January 12, 2018

Ms. Kavita Kale
Michigan Public Service Commission
7109 W. Saginaw Hwy.
P. O. Box 30221
Lansing, MI 48909

Via E-filing

RE: MPSC Case No. U-18419

Dear Ms. Kale:

The following is attached for paperless electronic filing:

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

Exhibits MEC-1 though MEC-16

Proof of Service

(Note: *The CONFIDENTIAL testimony and exhibits **are** subject to the Protective Order issued October 27, 2017, and will only be served on those parties with a signed NDC on file. A hard copy will be sent to Ms. Kale to file under seal**)*

Sincerely,

Digitally signed by Christopher M. Bzdok
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xc: Parties to Case No. U-18419, ALJ Suzanne D. Sonneborn
James Clift, MEC
Ariana Gonzalez and Rachel Fakhry, NRDC
Elena Saxonhouse, Sierra Club
Shannon Fisk, Jill Tauber and Cassandra McCrae, Earthjustice
George Evans

STATE OF MICHIGAN
BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of **DTE ELECTRIC COMPANY** for approval of Certificates of Necessity pursuant to MCL 460.6s, as amended, in connection with the addition of a natural gas combined cycle generating facility to it generation fleet and for related accounting and ratemaking authorizations	U-18419 ALJ Suzanne D. Sonneborn

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Direct Testimony of George Evans

On Behalf of Michigan Environmental Council,
Natural Resources Defense Council, and Sierra Club

PUBLIC VERSION

January 12, 2018

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I. INTRODUCTION AND QUALIFICATIONS

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

A. My name is George W. Evans. I am the President of Evans Power Consulting, Inc., and my business address is 358 Cross Creek Trail, Robbinsville, North Carolina 28771.

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

A. I am testifying on behalf of the Michigan Environmental Council ("MEC"), the Sierra Club ("SC"), and the Natural Resources Defense Council ("NRDC") (collectively, "MEC-SC-NRDC"). In addition, my testimony also summarizes the results of a scenario run I performed based on information supplied to me by Witness Tom Beach.

Q. Please summarize your qualifications and work experience.

A. I received a Bachelor of Science in Applied Mathematics from the Georgia Institute of Technology in 1974. In 1976, I received a Master of Science in Applied Mathematics, also from the Georgia Institute of Technology. My area of concentration was probability and statistics. In 1980, I joined Energy Management Associates, Inc. ("EMA"), the company responsible for the development of the premier electric utility modeling tools, PROMOD®, PROSCREEN®, PROVIEW® (now known as Strategist®) and MAINPLAN®. While at EMA, I worked with some fifty (50) major electric utilities in the United States and Canada in the application of these modeling tools for generation expansion planning, the development of net power costs, fuel budgeting, the analysis of power purchases and the development of optimal maintenance schedules for generating units.

In 1989, I left EMA to join GDS Associates, Inc., a consulting firm located in Marietta, Georgia. At GDS, I was a principal and the Manager of System Modeling. In this position, I was primarily responsible for performing analyses and presenting expert testimony concerning integrated resource planning, the forecasting of system production costs, developing estimates of the likelihood of service interruptions, developing estimates of replacement power costs, and related activities.

In August of 1997, I left GDS to join Slater Consulting as a Vice President. In December of 2011, I left Slater Consulting and formed Evans Power Consulting, Inc. I am sponsoring a copy of my current resume as Exhibit MEC-1.

Q. Have you testified previously as an expert witness?

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

Q. Have you testified previously before this Commission?

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

Q. Do you have experience concerning the Strategist model that was utilized by DTE to support its request in this case?

A. Yes, I do. I was involved in the design and development of Strategist (formerly known as PROSCREEN) while with EMA and I have presented expert testimony concerning Strategist modeling on thirteen (13) previous occasions, three of which were before the Commission: Case Nos. U-17429, U-17767, and U-18250.

Q. Does your experience with Strategist include use of the model in cases involving Integrated Resource Planning ("IRP") and proposed certifications for generating plants?

A. Yes, it does. I have presented expert testimony on sixteen (16) occasions in which the utility used Strategist in developing its IRP or proposal for certification of generating plants.

Q. Have you rerun the Strategist model using different input data and/or assumptions than that which the utility used in any of these proceedings?

