OLSON, BZDOK & HOWARD

August 21, 2019

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

       RE: MPSC Case No. U-20471

Dear Ms. Kunkle:

The following is attached for paperless electronic filing:

Direct Testimony of George Evans on behalf of the Michigan Attorney General, Michigan Environmental Council, Natural Resources Defense Council and Sierra Club

Exhibits MEC-1 through MEC-7 (*Exhibit MEC-6 is confidential and will be only served upon those with a signed NDC on file*)

Proof of Service

                  Sincerely,

                  Tracy Jane Andrews
                  tjandrews@envlaw.com

xc: Parties to Case No. U-20471

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

MPSC Case No. U-20471

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.)
_____)

Direct Testimony

of

George Evans

On behalf of

The Michigan Attorney General, Michigan Environmental Council, Natural Resources Defense Council, and the Sierra Club

August 21, 2019

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1 **I. PROFESSIONAL QUALIFICATIONS**

2 **Q. Please state your name, position and business address.**

3 A. My name is George W. Evans. I am the President of Evans Power Consulting, Inc., and

4 my business address is 358 Cross Creek Trail, Robbinsville, North Carolina 28771.

5 **Q. On whose behalf are you testifying in this proceeding?**

6 A. I am testifying on behalf of the Michigan Attorney General Dana Nessel ("AG"),

7 Michigan Environmental Council ("MEC"), the Sierra Club ("SC"), and the Natural

8 Resources Defense Council ("NRDC").

9 **Q. Please summarize your qualifications and work experience.**

10 A. I received a Bachelor of Science in Applied Mathematics from the Georgia Institute of

11 Technology in 1974. In 1976, I received a Master of Science in Applied Mathematics, also

12 from the Georgia Institute of Technology. My area of concentration was probability and

13 statistics. In 1980, I joined Energy Management Associates, Inc. ("EMA"), the company

14 responsible for the development of the premier electric utility modeling tools, PROMOD®,

15 PROSCREEN®(now known as Strategist®) and MAINPLAN®. While at EMA, I worked

16 with some fifty (50) major electric utilities in the United States and Canada in the

17 application of these modeling tools for generation expansion planning, the development of

18 net power costs, fuel budgeting, the analysis of power purchases and the development of

19 optimal maintenance schedules for generating units.

20 In 1989, I left EMA to join GDS Associates, Inc., a consulting firm located in Marietta,

21 Georgia. At GDS, I was a principal and the Manager of System Modeling. In this position,

22 I was primarily responsible for performing analyses and presenting expert testimony

23 concerning integrated resource planning, the forecasting of system production costs,

24 developing estimates of the likelihood of service interruptions, developing estimates of

25 replacement power costs, and related activities.

26 In August of 1997, I left GDS to join Slater Consulting as a Vice President. In December

27 of 2011, I left Slater Consulting and formed Evans Power Consulting, Inc. I am sponsoring

28 a copy of my current resume as Exhibit MEC-1.

1 **Q. Have you testified previously as an expert witness?**

2 A. Yes, I have provided expert testimony on more than 50 previous occasions, before the
3 public utility commissions in Alabama, Arkansas, Colorado, Delaware, Georgia,
4 Michigan, Mississippi, Nevada, Oklahoma, Pennsylvania, South Carolina, South Dakota,
5 and Utah; before the Federal Energy Regulatory Commission; and in state court and federal
6 court.

7 **Q. Have you testified previously before this Commission?**

8 A. Yes, I presented expert testimony before the Michigan Public Service Commission (the
9 "Commission") on eighteen previous occasions: Case Nos. U-10127, U-10685, U-10427-
10 R, U-10702-R, U-11180-R, U-15001, U-17317, U-17319, U-17429, U-17678, U-17680,
11 U-17767, U-17680-R, U-17678-R, U-18250, U-18142, U-18419, and U-20165.

12 **Q. Do you have experience concerning the Strategist model that was utilized by DTE**
13 **Electric Company ("DTE" or "the Company") to support its request in this case?**
14 A. Yes, I do. I was involved in the design and development of Strategist (formerly known as
15 PROSCREEN) while with Energy Management Associates, and I have presented expert
16 testimony concerning Strategist on fifteen previous occasions, five of which were before
17 the Commission: Case Nos. U-17429, U-17767, U-18250, U-18419 and U-20165.

18 **Q. Does your experience include the subjects of this case, namely, Integrated Resource**
19 **Planning ("IRP") and application of the Strategist model?**
20 A. Yes, it does. While with EMA in the 1980s, I was involved in the development and
21 application of the Strategist model. Since that time, I have presented expert testimony on
22 eighteen occasions that concern IRPs, many of which included the application of the
23 Strategist model.

24 **Q. Have you developed alternative generation portfolios in any of these proceedings?**

25 A. Yes, I have. In cases before the Georgia Public Service Commission, the Oklahoma
26 Corporation Commission, and the Michigan Public Service Commission, I developed
27 alternative generation portfolios (using Strategist) that were, in some cases, subsequently
28 approved by the Commissions.

1 **Q.** **Are you sponsoring any exhibits?**

2 A. Yes. I am sponsoring the following exhibits:

3   <u>Exhibit</u>   <u>Description</u>

4   MEC-1:   Resume of George Evans

5   MEC-2:   Response to MECNRDCSCDE-3.24

6   MEC-3:   Response to MECNRDCSCDE-5.4

7   MEC-4:   Response to MECNRDCSCDE-3.4

8   MEC-5:   Responses to MECNRDCSCDE-3.10 and MECNRDCSCDE-2.5

9   MEC-6C: DTE's hourly solar profile CONFIDENTIAL

10   MEC-7   Strategist Runs: Table 1 and Table 2

11 **II.** **<u>INTRODUCTION</u>**

12 **Q.** **What is the Company requesting in this case?**

13 A. The Company is requesting approval of its 2019 Integrated Resource Plan and the resulting

14 Proposed Course of Action ("PCA"), which the Company has split into the "Defined PCA"

15 covering the years 2020-2024 and the "Flexible PCA" covering the years 2025-2035. The

16 Defined PCA includes the following additions and retirements.

17   • Added solar and wind projects;

18   • Additional Voluntary Green Pricing (VGP) program renewables;

19   • Retirement of the Trenton Channel coal plant in 2022;

20   • Retirement of the St. Clair coal units 2, 3, 6, and 7 in 2022;

21   • Retirement of the St. Clair coal unit 1 in 2019;

22   • Conversion of the River Rouge coal unit 3 to industrial waste gas in 2020 until

23   retirement in 2022;

24   • Increased Energy Waste Reduction ("EWR") programs to achieve annual

25   energy savings of 1.65% in 2020 and 1.75% in 2021;

26   • Increased Demand Response ("DR") programs to 859 MW by 2024; and

27   • Added Conservation Voltage Reduction and Volt-Var Optimization

28   ("CVR/VVO") pilot program.

1 The Flexible PCA leaves a large number of issues to be determined in DTE's next IRP,

2 primarily related to the optimal mix of resources (if any) required to replace the two Belle

3 River coal units. DTE says that it currently plans to retire the Belle River units one and

4 two in 2029 and 2030, respectively, but that it will reevaluate those retirement dates in its

5 next IRP which the Company does not plan to file until 2025. However, DTE has indicated

6 that, in two of its four Flexible PCA pathways, a 414 MW combined cycle ("CCGT") gas-

7 fired power plant should replace the Belle River plant.

8 **Q. What is the purpose of your testimony?**

9 A. My testimony addresses certain shortcomings and errors in the process used by DTE to

10 develop its IRP, and more specifically, the optimal mix of resources (if any) that should be

11 used to replace the Belle River coal units upon retirement. In addition, as discussed in

12 Section X below, I performed Strategist analyses for other MEC/SC/NRDC witnesses. For

13 my Strategist runs performed for other witnesses, the Strategist input data modifications

14 and results of the Strategist runs are described in the testimony of each witness.

