the following:

Name/Party	E-mail Address
Administrative Law Judge Hon. Sally Wallace	wallaces2@michigan.gov
Counsel for DTE Electric Co. Lauren DuVal Donofrio Martin Heiser	mpscfilings@dteenergy.com donofriol@dteenergy.com martin.heiser@dteenergy.com
Counsel for MPSC Staff Amit T. Singh Heather M.S. Durian Daniel E. Sonneveldt Benjamin J. Holwerda Sarah Mullkoff	singha9@michigan.gov durianh@michigan.gov sonneveldtd@michigan.gov holwerdab@michigan.gov MullkoffS1@michigan.gov
Counsel for Department of Attorney General Joel B. King	ag-enra-spec-lit@michigan.gov kingJ38@michigan.gov
Counsel for ABATE Bryan A. Bradenburg Michael J. Pattwell	bbradenburg@clarkhill.com mpattwell@clarkhill.com
Counsel for Great Lakes Renewable Energy Association Don L. Keskey Brian W. Coyer	donkesey@publiclawresourcecenter.com bwcoyer@publiclawresroucecenter.com
Counsel for Energy Michigan Inc. Justin K. Ooms Laura Chappelle Timothy Lundgren	jkooms@varnumlaw.com lachappelle@varnumlaw.com tjlundgren@varnumlaw.com
Counsel for Environmental Law & Policy Center, the Ecology Center, the Solar Energy Industries Association, the Union of Concerned Scientists and Vote Solar Margrethe Kearney Jean-Luc Kreitner	mkearney@elpc.org jkreitner@elpc.org
Counsel for International Transmission Company Richard J. Aaron Courtney Kissel	raaron@dykema.com ckissel@dykema.com
Counsel for Geronimo Energy Timothy Lundgren Justin K. Ooms	tjlundgren@varnumlaw.com jkooms@varnumlaw.com

Counsel for Cypress Creek Renewables, LLC Jennifer Utter Heston	jheston@fraserlawfirm.com
Counsel for Convergen Energy, LLC Timothy Lundgren	tjlundgren@varnumlaw.com
Counsel for Association of Businesses Advocating Tariff Equity Bryan A. Brandenburg	BBrandenburg@clarkhill.com
Counsel for City of Ann Arbor Timothy Lundgren Justin Ooms	tjlundgren@varnumlaw.com jkooms@varnumlaw.com
Counsel for Heelstone Development, LLC **Midland Cogeneration Venture LP** Jason Hanselman John A. Janiszewski	jhanselman@dykema.com jjaniszewski@dykema.com
Counsel for Soulardarity Christopher M. Bzdok Lydia Barbash-Riley	chris@envlaw.com lydia@envlaw.com
Counsel for Michigan Public Power Agency Nolan Moody Peter H. Ellsworth	nmoody@dickinsonwright.com pellsworth@dickinsonwright.com
Co-Counsel for Soulardarity Rebecca J. Boyd Mark H. Templeton Robert A. Weinstock	rebecca.j.boyd@gmail.com templeton@uchicago.edu rweinstock@uchicago.edu

The statements above are true to the best of my knowledge, information and belief.

Date: August 21, 2019

By: _____

OLSON, BZDOK & HOWARD, P.C.
Counsel for MEC-NRDC-SC

Karla L Gerds
Digitally signed by Karla Gerds
DN: cn=Karla Gerds, o=Olson, Bzdok & Howard, P.C., ou, email=karla@envlaw.com, c=US
Date: 2019.08.21 19:59:48 -04'00'

Kimberly Flynn, Legal Assistant
Karla Gerds, Legal Assistant
Breanna Thomas, Legal Assistant
420 E. Front St.
Traverse City, MI 49686
Phone: 231/946-0044
Email: kimberly@envlaw.com
karla@envlaw.com and
breanna@envlaw.com