A. Yes, I have. In cases before the Georgia Public Service Commission and the Oklahoma Corporation Commission, I reran Strategist with corrected or more reasonable input data and assumptions and, as a result, developed alternative IRPs that were, in some cases, subsequently approved by the Commission.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit	Description
MEC-1:	Resume of George W. Evans
MEC-2	DTE response to MECNRDCSCDE-3.2
MEC-3:	DTE response to MECNRDCSCDE-3.1a and Attachment
MEC-4:	Corrected Figure 4 from Mr. Chreston's direct testimony

MEC-5:	DTE response to MECNRDSCDE-1.2a
MEC-6:	DTE response to MECNRDCSCDE-5.3 and Attachments
MEC-7C:	Case 0 Strategist Complete Report (CONFIDENTIAL)
MEC-8C:	Strategist Input Data for Demand Response Alternatives (CONFIDENTIAL)
MEC-9:	DTE response to MECNRDCSCDE-3.3x
MEC-10:	DTE response to MEDNRDCSCDE-11.7
MEC-11C:	DTE Strategist Report on Solar Capacity Contribution (CONFIDENTIAL)
MEC-12:	Summary of Strategist Results
MEC-13C:	Details of Strategist Results (CONFIDENTIAL)
MEC-14C:	2017 Reference Case Heat Rates (CONFIDENTIAL)
MEC-15C:	2016 DTE Belle River Plant Heat Rate print-out (CONFIDENTIAL)
MEC-16C:	Case 7 Strategist Complete Report (CONFIDENTIAL)

Q. What is the purpose of your testimony?

A. DTE Electric Company (the "Company" or "DTE") seeks Certificates of Necessity for a proposed 1,100 MW natural gas combined cycle ("NGCC") generating plant that would begin to produce electric energy in the year 2022. In support of its request, DTE has submitted a series of analyses that are based primarily upon modeling performed utilizing the Strategist computer model. My testimony concerns DTE's Strategist modeling analyses. Specifically, I testify regarding how DTE presented its Strategist modeling results under various sensitivities or plans, and the flawed and erroneous information supplied by DTE concerning its Strategist modeling and analyses. I also testify about the results of the Strategist modeling that I have performed.

In addition, at the request of MEC-NRDC-SC witness Bob Fagan, I extracted from the Strategist model the operating costs and forecasted revenues for each of DTE's coal units

from DTE's 1.15% EE reference case. Mr. Fagan addresses this issue further in his testimony.

Q. Please summarize your conclusions.

A. Based on my review of the Company's Strategist modeling and the modeling runs that I performed, I conclude that DTE has not supported its application for approval of the new NGCC generation facility with the required analyses. Specifically, DTE has not accurately projected or analyzed resources, capacity and load requirements, and costs under its proposed portfolio.

In addition, the Strategist modeling that I performed shows that there are available cost-effective electric resources that could defer, displace, or partially displace the proposed NGCC generation facility by including additional renewable energy, energy efficiency programs, load management, and demand response, including those in its current portfolio as well as beyond its portfolio. More specifically, by correcting certain flaws related to how DTE modelled demand response, energy efficiency, and renewable resources, the Strategist model shows the result would be to defer the Company's proposed NGCC plant until 2029 and produce cost savings of $1.882 billion (NPVRR), when compared to DTE's Preferred Plan. In addition, under several alternative scenarios, Strategist shows similar deferrals and significant cost savings.

II. DTE DID NOT PRESENT AND COMPARE THE OPTIMAL (LEAST-COST) STRATEGIST PLANS IN ITS IRP

Q. What is the Strategist model?

A. Strategist is a resource planning software model used to develop resource plans for electric utilities. Given projections of future load growth, fuel prices, the costs of potential new resources and other information, Strategist selects a resource plan that minimizes ratepayer costs while maintaining reliable service. Strategist proceeds one year at a time, simulating hourly dispatch while tracking generation and system costs. Strategist produces a schedule of various combinations of new resource additions, which may include natural gas combined cycle plants, combustion turbines, renewable resources, peak load reduction programs, and energy efficiency programs. Strategist tracks the cost for each combination, and at the end of the model run, identifies the least cost expansion plan as well as sub-optimal plans evaluated during the simulation. Thus, Strategist allows for the consideration, testing, and comparison of various scenarios under different sensitivities (*e.g.*, future fuel prices).