15 **Q. What process was used by DTE to develop its 2019 IRP?**

16 A. DTE developed and modeled four scenarios, or sets of assumptions. The scenarios are

17 Reference ("REF"), Business as Usual ("BAU"), Emerging Technology ("ET"), and

18 Environmental Policy ("EP"). The REF scenario represents DTE's internally developed

19 view of the future, including DTE's gas price forecast, planning assumptions and goals.

20 The BAU, ET, and EP scenarios are required by the Michigan Integrated Resource

21 Planning Parameters ("MIRPP") established pursuant to public act 341 of 2016, section 6t.

22 The BAU scenario utilizes publicly available information, such as the gas price forecast

23 from the 2018 Annual Energy Outlook published by the U.S. Energy Information

24 Administration. The ET scenario is based on the BAU scenario but assumes a 35%

25 reduction in capital costs for renewable resources other than wind, and a 17.5% reduction

26 in capital costs for wind resources. The EP scenario is also based on the BAU scenario but

27 requires a 30% reduction in CO_2 production by 2030 and assumes a reduction of 35% for

28 wind and solar capital costs. DTE developed portfolios under each scenario, using the

29 Strategist model, and then performed a series of sensitivities on each resulting IRP. At this

30 point, DTE determined the Defined PCA (for the years 2020-2024) and selected four

1   potential plans (labeled PCA Pathways A, B, C and D) for the Flexible PCA (covering the

2   years 2025-2035). Each of these Pathways and the Defined PCA was then subjected to five

3   separate risk analyses and finally, ranked under the Company's planning principles. The

4   four selected pathways for the Flexible PCA under each scenario are shown in Tables 41,

5   42, 43 and 44 on pages 137 through 141 of Ms. Mikulan's direct testimony.

6 **Q.   What shortcomings and errors have you identified in the Company's development of**

7 **the IRP?**

8 A.   I have identified the following problems with the Company's process for the development

9   of its 2019 IRP:

10   • The Company's process does not result in an identifiable selected IRP;

11   • The Company's process is unfathomable in large part due to a lack of

12   transparency;

13   • The Company's process involves excessive manual intervention;

14   • The Company's process does not result in the selection of the optimal plan;

15   • The Company's process contains an unsubstantiated bias towards dispatchable

16   resources;

17   • Two of the Company's four pathways result in excess (unused) capacity;

18   • The Company's modeling does not appear to accurately represent some

19   operations of the DTE system;

20   • The Company's Strategist input data includes a number of errors; and

21   • The Company failed to utilize the End Effects process in Strategist.

22   The following Sections of my testimony discuss each of these problems.

1   **III.   NO IDENTIFIABLE IRP**

2   **Q.   Please describe what you mean by your claim that the Company's process does not**

3   **result in an identifiable IRP.**

4   A.   The Company has clearly identified its plan for the years 2020-2024 but has not identified

5   a plan for the years 2025-2035. Instead, the Company has listed four potential pathways

6   for the years 2025-2035. These potential plans are shown in Tables 41, 42, 43 and 44 on

7   pages 137 through 141 of Ms. Mikulan's direct testimony.

8   **Q.   Why is this an issue?**

9   A.   In its application, DTE states that "the flexible PCA for years 2025-2035 is by its nature

10   undefined and may be separately approved."[1] The Company is asking for approval of this

11   Flexible PCA, but it is not clear exactly what the Commission should approve. Also, for

12   the parties to this case, it is not clear how to analyze the Flexible PCA, since by its nature,

13   it is undefined.

14   **IV.   DTE's PROCESS IS NOT TRANSPARENT, IS UNFATHOMABLE, AND**
15   **INVOLVES MANUAL SELECTIONS**
16
17   **Q.   Please describe how the Company's process is not transparent, is essentially**

18   **unfathomable and involves excessive manual intervention.**

19   A.   Attached as Exhibit MEC-2 is DTE's response to Question No. MECNRDCSCDE-3.24.

20   In this response DTE states that "In regards to resource alternatives selected for the

21   proposed course of action pathways all resources identified (EWR level, VGP programs,

22   Demand Response and 1x1 CCGT) were forced in manually to Strategist." In other words,

23   the Company's Flexible PCA is the result of manual selections made by DTE personnel.

24   **Q.   Is this evident in the Company's filing and direct testimony?**

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[1] Page 4 of the Company's Application.

1　A.　No, it is not. Neither the word *manual* nor *manually* appear in Ms. Mikulan's direct

2　　　testimony. When describing Tables 41, 42, 43 and 44 (which show the resources in the

3　　　Flexible Plan Pathways) in her direct testimony, she states that "Columns (b), (c), and (d)

4　　　describe the resources selected within the least-cost plan or PCA pathway."[2]

5　**Q.**　**What process does DTE say was used to select the resources in the Flexible Plan**

6　　　**Pathways?**

7　A.　As shown in Exhibit MEC-2, Ms. Mikulan states that "The resources selected by the

8　　　Company in the proposed course of action pathways were a result of the synthesis of nearly

9　　　140 scenario/sensitivity combinations evaluated and growing interest in voluntary

10　　　renewables."[3]

11　**Q.**　**What process was used by the Company to produce the four pathways in the Flexible**

12　　　**PCA?**

13　A.　I was unable to understand the complete process. The Company has not produced a full

14　　　description of the process used to select the Flexible PCA Pathways. DTE's responses to

15　　　questions on this are shown in Exhibit MEC-3.[4] DTE did approximately 140 optimized

16　　　modeling runs under different scenarios and sensitivities in which it allowed Strategist to

17　　　select resources. Then DTE took the results of those modeling runs, along with other

18　　　factors, and manually selected resources for the four PCA Pathways. However, the four

19　　　PCA Pathways include a different assumption concerning DTE's Voluntary Green Pricing

20　　　Program ("VGP"). The four selected least-cost plans from DTE's Strategist optimization

21　　　runs include only 300 MW of VGP.[5] Yet each of the four PCA Pathways include 465 or

22　　　1,390 MW of VGP.[6]

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[2] Lines 7-8 on page 136 of Ms. Mikulan's direct testimony

[3] Ex MEC-2 (Response to MECNRDCSCDE-3.24).

[4] Ex MEC-3 (Response to MECNRDCSCDE-5.4a, b).

[5] See Mikulan Direct, pages 137-141, line one of Tables 41, 42, 43 and 44.

[6] See Mikulan Direct, pages 137-141, Tables 41, 42, 43 and 44.

1 **Q.** **Is this a significant flaw?**

2 A. Yes, it is. DTE made a significant change to one of the assumptions (the level of VGP) but
3   failed to perform Strategist optimization runs to account for this change. Instead DTE
4   selected resources manually for the four PCA Pathways. In addition, DTE varied the level
5   of EWR, again manually, in the creation of the PCA Pathways.

6 **Q.** **What do you conclude?**

7 A. Because DTE made significant changes to assumptions and manually selected the
8   resources in the PCA Pathways, it is highly unlikely that the PCA Pathways are reasonable
9   plans. In fact, in Section IV of my testimony, I demonstrate that the PCA Pathways are not
10   optimal or least-cost.

11 **V.** **PROCESS DID NOT PRODUCE OPTIMAL PLAN**

12 **Q.** **Please explain your assertion that the Company's process does not result in the**
13   **selection of the optimal plan.**

14 A. I derived a pathway that was less expensive than any of DTE's four Pathways (under the
15   REF scenario), by minimizing manual intervention and allowing Strategist to select
16   optimal resources. Using 2% EWR and 1,390 MW of VGP, I performed a Strategist
17   optimization based on the Company's REF scenario. This modeling run is shown as Case
18   1 in Exhibit MEC-7 and discussed in Section X below. In this run, Strategist found no
19   need to replace the Belle River coal plant, that is, did not include any resources to replace
20   Belle River. The resulting plan has an NPVRR of $12,362 million. This plan is lower cost
21   (using Strategist's costs) than any of the Pathways identified in Table 41 on page 137 of
22   Ms. Mikulan's direct testimony[7].