Q. How did you generate your Strategist results?

A. I utilized the Strategist computer model, as provided by DTE through ABB (the software vendor). My first task was to "benchmark" the model and the data, that is, ensure that I could produce the results exactly as produced by DTE, using DTE's assumptions and input data. Through the benchmarking process, I discovered a serious flaw with DTE's analyses.

Q. By benchmarking, do you mean that you verified the accuracy of DTE's Strategist modeling?

A. No, I do not. This benchmarking process only served to ensure that I could replicate the results produced by DTE and did not include an attempt to verify the accuracy or reasonableness of DTE's Strategist modeling.

Q. Were you able to benchmark Strategist?

A. Not at first. I utilized the Strategist computer model supplied by DTE through ABB with all of DTE's input data and assumptions for the case identified by DTE as its "Base Resource Plan" case.[1] My results differed significantly from those reported by DTE. The total Net Present Value of Revenue Requirements ("NPVRR") of the Base Resource plan was $36 million lower than the value provided by DTE.[2] In addition, the resource plan did not match the resource plan shown in DTE's IRP.[3] I experienced the same issue with most of DTE's other Strategist results. That is, for the most part, the Strategist results provided by DTE in testimony and in DTE's IRP did not match the results of Strategist runs that I initially produced using DTE's assumptions and input data.

Q. What is the basis of the discrepancy between your Strategist run results (using DTE's assumptions and input data) and the results provided by DTE in testimony and in its IRP?

A. As I discuss above, Strategist produces a range of resource plans, from the optimal (least cost) resource plan and to less optimal (more expensive) plans. As shown in information

[1] This is the first case in Figure 4 on page 44, and discussed in lines 8-15 on page 41, of Mr. Chreston's direct testimony.

[2] Ex MEC-2 (DTE response to MECNRDCSCDE-3.2).

[3] Table 11.6.1-2, page 198 of Exhibit A-34 Revised (IRP).

obtained through discovery,[4] for many scenarios presented and compared by DTE to its Base Resource Plan, DTE did not select Strategist's optimal plan but instead manually chose one of Strategist's non-optimal plans.

Q. What do you mean when you say DTE "manually chose" a non-optimal plan?

A. Rather than accepting Strategist's least cost (optimal) plan, DTE personnel selected a higher cost (non-optimal) plan among the many hundreds of non-optimal plans that Strategist produced.

For example, DTE selected the resource plan ranked 22nd in its 2.0% EE case, rather than the optimal plan under this scenario.[5] The following list shows the various cases and their relative rank (Plan Number):[6]

Strategist Chosen Plan for all Cases **Case No:** U-18419

Scenario	Case	Strategist Chosen Plan #
Reference	Base	2
Reference	3x1 in 2022	1
Reference	1x1 in 2022 and 2024	1
Reference	High Renewables	2
Reference	2.0% EE	22
Reference	1.5% EE	2
Reference	1% EE	16
Reference	<1% EE	1
Reference	High Load Demand	1
Reference	Low Load Demand	1
Reference	Commercial Choice Returns	1

[4] DTE's response to MECNRDCSCDE-3.1a, attached as Exhibit MEC-3.

[5] This is seen in line 6 of the last page (page 3 of 3) of Exhibit MEC-3, DTE's response to MECNRDCSCDE-3.1a and attachment.

[6] Exhibit MEC-3, DTE's response to MECNRDCSCDE-3.1a Attachment.

Scenario	Case	Strategist Chosen Plan #
Reference	C&I Choice Returns	1
High Gas Price	Base Case	11
High Gas Price	Base Case with CO_2 on all	12
High Gas Price	3x1 in 2022	1
High Gas Price	High Renewables	41
High Gas Price	1.5% EE	6
High Gas Price	1% EE	45
High Gas Price	Fermi 3 in 2030	1
High Gas Price	Capital Increase on CCs	20
Low Gas Price	Base Case	5
Low Gas Price	3x1 in 2022	1
Low Gas Price	1.0% EE	2
Low Gas Price	1.5 EE	4
Low Gas Price	Capital Increase on CCs	2
Emerging Technology	Base Case	2
Emerging Technology	3x1 in 2022	1
Emerging Technology	High Renewables	2
Emerging Technology	1.0% EE	13
Emerging Technology	1.5% EE	2
Emerging Technology	Capital Increase on CCs	2
Aggressive CO2	Base Case	3
Aggressive CO2	3x1 in 2022	1
Aggressive CO2	Optimized EE	18
Aggressive CO2	1.5 EE	2
Aggressive CO2	Retire Monroe by 2037	1
2017 Reference	Base	1

Q. Once you had the information about which Plan the Company selected, were you able to benchmark Strategist?

A. Yes, once DTE provided the information identifying the Plan Numbers that it discussed and compared, I was able to replicate the Strategist results exactly as produced by DTE, using DTE's assumptions and input data.