23 **Q.** **What does this show?**

24 A. This Strategist result demonstrates two things. First, the four Pathways that DTE manually
25   selected for its Flexible PCA do not include the optimal pathway. There is at least one plan

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[7] $12,362 is lower than any of the values shown in column(e) in Table 41, page 137, Ms. Mikulan Direct.

1　　(my plan including 1,390 MW VGP with 2% EWR) that is lower cost than any of the

2　　Pathways manually selected by DTE. Therefore, the undefined manual process used by

3　　DTE is not a process capable of selecting the optimal plan. Also, this Strategist result shows

4　　that there may be no need to replace Belle River when the plant is retired.

5　**VI.**　**BIAS TOWARDS DISPATCHABLE RESOURCES**

6　**Q.**　**Please explain your claim that the Company's process contains an unsubstantiated**

7　　　　**bias toward dispatchable resources.**

8　A.　Ms. Mikulan's direct testimony contains the following statement.

9　　　　"There is additional uncertainty regarding how a DTE Electric fleet, without
10　　　　additional dispatchable generation, would perform and be able to serve our
11　　　　customers reliably.'[8]

12　　　　DTE's process includes the "Application of Planning Principles", one of which is
13　　　　Reliability.[9]

14　**Q.**　**How does this Reliability Planning Principle impact DTE's selection of potential**

15　　　　**plans?**

16　A.　DTE witness Mikulan describes the process of applying the Planning Principles:

17　　　　**"Q173. What is the application of planning principles?** 20

18　　　　A173. The application of planning principles was both a subjective review of the least
19　　　　cost plans and resources that were evaluated for the PCA, and a more objective
20　　　　comparative analysis method that was used to rank each plan by individual planning
21　　　　principles. In our analysis, 12 plans were analyzed and assigned rankings for five of
22　　　　the seven planning principles: reliability, clean, flexible and balanced, reasonable risk,
23　　　　and community impact. The plans were not ranked based on affordability, as each
24　　　　plan was identified as least-cost, and the plans were not ranked on compliance, as each
25　　　　plan was compliant with current regulations. The 12 plans selected for analysis
26　　　　consisted of six of the nine least-cost plans from the scenario modeling (shown in
27　　　　Table 10) and the four pathways (shown in Table 40), with one pathway and least-
28　　　　cost plan overlapping. That is, the four preferred plans and the optimal plans from
29　　　　each of the scenarios specified in the (MIRPP) were analyzed in this method. The

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[8] Mikulan Direct, page 116, lines 3-5.

[9] See, *e.g.*, IRP, p. 41.

1   application of planning principles method, as shown in Figure 8, allowed for a
2   comprehensive view of each plan's ranking on the individual planning principles.

3   **Q174. What are the conclusions of the application of planning principles on the**
4   **PCA pathways?**

5   A174. The four PCA pathways are represented by plans 7, 8, 9, and 10 in Figure 8.
6   All the pathways have rankings ranging from number one to number across the five
7   evaluated planning principles. Of the four pathways, B and D have three or more top
8   rankings (1-3). Pathways A and C each have one top ranking (1-3). Additionally, the
9   rankings for A and B are all at or better than 7. Of the four pathways, B appears to be
10   the best overall in this qualitative assessment, with its four top-three rankings and the
11   fifth ranking being a seven. More details are shown in Exhibit A-4, Appendix T."[10]

12   The results of applying the Planning Principles were used to select the PCA Pathways.

13   **Q.**   **What is the bias that you claim?**

14   A.   DTE states that the Reliability Planning Principle ranks plans with renewable generation

15   below plans with combined cycle generation. The description of the application of the

16   Reliability Planning Principle contains the following statements.

17   "Plans scored well with high levels of energy waste reduction coupled with
18   dispatchable generation, such as combined cycle." … Demand Response was
19   viewed as dispatchable, more reliable than a renewable generation resource, though
20   not as reliable as a combined cycle. Ranking first in the reliability analysis was Plan
21   12. Plan 12 had the highest level of EWR at 2%, and had a complimentary
22   combined cycle."[11]

23   **Q.**   **Why do you claim this bias is unsubstantiated?**

24   A.   First, DTE appears to assume that renewable resources can never be dispatchable. Witness

25   Milligan addresses this assertion in his testimony. Also, the Company was asked in

26   discovery to provide the amount of dispatchable generation required by DTE to perform

27   and to be able to serve DTE customers reliably. The Company was not able to provide any

28   quantification of this stated requirement for dispatchable generation.[12]

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[10] Mikulan Direct, page 131, line 20 to page 134, line 6, Figure 8 excluded.

[11] Page 143 in Exhibit A-4

[12] Ex MEC-4 (Response to MECNRDCSCDE-3.4b).

1   **Q,**   **Does Strategist indicate any loss in reliability without additions of dispatchable**

2   **generation?**

3   A.   No, it does not. As a part of the results provided with each run, Strategist reports the

4   expected Loss of Load Hours – a reliability index. The Strategist run I describe in Section

5   IV, in which Strategist does not replace Belle River at all, shows no loss of load hours in

6   the years after the retirement of Belle River. So according to Strategist, there is no reduction

7   in DTE's reliability when no dispatchable resource is added to replace Belle River.

8   **VII.**   **TWO OF FOUR PATHWAYS CREATE EXCESS CAPACITY**

9   **Q.**   **Why do you claim that two of DTE's four PCA Pathways create excess (unused)**

10   **capacity?**

11 A.   According to Table 41 on page 137 of Ms. Mikulan's direct testimony, PCA A and PCA

12   B differ in one key respect: PCA A adds 50 MW of DR in 2029/2030 while PCA B has a

13   414 MW CCGT unit in 2029/2030, which DTE manually added. Since all four pathways

14   must meet DTE's capacity requirement, PCA B creates at least 364 MW (414 less 50) of

15   capacity that is not needed to meet DTE's capacity requirement in 2029/2030. A similar

16   comparison between PCA C and PCA D shows that PCA D creates at least 264 MW of

17   capacity that is not needed in 2029/2030.

18 **Q.**   **Does this excess capacity become useful in years after 2029/2030?**

19 A.   No, it does not. DTE is not experiencing load growth, so this excess created in 2029/2030

20   grows significantly until the Monroe coal units retire in 2040. In PCA B, the capacity

21   excess grows to 1,125 MW in 2039, while in PCA D, the capacity excess grows to 883

22   MW in 2039.[13]

23 **Q.**   **What does this mean concerning DTE's preferred CCGT addition to replace Belle**

24   **River?**

25 A.   This means that DTE's preferred replacement for Belle River in pathways B and D

26   creates a large amount of excess capacity that is not necessary to serve the needs of

27   DTE's customers for a ten-year period.

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[13] See Ex A-7, line 37 on each pages 6 and 12.

1 **Q.**   **Could DTE's customers benefit from energy and/or capacity sales to MISO in this**

2   **situation?**

3 **A.**   It is possible that this excess capacity could result in profitable capacity and/or energy sales

4   to MISO, which would provide some benefit to DTE's customers. However, building new

5   capacity primarily for profits from potential sales to MISO is not a reasonable plan. Success

6   would depend on many factors difficult to forecast and not under DTE's control, such as

7   the actual MISO capacity and energy prices in 2030 through 2040.

8 **VIII.**   **STRATEGIST MODELS APPEAR INCONSISTENT WITH ACTUAL**
9   **OPERATIONS**

10 **Q.**   **Why do you claim that the Company's Strategist modeling results appear inconsistent**

11   **with the actual operations of the DTE system?**

12 **A.**   I compared the actual operation of the DTE system in 2014-2018 to the results of DTE's

13   Strategist modeling for the years 2018-2022. Chart 1 displays in graphic form the actual

14   MISO purchases made over the years 2014-2018 against the MISO purchases estimated by

15   DTE's Strategist model in the period 2018-2022.

16   **<u>Chart 1:</u>**

17
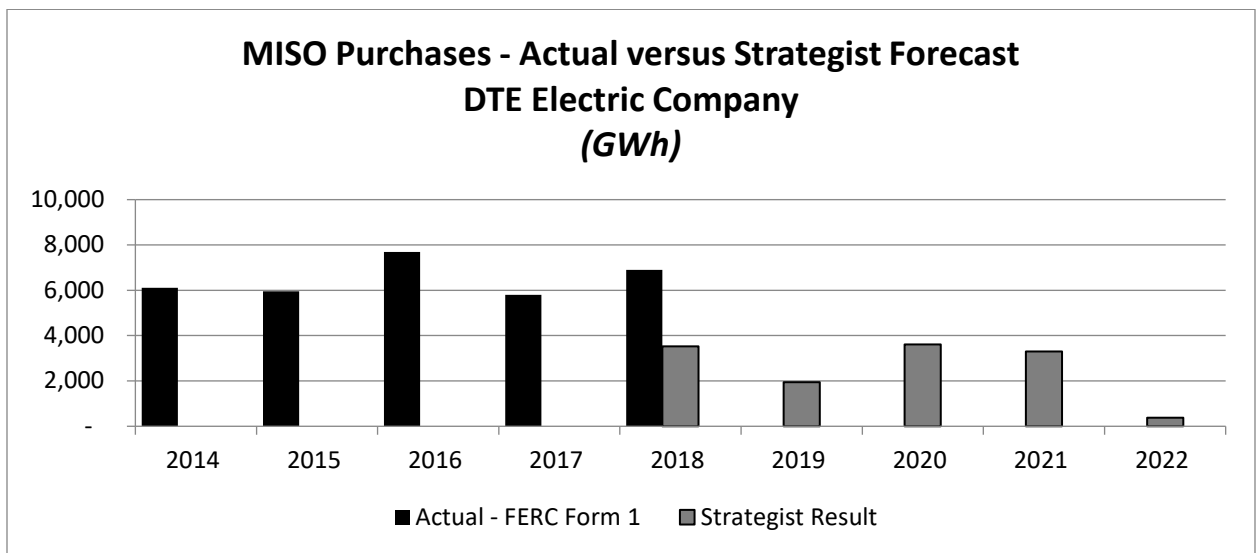
1   Over the five-year period, DTE's Strategist results are less than half (39%) of actual MISO

2   purchases, the Strategist 2018 estimate is 51% of actual 2018 purchases, and the Strategist

3   estimate of 2022 MISO purchases is 6% of the actual five-year average purchase.

4   Chart 2 compares the actual MISO sales made by DTE against the MISO sales estimated

5   by Strategist.

6   **Chart 2:**

7

MISO Sales - Actual versus Strategist Forecast
DTE Electric Company
(GWh)
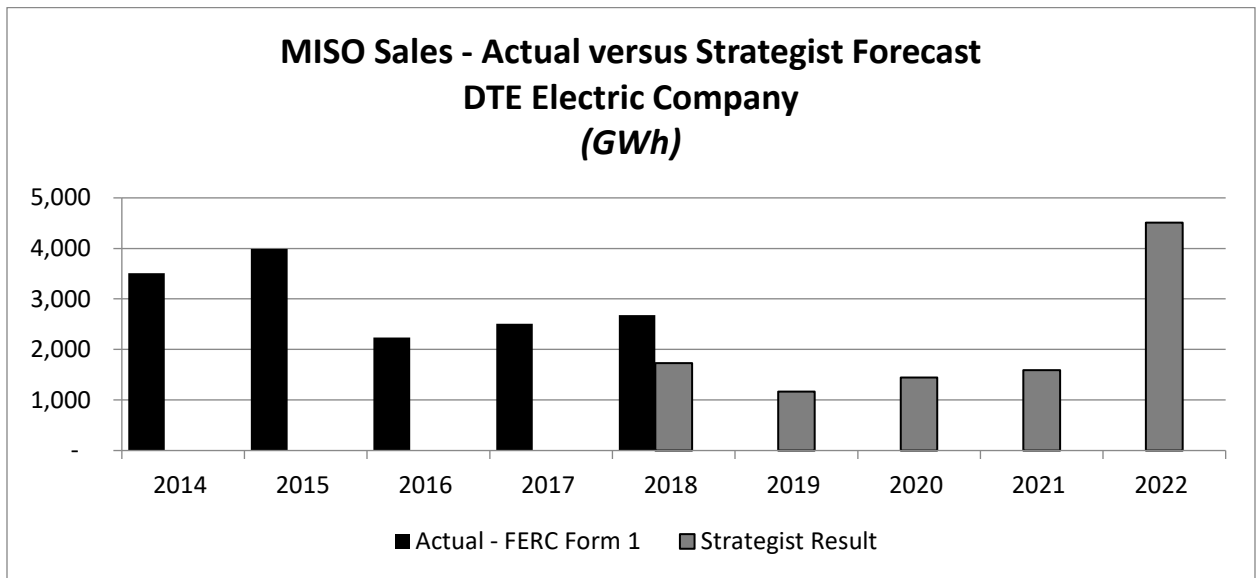
8   The Strategist estimates of MISO sales in 2018-2021 are significantly below the actual

9   MISO sales, averaging 50% of actual sales, and the Strategist estimate of 2022 MISO sales

10   exceeds any level seen in the years 2014-2018.

11   **Q.   Did DTE compare Strategist results to actual results, as you have done?**

12   A.   DTE has not provided any evidence that Strategist results were compared to actual results

13   of DTE operations. Exhibit MEC-5 shows the Company's response to Question No.

14   MECNRDCSCDE-2.5, which requests evidence of verification. The Company does claim

15   that they can "reasonably confirm that the Strategist input data was accurate" and that

16   "outputs of the Strategist models were also reviewed by SMEs for accuracy." However, no

17   evidence of such reviews has been provided.

1 **VIII.** **ERRORS IN STRATEGIST INPUT DATA**

2 **Q.** **What errors have you identified in DTE's Strategist input data?**

3 A. I have identified the following errors in DTE's Strategist input data.

4 • DTE included the Michigan Public Power Agency (MPPA) portion of the Belle
5 River coal plant;
6 • DTE's hourly generation profile for solar units shows generation in nighttime
7 hours.

8 **Q.** **Does DTE agree that including the MPPA portion of the Belle River coal plant is an**
9 **error?**

10 A. In DTE's Response to MECNRDCSCDE-3.10 (Exhibit MEC-5), DTE admits that the
11 entire Belle River plant, including the MPPA portion, was included in most of DTE's
12 Strategist modeling. However, DTE claims in this response that this is not an issue, because
13 "it cancels out in the delta analysis".

14 **Q.** **Do you agree with DTE that including the MPPA portion is not a problem?**
15 A. No, I do not. The MPPA portion of Belle River will produce energy that will be counted
16 by Strategist as a portion of the energy required to serve DTE customers. This situation
17 will cause Strategist to be less likely to add resources that provide large amounts of energy,
18 in that the MPPA portion of Belle River is seen as providing such energy. In other words,
19 the presence of the MPPA portion of Belle River can improperly impact Strategist's
20 selection of an optimal expansion plan.

21 **Q.** **Please describe the issue with DTE's hourly solar profile.**
22 A. As shown in Exhibit MEC-6C, the hourly generation profile used for all solar units in
23 DTE's Strategist runs includes generation in the hour ending at 2:00 am on Mondays.