Q. What is the significance of DTE's decisions to select Strategist plans other than the optimal (least-cost) plan?

A. Because DTE did not select and compare the optimal plans identified by Strategist for a number of the scenarios that DTE modeled, the resource plans discussed by DTE are not necessarily the least cost plans from Strategist. Moreover, the comparisons DTE made among the various Strategist cases inappropriately compare the least cost plan for one case to plans that are, in many cases, not the least-cost plan, and thus are meaningless comparisons.

Q. Please explain.

A. Rather than accepting the least-cost plan produced by Strategist for each case, DTE chose, for example, the second-best plan for its Base Resource case, the second-best plan for its Preferred case (the 1.5% Energy Efficiency case), and the twenty-second-best plan for its 2.0% Energy Efficiency case. The resulting comparisons between different cases and scenarios are skewed by this manual selection of non-optimal plans.

Q. Have you corrected the information presented in Mr. Chreston's Figure 4 to compare the optimal plans under each scenario?

A. Yes. Attached as Exhibit MEC-4 is a table showing the information in Mr. Chreston's Figure 4 from page 44 of his direct testimony, which I corrected to show an accurate comparison of the optimal plans developed by Strategist. One example of the problem caused by DTE's use of non-optimal results is the concealment of more savings arising from the 2.0% Energy Efficiency plan than DTE has presented in its application. This Exhibit MEC-4 shows that 2.0% Energy Efficiency is more cost effective than the Company's Preferred Plan (the 1.5% Energy Efficiency Plan), saving ratepayers $82

million over the Company's Preferred Plan, rather than the $64 million shown in Mr. Chreston's Figure 4 (1,068 less 1,004).

Q. In your previous reviews of IRPs produced by other electric utilities, have you observed this problem?

A. No, I have not. It is standard practice in the industry to clearly present all the optimal plans and utilize the optimal (least cost) resource plans produced by Strategist.

Q. Is it your position that DTE should only accept one of the least-cost plans produced by Strategist as its preferred plan?

A. Not necessarily. Once a utility has identified and reviewed all optimal model results and sensitivities, an evaluation of whether other considerations (such as minimizing risk) justify selecting a plan that is not least-cost may occur. DTE explained its selection process in discovery, stating that it used its "planning principles to determine that the Strategist resource plans with the 2x1 combined cycle gas turbine would be the better selection for customers."[7] DTE's process has thus been stilted by manually selecting and comparing various non-optimal results from Strategist, instead of presenting and comparing the optimal, least-cost results produced by the model. Moreover, by failing to disclose in testimony or the IRP how and why plans were selected and compared, the Company's application suffers lack of transparency, introduces the potential for bias, and undermines comparison among tested scenario.

[7] Exhibit MEC-5 (DTE's response to MECNRDSCDE-1.2a); Exhibit MEC-6 (DTE's response to MECNRDCSCDE-5.3).

Q. In addition to your benchmark runs, did you perform other Strategist modeling runs?

A. Yes, I did. At the request of witnesses from MEC-SC-NRDC and Mr. Beach, I ran Strategist with specified inputs and assumptions regarding renewable resources, energy efficiency, demand response, and other changes provided by these witnesses. In performing these modeling runs, I identified flaws and errors related to how DTE performed its Strategist modeling and then performed additional modeling runs to correct them. In the next section, I discuss those flaws and errors, and my modeling runs correcting them. I then discuss the results of the Strategist runs that I performed using inputs and assumptions from MEC-SC-NRDC and from Witness Tom Beach.

III. FLAWS IN DTE'S STRATEGIST RUNS AND CORRECTION RESULTS

Q. What flaws have you identified in DTE's Strategist modeling supporting the Company's request for approval of a new NGCC generating facility?