24 **Q.** **Why is this an error?**
25 A. Since the sun is not shining in the hour ending at 2:00 am, a solar resource could not
26 produce any generation in that hour.

27 **IX.** **END EFFECTS**
28 **Q.** **What is the issue with DTE's failure to use the Strategist End Effects analysis?**

1   A.   Strategist provides the opportunity to continue the evaluation of available resources beyond

2   the specified study period. DTE is using a study period of 2018 through 2040. With the

3   Strategist End Effects logic, Strategist will evaluate alternatives over a longer period. The

4   Strategist help screen states that, without End Effects analysis, the results may be biased

5   against implementing capital intensive alternatives in the latter years of the planning

6   period.

7   **Q.   Have you evaluated the impact of utilizing the Strategist End Effects analysis?**

8   A.   Yes, I have. I included the End Effects analysis in two of DTE's Strategist runs – the DTE

9   Strategist run that produced the "Least-cost Plan" in Table 41 on page 137 of Ms.

10   Mikulan's direct testimony and the DTE Strategist run described in Table 15 on page 87

11   of Ms. Mikulan's direct testimony as the LCP for the Belle River Retirement Sensitivity.

12 **Q.   What changes occurred in the Strategist results with this one change?**

13 A.   With this one change, Strategist selected solar and wind generation to replace the Belle

14   River in both cases – the Table 41 Least-cost Plan and the Belle River Retirement

15   Sensitivity LCP Without this change, Strategist selected the 414 MW CCGT plant to

16   replace Belle River. These two revised Strategist runs are Case Nos. 2 and 3 in Table 1 in

17   Exhibit MEC-7.

18 **Q.   Can you describe the implications of these two Strategist runs?**

19 A.   These two runs show that, using End Effects, Strategist finds that the optimal replacement

20   for the Belle River coal plant is a mix of solar and wind generation, whether Belle River is

21   retired as currently planned (2029/2030) or earlier (2025/2026) - not a CCGT plant.

22 **Q.   Other than the fact that Strategist considers wind and solar the best option when**

23   **including End Effects, are there other advantages to these plans?**

24 A.   Yes, there are other advantages. Solar and wind can be added in smaller increments of

25   capacity than the 414 MW CCGT plant. In that DTE's capacity need with the retirement

26   of Belle River is likely to change as we approach the retirement date, this revised plan

1   would allow DTE to add capacity that closely matches the actual need, instead of using a

2   large CCGT plant that will likely result in a large amount of excess capacity.

3   **Q.**   **Do the DTE Strategist runs' use of Economic Carrying Charge ("ECC") negate the**

4   **need for End Effects analysis?**

5   A.   No, it does not. The ECC concerns only the capital costs of the alternatives considered for

6   addition by Strategist. The Strategist End Effects analysis considers, in addition to capital

7   costs, the operating costs of the various alternatives and the operating characteristics of the

8   alternatives over a period beyond DTE's study period.

9   **X.**   **ALTERNATIVE STRATEGIST RUNS**

10   **Q.**   **Have you developed additional Strategist results, apart from Case 1, Case 2, and Case**

11   **3 as described in your testimony?**

12   A.   Yes, based on the information provided to me by other witnesses, as shown in Exhibit

13   MEC-7, I developed a series of Strategist results that show how alternative resource plans and

14   retirement dates are better options than what DTE proposes.

15   **Q.**   **Please describe the general process you have used to develop your additional**

16   **Strategist results.**

17   A.   Using DTE's scenarios as a starting point, I have made multiple adjustments to the

18   Strategist model parameters to incorporate corrections or test different assumptions within the

19   DTE scenarios.

20   **Q.**   **What is the basis for the adjustments used to make your Strategist runs?**

21   A. Except for Case 1, Case 2, and Case 3, which I discuss above, the runs are based on adjustments

22   provided by other witnesses. The referenced witnesses describe and provide explanations for the

23   model assumptions and data they provided to me for use in the Strategist modeling runs that I

1   performed. The two tables in Exhibit MEC-7 summarize the results of these Strategist runs and

2   identify the witnesses supporting the modifications.

3   **Q.   Please describe the results shown in Exhibit MEC-7, Table 1.**

4   A.   Cases 1 through 6 focus on the overall resource portfolio and show the following:

5   • Case 1 shown in Exhibit MEC-7, Table 1 is the Strategist optimization based on the Company's

6   REF scenario and includes 1,390 MW of VGP along with a 2.0% EWR. As I describe

7   elsewhere in my testimony, this run results in an NPVRR of $12,362 million and a savings of

8    $89 million compared with DTE's REF scenario PCA Case B.

9   • Case 2 shows the results of incorporating the End Effects analysis. As shown in Case 2 and as

10   I discuss elsewhere in my testimony, using the End Effects logic in DTE's Strategist run that

11   produced the "least-cost plan" results in Strategist selecting wind and solar to replace Belle

12   River in 2029/2030.

13   • Case 3 shows that using the End Effects logic in DTE's Belle River 2025/2026 retirement

14   sensitivity Strategist run results in Strategist selecting wind and solar to be built in 2025/2026

15   to replace Belle River.

16   • Cases 4, 5, and 6 test retiring Belle River in 2025/2026 with the following adjustments:

17   o Case 4 corrects the characterization of the Belle River units such that Belle River 1

18   contributes toward meeting peak load in summer 2025 and Belle River 2 contributes

19   toward meeting peak load in summer 2026; increases VGP levels to 465 MW,

20   consistent with DTE's latest assumptions; corrects DTE's solar capacity credit

21   assumption such that current new solar resources are assumed to provide an initial

22   capacity credit of 66 percent (while retaining DTE's assumption that solar capacity

23   credit levels hold constant until 2023 and then decline by 2% per year until they reach

1   30%); uses a 16% wind capacity credit assumption; adjusts the fixed cost revenue

2   requirements of alternative resources to account for corrections to DTE's discounting,

3   capital cost escalation rates, wind resource capital costs, and solar fixed operations and

4   maintenance costs; adjusts wind capacity factors to be consistent with better-

5   performing wind resources; and allows for superfluous builds of near-term renewable

6   resources. This run results in Strategist selecting superfluous renewable resources and

7   an NPVRR of $12,926,068.

8   o Case 5 includes the same modifications as Case 4 other than allowing for superfluous

9   resources. It also increases the EWR plan level to 2.00%., as corrected by Mr. Neme to

10   reflect the impacts of marginal line loss rates, and also with Mr. Neme's correction to

11   the amount of EWR assumed to be embedded in DTE's load forecast This run results

12   in Strategist not selecting any replacement for the BR capacity and an NPVRR of

13   $12,046,477.

14   o Case 6 corrects the Belle River characterization as in Case 4 and increases the VGP

15   level to 465 MW, but makes these adjustments to the Emerging Technology scenario

16   assessment. This run results in a 2027 wind and solar build to replace Belle River and

17   a $11,526,649 NPVRR.

18   **Q.   Please describe the results shown in Exhibit MEC-7, Table 2.**

19   A.   In Table 2, Cases 7 through 13 focus on identifying the least cost EWR plans as opposed

20   to the overall resource portfolio:

21   • Cases 7 through 9 test ramping EWR levels from 1.50% to 1.75% through 2.25% through the

22   year 2025, then reducing the EWR savings levels to 1.50% after 2025 for the years 2026

23   through 2040. All of the EWR levels were run using DTE's Reference Scenario with EWR

1   Tiered Costs. These runs result in NPVRRs of $13,268 million in Case 7 at 1.75% EWR, which

2   is $28 million less than the DTE reference scenario; $13,264 million in Case 8 at 2.00% EWR,

3   which is $107 million less than the DTE reference scenario; and $13,324 million in Case 9,

4   which is $313 million less than the DTE reference scenario. When comparing the 7 years of

5   higher savings reverting in 2026-2040 back to 1.50% for all years, these runs indicate that

6   2.00% is the economically optimal EWR level through 2025.

7 •   Cases 10 through 13 test EWR levels from 1.50% through 2.25% using DTE's Reference

8   Scenario with EWR Tiered Costs, but valued using the marginal (as opposed to average)

9   transmission and distribution (*i.e.*, line) loss represented by an average marginal loss rate of

10   10.2% and a peak demand savings marginal loss rate of 20.4%. These runs resulted in NPVRRs

11   of $13,195 million in Case 10 at 1.50% EWR, which is $83 million less than the DTE reference

12   scenario EWR savings level; $13,203 million in Case 11 at 1.75% EWR, which is $93 million

13   less than the DTE reference scenario EWR savings level; and $13,267 million in Case 12 at

14   2.00% EWR, which is $104 million less than the DTE reference scenario EWR savings level.

15   Finally, Case 13 resulted in an NPVRR of $13,576 million at 2.25% EWR, which is $61 million

16   less than the DTE reference scenario EWR savings level, and also removes the need to replace

17   Belle River.

18 **XI.**   **CONCLUSIONS AND RECOMMENDATIONS**

19 **Q.**   **Please summarize your conclusions.**

20 A.   Based on my review and analysis discussed above, I conclude that DTE's IRP suffers

21 numerous flaws and problems that are significant and pervasive, and the results presented in the

22 IRP are thus not reliable or credible. As presented, and until the issues I have discussed are

23 properly remedied, I find the DTE IRP is not reasonable and prudent.

1 **Q.   Do you have additional recommendations for the Commission to consider for future**

2 **IRPs, to improve upon or resolve the issues you have identified in your testimony?**

3 A.   Yes, for future IRP filings, the Commission should require that DTE:

4   • Develop the IRP with a process that is fully transparent and defined;

5   • Refrain from the manual selection of resources;

6   • Remove all bias toward dispatchable resources;

7   • Re-evaluate the resources needed (if any) to replace the Belle River plant at retirement;

8   • Show that Strategist (or the any model replacing Strategist) produces results reasonably
9   close to actual DTE operating results;

10   • Include only the DTE owned portion of the Belle River coal plant in Strategist or the
11   model replacing Strategist; and

12   • Utilize the End Effects process in Strategist or the model replacing Strategist.

13 **Q.   Does this conclude your direct testimony?**

14 A.   Yes, it does.

George W. Evans
President
Evans Power Consulting, Inc.

EDUCATION: Master of Science, Applied Mathematics, Georgia Institute of Technology, 1976
Bachelor of Science, Applied Mathematics, Georgia Institute of Technology, 1974

PROFESSIONAL MEMBERSHIP: Institute of Electrical and Electronic Engineers

EXPERIENCE:

Mr. Evans is currently the President of Evans Power Consulting, Inc. He has served the electric power utility industry for over thirty-five years. His primary areas of expertise include market price forecasting, integrated resource planning, the analysis of purchased power, system operations, net power costs, interruptible rates, the optimal scheduling of generator maintenance, the computer simulation of electric power systems, the integration of renewable generation and demand-side management. As an expert witness in these areas, Mr. Evans has submitted expert testimony on 58 occasions, before the public utility commissions in Alabama, Arkansas, Colorado, Delaware, Georgia, Michigan, Mississippi, Nevada, Oklahoma, Pennsylvania, South Carolina, South Dakota, Vermont and Utah; and also before the FERC, and in both state and federal court. He is an expert in the computer modeling of electric power systems and the use of PROMOD IV, Strategist, GRID, POWERSYM, EGEAS, ELFIN and ENPRO.

Specific Experience Includes:

2011-Present Evans Power Consulting, Inc.

Michigan Environmental Council – Presented expert testimony concerning the economic operation of the coal fleets of DTE Electric Company and Consumers Energy Company. Developed an hourly after-the-fact process to evaluate the cost-effectiveness of the coal fleets.

Michigan Environmental Council – Presented expert testimony on the Integrated Resource Plans of DTE Electric Company and Consumers Energy Company.

South Carolina Office of Regulatory Staff – Testified for staff on the proposed portfolio of Demand-Side Programs proposed by South Carolina Electric & Gas, Duke Energy Progress and Duke Energy Carolinas; and performed annual reviews of the DSM programs and the DSM rate riders of the three companies.

Utah Department of Public Utilities – Testified for staff in two PacifiCorp rate cases concerning net power costs, testified on PacifiCorp's application to install Selective Catalytic Reduction Systems on two coal units, and performed a review of PacifiCorp's thermal maintenance practices and procedures.

Arizona Corporation Commission – Evaluated the 2012 and 2014 Integrated Resource Plans of Arizona Public Service Company, Tucson Electric Power Company, UNS Electric,

George W. Evans
President
Evans Power Consulting, Inc.

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Arizona Electric Power Cooperative, and the Salt River Project; and presided over public meetings concerning the IRPs.

1997-2011   Slater Consulting

Utah Department of Public Utilities – Testified in two PacifiCorp rate cases concerning the appropriate level of net power costs, including wind integration costs and other issues.

South Dakota PUC – Testified on the Integrated Resource Plans of Black Hills Power and Otter Tail Power, and the validity of a coal fired generation addition and a wind generator addition.

Golden Spread Electric Cooperative – Presented expert testimony in a FERC complaint concerning the actual operation of an economy sales agreement between Golden Spread and Southwestern Public Service Company.

Cooper Nuclear Plant - Development of the estimated damages caused by imprudent outages of a Nebraska nuclear generating unit.

Millstone 3 Nuclear Unit - Analysis of the replacement energy costs for the Millstone 3 nuclear unit on behalf of the co-owners.

Independent Power Producers - Presented expert testimony before the Alabama and Mississippi PSCs concerning the construction of new combined cycle facilities in those states.

S.C. State Energy Office - Developed a report summarizing and evaluating the Integrated Resource Plans filed by the electric utilities of South Carolina.

1989-1997   GDS Associates, Inc.

Mr. Evans served as a principal and the Manager of the System Modeling group, where he was responsible for performing analyses, providing expert testimony and developing customized software. He is an expert in the use of the industry standard computer models PROMOD III, PROSCREEN II, PROVIEW, MAINPLAN, CAT II and ENPRO. A sampling of representative assignments follows:

Tenaska, Air Liquide & Tenneco - Developed forecasts of market clearing prices for electricity in the ERCOT region.

GEMC - Produced a forecast of market clearing prices for electricity in the SERC region and estimated stranded costs.

George W. Evans
President
Evans Power Consulting, Inc.

Central Virginia Electric Cooperative - Designed, developed and installed software to allow the Cooperative to purchase economy energy in an optimal manner on a daily basis.

City of Grand Island, Nebraska - Developed the initial Integrated Resource Plan for the City of Grand Island.

Georgia PSC - Evaluated the 1995 Integrated Resource Plans filed by Georgia Power and Savannah Electric. Developed alternative Integrated Resource plans that were approved by the Commission.

Nucor Steel - Audited the bills for electric service for the Nucor-Hickman Steel Mill.

Nucor Steel - Testified before the Arkansas PSC concerning the reasonableness of a buy-through clause for interruptible customers.

Nucor Steel - Developed a comprehensive forecast of the likely levels of interruptions of service over the next ten years.

South Dakota Public Utility Commission - Evaluated the rate filing and Integrated Resource Plan filed by Black Hills Power & Light.

Georgia PSC - Evaluated Georgia Power's initial RFP for power, all bids received and Georgia Power's selection process. Testified before the Georgia PSC concerning the reasonableness of Georgia Power's evaluation process and resulting request for certification.

Michigan Attorney General - Performed studies concerning the availability of the Midland Cogeneration Venture and Consumer Power Company's avoided costs.

Michigan Attorney General - Developed estimates of cost reductions due to improved projected fossil performance and changes in cogeneration levels in a Consumers Power rate case.