A. I identified or observed the following flaws and errors in DTE's 2016 Strategist modeling:

(A) Failure to allow additional demand response resources to be selected prior to 2023;

(B) Incorrect modeling of energy efficiency programs;

(C) Incorrect capacity credit for solar facilities;

(D) Failure to analyze incremental additions of relatively small amounts of renewable resources; and

(E) Use of incorrect costs for renewables.

This section of my testimony discusses these flaws and errors in more detail. In addition, this section presents the results of a Strategist modeling run that corrects these flaws and errors – i.e., the errors related to demand response, energy efficiency, and renewable resources. As shown in Case 0 in Exhibit MEC-12, the impact of correcting these flaws on DTE's 2016 1.5% EE Strategist run is to delay the Company's proposed new NGCC plant until 2029 with a cost savings of $1.882 billion (NPVRR), when compared to DTE's Preferred Plan. This section of my testimony also discusses errors related to how DTE modeled the heat rate for the NGCC plant and the Belle River peaker plant in its 2017 Strategist runs.

Q. What issue have you identified regarding how DTE modeled demand response additions?

A. DTE's Strategist runs did not allow their additional demand response ("DR") programs to be selected prior to 2023, thus keeping additional DR from competing against the combined cycle plant that the Company has selected for installation in 2022.

Q. What additional DR programs did DTE model in Strategist?

A. DTE modeled three possible demand response additions: Behavioral DR (BEHA – 24 MW); Thermostat DR (THER – 82 MW); and Bring Your Own Thermostat (DR_B – 32 MW). However, in the 2016 Base Resource Plan Strategist run, Strategist was not allowed to add these DR alternatives in any year. In the 2016 1.5% Energy Efficiency Strategist run (DTE's Preferred Plan), these demand response additions could only be selected *after* 2022. In other words, DTE prevented the demand response resources from

potentially obviating, deferring, or minimizing the need for the new NGCC plant. Exhibit MEC-8C shows DTE's Strategist input data from DTE's 2016 1.5% Energy Efficiency case concerning the selection of the additional DR programs. In this exhibit, the "Cumulative Maximum" values (which are [[ ]] in years 2016 through 2022) prevent Strategist from selecting these alternatives in the years 2016 through 2022.

Q, How did you correct this error?

A. I corrected the error in Strategist Case 0 in Exhibit MEC-12 by allowing the additional DR programs modeled by DTE to be selected in 2022 or later years by Strategist in the Company's 2016 1.5% Energy Efficiency case.

Q. What flaws have you identified regarding how DTE modeled energy efficiency programs in Strategist?

A. Another flaw I observed in DTE's analysis relates to how the Company modeled energy efficiency programs ("EE"). Specifically, when DTE modeled additional EE in Strategist, it did so by subtracting the full savings from the new EE scenario (e.g. its 1.5% per year scenario) from its base case load forecast and then adding back in the savings it had assumed were embedded in its forecast (i.e. what DTE calls 1.15% EE), so that the net effect is just the additional savings from the more aggressive EE.[8] However, on the cost side, it appears that DTE added in the full cost of the more aggressive EE scenario, but did not subtract out the cost associated with the base case EE program savings scenario. Thus, the costs included in the Strategist modeling overstate the incremental cost of more

[8] See Exhibit MEC-9, which is DTE's response to data request MECNRDCSCDE-3.3x, including DTE's description of this process.

aggressive efficiency scenarios relative to the Reference Case, and therefore understate the magnitude of the cost savings relative to the Reference case of more aggressive efficiency efforts.

Q. Did DTE explain why it modeled EE in this way in Strategist?

A. Yes, DTE explained that their approach results in total EE savings and total EE costs.[9] But the fact remains that the EE costs are not included in DTE's base reference case. Thus, when comparing DTE's 1.5% or 2.0% EE cases to their base reference case, which is what I understand their scenario analyses to present, the Company understates the difference in cost.

Q. Did you correct this flaw in the way DTE modelled EE?

A. Yes, in Strategist Case 0 in Exhibit MEC-12, I corrected this flaw by including in the 1.5% EE case only the increased costs associated with the 1.5% EE plan, as compared to the base plan (1.15% EE).