Pennsylvania PUC - Testified concerning the capacity needs of a Pennsylvania utility and the appropriate avoided costs due potential cogeneration projects.

Golden Spread Electric Cooperative - Developed detailed historical reconstructions of five years of hourly operations of a major Texas utility to illustrate the penalties arising to wholesale ratepayers as a result of off-system sales.

George W. Evans
President
Evans Power Consulting, Inc.

Sam Rayburn G&T - Designed, developed and implemented a PC-based software system to facilitate daily load forecasting, optimal resource scheduling and inadvertent accounting in a user-friendly fashion.

Tex-La Electric Cooperative - Designed, developed and implemented a similar software system for daily load forecasting and optimal resource scheduling. This application also included the development of an optimization process which maximizes the total economy energy scheduled while adhering to limitations on load factor and the number of hourly changes.

PG&E-Bechtel Generating Company - Assisted this NUG developer in forecasting the dispatchability of a project and estimating likely costs in a power bidding solicitation.

1980-1989   Energy Management Associates, Inc. - now known as New Energy Associates

While with EMA, Mr. Evans performed product development, maintenance programming and client support on the three major products marketed and developed by EMA - PROMOD III, PROSCREEN II, and MAINPLAN. He is extremely well-versed in the development of databases for these tools and in applying these tools to particular studies.

As MAINPLAN Product Manager (1985-1989), Mr. Evans supervised and directed the development, maintenance, and client support for MAINPLAN - the software package that is the industry leader in the area of generating unit maintenance scheduling. The client base for MAINPLAN grew from two clients to over thirty clients during his involvement. Also during his tenure, a chronological production costing model was added to MAINPLAN. This highly detailed model has been used to evaluate interchange opportunities, the cost of forced outages, short-term fuel requirements and unit commitment strategies.

Publications:

Backcasting - A new computer application can determine historical truth for utilities that must refute damage claims, Fortnightly, October 1, 1993.

"Avoiding and Managing Interruptions of Electric Service Under an Interruptible Contract or Tariff", Industrial Energy Technology Conference, April, 1995.

"Analysis and Evaluation of the Integrated Resource Plans of the Investor-Owned and State-Owned Electric Utilities in South Carolina", for the South Carolina State Energy Office, April, 1998.

Programming Languages: Visual Basic, C++ for Windows, C , FORTRAN and COBOL.

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-3.24
Respondent:	L. K. Mikulan
Page:	1 of 1

Question: In lines 7-8 on page 136 of her direct testimony, when describing Tables 41-44, Ms. Mikulan states that "Columns (b), (c), and (d) describe the resources selected within the scenarios, the 414 MW 1x1 CCGT shown in column (d) of Tables 41-44 was not economically selected by Strategist but was instead forced in manually by DTE. If confirmed, please explain. If not confirmed, please provide evidence to show that these CCGT units were not forced in manually by DTE.

Answer: Confirmed. In Table 41 and Table 42, the 414 MW 1x1 CCGT shown in column (d) on the row titled "Least-cost Plan" was economically selected by Strategist. In regards to resource alternatives selected for the proposed course of action pathways all resources identified (EWR level, VGP Programs, Demand Response and 1x1 CCGT) were forced in manually to Strategist. The resources identified in the proposed course of action pathways were not the result of a specific Strategist optimization run. The resources selected by the Company in the proposed course of action pathways were a result of the synthesis of nearly 140 scenario/sensitivity combinations evaluated and growing interest in voluntary renewables.

Attachments: *N/A*

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-5.4a
Respondent:	L. K. Mikulan
Page:	1 of 1

Question: The following questions concern the Company's response to MECNRDCSCDE-3.24 in which the Company states that "The resources selected by the Company in the proposed course of action pathways were a result of the synthesis of nearly 140 scenario/sensitivity combinations evaluated and growing interest in voluntary renewables."

a. What is meant by "synthesis" in this statement?

Answer: It means that the resources selected by the Company in the proposed course of action pathways were not the result of any single scenario/sensitivity optimization run but rather the resources selected in the proposed course of action pathways represented a diverse sample of the resources that were included in least-cost build plans across the nearly 140 scenario/sensitivity combinations modeled.

Attachments: *N/A*

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-5.4b
Respondent:	L. K. Mikulan/S. G. Pfeuffer
Page:	1 of 1

Question: The following questions concern the Company's response to MECNRDCSCDE-3.24 in which the Company states that "The resources selected by the Company in the proposed course of action pathways were a result of the synthesis of nearly 140 scenario/sensitivity combinations evaluated and growing interest in voluntary renewables."

      b. Please describe in detail each of the steps taken by the Company to select the resources in the proposed course of action pathways.

Answer: In selecting the resources in the PCA pathways, the Company reviewed the modeling results, the assumptions about the key drivers, the planning principles, the comments received from stakeholders, and selected diverse pathways that included a variety of resources.

Attachments: *none*

MPSC Case No.: U-20471

Requestor: MECNRDCSC

Question No.: MECNRDCSCDE-3.4a

Respondent: L. K. Mikulan

Page: 1 of 1

Question: The following questions concern Ms. Mikulan's statement in lines 3-5 on page 116 of her direct testimony that states "There is additional uncertainty regarding how a DTE Electric fleet, without additional dispatchable generation, would perform and be able to serve our customers reliably.".

    a. Please provide the basis for (including any studies that support) this statement.

Answer: I reviewed the results of the Brattle Study supported by Witness Chang in Exhibit 47.

Attachments: *N/A*

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-3.4b
Respondent:	L. K. Mikulan
Page:	1 of 1

Question: The following questions concern Ms. Mikulan's statement in lines 3-5 on page 116 of her direct testimony that states "There is additional uncertainty regarding how a DTE Electric fleet, without additional dispatchable generation, would perform and be able to serve our customers reliably.".

    b. What amount of dispatchable generation is required to allow the DTE fleet to perform?

Answer: As discussed in the Brattle Study supported by Witness Chang on pages 10 and 11 of Exhibit 47, the level of dispatchable generation that DTE Electric requires will depend on several uncertain factors. These factors include:

- The amount of intermittent renewable resources in the generation portfolio

- The ability to import energy and capacity from elsewhere on the bulk electric system

- The level of flexibility available from other resources, including the Ludington pumped storage facility, as well as current and future demand response programs

The loss-of-load (LOLE) results shown in Figure 6 of Exhibit 47 on page 16 illustrate a range of possible outcomes based on different assumptions for several of these factors listed above. Ultimately, the level of dispatchable generation required to reliably serve DTE Electric's load will depend on the extent to which other resources (such as renewables, electricity imports, pumped storage, and demand response resources) are able to serve load in every hour of the year.

Attachments: *N/A*

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-3.4c
Respondent:	L. K. Mikulan
Page:	1 of 1

Question: The following questions concern Ms. Mikulan's statement in lines 3-5 on page 116 of her direct testimony that states "There is additional uncertainty regarding how a DTE Electric fleet, without additional dispatchable generation, would perform and be able to serve our customers reliably.".

    c. What amount of dispatchable generation is required to be able to serve DTE customers reliably?

Answer: See response to question 3.4b.

Attachments: *N/A*

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-3.4d
Respondent:	S. D. Burgdorf/L. K. Mikulan
Page:	1 of 1

Question: The following questions concern Ms. Mikulan's statement in lines 3-5 on page 116 of her direct testimony that states "There is additional uncertainty regarding how a DTE Electric fleet, without additional dispatchable generation, would perform and be able to serve our customers reliably.".

    d. Please provide the current DTE requirements for operating reserves, spinning reserves and regulating reserves.

Answer: DTE Electric does not determine what the specific requirements are for operating reserves, spinning reserves, and regulating reserves that are needed to reliably serve customers. MISO operates their ancillary services market to procure the necessary operating reserves, spinning reserves, and regulating reserves that they determine are needed, at any given time, for the customers of DTE Electric and other customers in MISO.

Attachments: *N/A*

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-3.10
Respondent:	L. K. Mikulan
Page:	1 of 1

Question: Please confirm that DTE is including only the DTE portion of the Belle River coal plant in DTE's Strategist and PROMOD modeling supporting the Company's testimony in this case. If not confirmed, please explain.

Answer: Not Confirmed. DTE models the entire Belle River coal plant in PROMOD, but carves out DTE's ownership portion for regulatory and internal accounting purposes, such as PSCR related expenses associated with the plant such as fuel, chemicals, emission allowance expenses, etc. This carve out is performed in the Annual Gen reports. For example:- WP LKM-80 REF Annual Generation Report – Format tab – (GWH): Unit Generation Column.

The majority of the Strategist modeling in this case used the same approach of modeling the entire Belle River. A similar carve out as described above was not performed in Strategist since it cancels out in the delta analyses. However, in the Belle River Retirement analysis, only the DTE portion was modeled starting in 2025. Before 2025, full Belle River was modeled since it cancels out in the delta analysis. Workpapers with DTE portion only after 2025 include:

WP LKM-531 REF Blr Retirement - tiered - 2 EE
WP LKM-532 REF Blr Retirement - tiered - 1.75 EE NP 29
WP LKM-533 REF Br Retirement - tiered - 1.75 EE NP 40
WP LKM-534 REF Blr Retirement - tiered - 1.75 EE
WP LKM-593 ET Blr Retirement - flat low -2 EE
WP LKM-594 ET Blr Retirement - flat low -2 EE NP29
WP LKM-595 ET Blr Retirement - flat low -2 EE NP40
WP LKM-592 ET Blr Retirement - flat low -1.75 EE

Attachments: *All non-confidential workpapers were included on the discs that were provided to parties at the pre-hearing conference on April 26, 2019. In addition, the workpapers can be accessed at the following hyperlink under MECNRDCSCDE-1:*
https://dteenergy.sharepoint.com/sites/DiscoveryPortal/Elec/U-204712019IRPPublic/default.aspx

MPSC Case No.:	U-20471
Requestor:	MECNRDCSC
Question No.:	MECNRDCSCDE-2.5
Respondent:	Legal/L. K. Mikulan
Page:	1 of 1

Question: Did DTE verify that Strategist accurately models the DTE and MISO systems? If so, please provide the results of the verification. If not, please explain.

Answer: DTE Electric objects for the reason that the request is unclear, unduly vague and incapable of answer in its present form since it is unknown what is meant by "accurately models". Subject to this objection, and without waiving this objection, DTE Electric answers as follows:

DTE Electric does not model the MISO system with the Strategist model. DTE Electric did verify that the results of the Strategist modeling were accurate for the DTE Electric system.

The Strategist SAV files were directly translated from the Promod database using a platform called Powerbase. The translation process was verified at the beginning of the IRP process to ensure all the input data translated properly. See attached files for the results of the verification. Based on this verification, the Company can reasonably confirm that the Strategist input data was accurate. The outputs of the Strategist models were also reviewed by SMEs for accuracy. See response to MECNRDCSCDE 2.6.

Attachments: The following documents are available for download at the following hyperlink:
https://dteenergy.sharepoint.com/sites/DiscoveryPortal/Elec/U-204712019IRPPublic/default.aspx
U-20471 MECNRDCSCDE-2.5 Gas Price Check
U-20471 MECNRDCSCDE-2.5 CO2 Check
U-20471 MECNRDCSCDE-2.5 VOM Check
U-20471 MECNRDCSCDE-2.5 Transactions Check
U-20471 MECNRDCSCDE-2.5 SO2 Check
U-20471 MECNRDCSCDE-2.5 NOx Check
U-20471 MECNRDCSCDE-2.5 Heat Rate Check

DTE's Hourly Solar Generation Profile - Monday

Day of Week	Hour Ending	January	February	March	April	May	June	July	August	September	October	November	December
Monday	1												
	3												
	4												
	5												
	6												
	7												
	8												
	9												
	10												
	11												
	12												
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	20												
	21												
	22												
	23												
	24												

TABLE 1: Overall Resource Portfolio Runs

Case No.	Witness	Description	Scenario	Case Basis	EWR Level	VGP Level (MW)	2029/2030 Build	NPVRR ($M)	Change to NPVRR ($M)	Notes
1	Evans	Changed PCA B to include 2.00% EWR and Optimized	REF	PCA B	2.00%	1,390	None	$12,362	-$89	
2	Evans	Added End Effects Processing	REF	LCP	1.50%	300	Wind & Solar	N/A	N/A	NPVRR over longer time period than DTE runs and are not comparable.
3	Evans	Added End Effects Processing	REF	BR Sensitivity	1.75%	300	Wind & Solar in 2025/2026, None in 2029/2030	N/A	N/A	NPVRR over longer time period than DTE runs and are not comparable; wind and Solar built in 2025/2026 to replace Belle River.
4	Allison/Jester	Adjustments to BR characterization, VGP 465 MW, new resource revenue requirements, wind capacity factors, solar & wind capacity credits, 1 superfluous resource allowed	REF	BR Sensitivity	1.75%	465	414 MW CC	$12,926	-$527	Superfluous wind resource built in 2021; NPVRR delta relative to renewable replacement of Belle River drops to $17 million from $209 million.
5	Allison/Neme	Neme adjustments to 2% EWR modeling to reflect marginal line losses and corrections to savings embedded in load forecast; Allison adjustments to BR characterization, VGP levels; new resource revenue requirements, wind capacity factors, and solar & wind capacity credits	REF	BR Sensitivity	2.00%	465	None	$12,046	-$1,406	Belle River units retired in 2025/2026, no replacement needed or built by Strategist.
6	Allison	Adjustment to BR capacity contribution, VGP levels	ET	BR Sensitivity	2.00%	465	None	$11,527	-$540	Wind and Solar built in 2027 to replace Belle River.

TABLE 2: EWR Runs

Case No.	Witness	Description	Scenario	Case Basis	EWR Level	NPVRR ($M)	Change to NPVRR ($M)	Notes
7	Neme	Ramp to 1.75%, then revert to 1.50% EWR savings after 2025	REF	LCP	1.75%	$13,268	-$28	
8	Neme	Ramp to 2.00%, then revert to 1.50% EWR savings after 2025	REF	LCP	2.00%	$13,264	-$107	
9	Neme	Ramp to 2.25%, then revert to 1.50% EWR savings after 2025	REF	LCP	2.25%	$13,324	-$313	
10	Neme	Adjustment to 10.2% average T&D loss multiplier and 20.4% peak demand savings marginal loss rate multiplier	REF	LCP	1.50%	$13,195	-$83	
11	Neme	Adjustment to 10.2% average T&D loss multiplier and 20.4% peak demand savings marginal loss rate multiplier	REF	LCP	1.75%	$13,203	-$93	
12	Neme	Adjustment to 10.2% average T&D loss multiplier and 20.4% peak demand savings marginal loss rate multiplier	REF	LCP	2.00%	$13,267	-$104	
13	Neme	Adjustment to 10.2% average T&D loss multiplier and 20.4% peak demand savings marginal loss rate multiplier	REF	LCP	2.25%	$13,576	-$61	Removes the need to replace Belle River

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.	U-20471 ALJ Sally L. Wallace

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PROOF OF SERVICE

On the date below, an electronic copy of **Direct Testimony of George Evans on behalf of the Michigan Attorney General, Michigan Environmental Council, Natural Resources Defense Council and Sierra Club along with Exhibits MEC-1 through MEC-7 (MEC-6 is confidential and only being served upon those with a signed NDC on file)** 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.

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

Date: August 21, 2019

By: _____

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