Q. Are there other flaws in the Company's Strategist modeling of EE programs?

A. Yes, Mr. Neme has identified three other flaws regarding DTE's modeling of EE programs within Strategist, which he discusses in more detail in his testimony. First, Mr. Neme identified that DTE incorrectly assumed that their load forecast includes the full energy reductions arising from DTE's 1.15% EE program. Second, Mr. Neme identified that DTE assumed all EE savings will last 15 years, when in fact, various EE programs have varying lives and the average across all measures is about 12 years. Third, Mr. Neme testifies that DTE has understated the maximum amount of efficiency that DTE

[9] Ex MEC-10 (DTE response to MEDNRDCSCDE-11.7).

could cost-effectively acquire. In addition to these flaws with DTE's Strategist modeling of efficiency, Mr. Neme notes that DTE did not include in its IRP analysis the additional transmission and distribution ("T&D") and/or ancillary services cost savings that arise from additional EE programs (and which are not addressed in Strategist).[10]

Q. What are the implications of the first three flaws Mr. Neme raises with respect to the Company's Strategist modeling of energy efficiency?

A. Because of the first flaw identified by Mr. Neme, regarding how DTE modeled the energy savings of EE programs, when DTE adds back the assumed energy savings from its 1.15% EE programs, it has added back too much energy, resulting in excessive energy requirements in DTE's Strategist runs. The second issue identified by Mr. Neme means that the annual energy savings in the modeling runs do not accurately reflect the actual mix of lives of the EE programs, which effectively results in over-stating of the impacts of efficiency programs in the near to mid-term (though understating them in the long-term). The third issue identified by Mr. Neme means that DTE has not modeled in Strategist the full range of efficiency program savings and therefore has inappropriately constrained its consideration of alternatives to its proposed new power plant.

Q. Have you been able to correct the flaws identified by Mr. Neme in DTE's modeling of EE programs in Strategist?

A. I corrected the first two flaws identified by Mr. Neme related to the energy savings of EE programs along with the failure of DTE to include the costs of the base (1.15%) EE plan for my Strategist Case 0 in Exhibit MEC-12. I corrected the first flaw by adding back

[10] Strategist is not capable of capturing the T&D benefits that arise from additional EE programs – these additional benefits are described in Mr. Neme's testimony.

only half of the savings DTE assumed to be embedded in its Reference Case load forecast (i.e. nominally 0.575% per year instead of the 1.15% level assumed by DTE). I corrected the second flaw by adjusting cumulative annual savings numbers for both DTE's 1.5% efficiency scenario and its base case efficiency scenario to reflect the actual mix of efficiency measure lives in DTE's 2018-2019 energy waste reduction plan. In both cases, the corrections were based on specific year-by-year cumulative annual GWh savings values provided to me by Mr. Neme. As I discuss later, I also modeled Mr. Neme's sustained 2.0% per year (through 2030) efficiency scenario in my Strategist Case 1 in Exhibit MEC-12. Since my focus is on DTE's Strategist modeling, I do not address the issue of T&D and ancillary services benefits of efficiency; Mr. Neme discusses those benefits in his testimony.

Q. Please explain the flaws related to how DTE modeled renewable resources in Strategist.

A. I addressed three flaws related to how DTE modeled renewable resources. The first relates to how DTE modelled the capacity credit for solar facilities in Strategist. As discussed by MEC-SC-NRDC Witness Avi Allison, new solar facilities should receive a 50% capacity credit. [11] That is, 50% of the installed capacity from new solar facilities should count toward meeting DTE's reserve requirement.

Q. Do the Company's Strategist runs reflect this information?

[11] This is also discussed on in Table 11.5.1-1 on page 190 of Exhibit A-4 Revised, the IRP.

A. No, they do not. The new solar alternatives available in DTE's Strategist runs provide a 41% capacity credit, thus reducing the benefit provided by new solar facilities.[12]

Q. Does the Company's High Renewables case include the 50% capacity credit for new solar facilities?

A. No, it does not. The Company's High Renewables case gives a 32% capacity credit to new solar facilities. In addition, the renewables in this High Renewables case are not the renewable resources that are available for selection by Strategist in the Company's other Strategist runs. This second problem alone makes the High Renewables case incomparable to the other Company Strategist cases.

Q. Please describe the issue concerning the incremental additions of relatively small amounts of renewable resources.

A. As discussed by Mr. Allison, the new solar facilities available for selection in the DTE Strategist runs are each 502 MW and the new wind facilities are each 1,000 MW. By only making available such relatively large solar and wind facilities, DTE has limited the ability of Strategist to select renewable resources that would potentially offset the need for new capacity in whole or in part. This is underscored by the Company's High Renewables case, in which the Company added wind and solar facilities in smaller increments.[13]

[12] This is shown in row 19 of the CONFIDENTIAL Strategist data in Exhibit MEC-11C.

[13] In DTE's High Renewables Strategist case, new wind resources are added in increments of approximately 74 MW and new solar resources in increments of approximately 93 MW.

Q. What other corrections related to DTE's modeling of renewable resources did you address?

A. In addition to the solar capacity issue and the wind and solar size increments issue, Mr. Allison provided me with adjustments that were needed in the revenue requirements used by DTE for new renewable resources, including corrected solar O&M costs, corrected wind PTC discounting, and the elimination of the rate of return on O&M costs for both wind and solar resources. Mr. Allison discusses these issues and other errors related to renewable resources in his testimony. I included the corrections provided by Mr. Allison in my corrections run in Strategist modeling (Exhibit MEC-12, Case 0).

Q. Have you identified the impact of these DTE Strategist flaws?

A. Yes, I have. As shown in Case 0 in Exhibit MEC-12, the combined impact of correcting all of these identified flaws on DTE's 1.5% EE Strategist run is to delay the Company's proposed NGCC plant until 2029 with a cost savings of $1.882 billion (NPVRR), when compared to DTE's Preferred Plan. Additional details for this Case 0 are shown in Exhibit MEC-13C (Details). The complete details of Case 0 are provided in Exhibit MEC-7C (Case 0 Strategist Complete Report).

Q. Have you identified any errors in DTE's 2017 Strategist cases?

A. Yes, I have. As a final check on the series of 2016 Strategist runs made by DTE, DTE performed a small number of Strategist cases updating the data and assumptions to current values (the 2017 runs). In the 2017 Reference Base Case, the average heat rates for two generating facilities – the proposed NGCC plant and the Belle River peaker plant – appear completely unreasonable. DTE's 2017 Strategist case run shows the proposed

NGCC plant with a heat rate ranging from [[ ]] MBtu/MWh to [[ ]] MBtu/MWh over the years 2023 through 2029, and the Belle River peaker plant with an average heat rate from [[ ]] MBtu/MWh to [[ ]] MBtu/MWh over the years 2016 through 2022.[14]

Q. What are appropriate heat rates for these two generating facilities?

A. DTE indicated the heat rate for the proposed NGCC to be 6.250 MBtu/MWh,[15] and the 2016 Strategist heat rate for the Belle River peaker is [[ ]] MBtu/MWh.[16]

Q. What impact do these errors have on DTE's 2017 Strategist runs?

A. DTE is significantly understating the costs of the proposed NGCC plant and the Belle River peaker in its 2017 Strategist runs, thus significantly understating the costs of its Preferred Plan.

Q. Have you performed Strategist runs to correct this 2017 errors?

A. Yes, I discuss my corrected 2017 Strategist runs in the following section.

[14] Exhibit MEC-14C, 2017 Reference Case Heat Rates (CONFIDENTIAL)

[15] Table 12.2-1 CCGT Assumptions, page 223 of Exhibit A-4 Revised (IRP).

[16] Exhibit MEC-15C, 2016 DTE Belle River Plant Heat Rate print-out (CONFIDENTIAL)

IV. ALTERNATIVE STRATEGIST RESULTS

Q. Have you developed additional Strategist results, apart from Case 0 in Exhibit MEC-12, that corrects DTE errors and flaws?

A. Yes, based on information provided to me by other witnesses, I have developed a series of Strategist results that show alternative resource plans to satisfy DTE's claimed future needs.

Q. Please describe the general process you have used to develop your additional Strategist results.

A. Following the process used by DTE, all but two of these cases are based on DTE's 2016 Preferred Plan Strategist case (1.5% Energy Efficiency). The final combined result was then re-run using DTE's updated 2017 assumptions and compared to the Company's 2017 Strategist result.

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

A. The runs are based on adjustments provided by other witnesses. The referenced witnesses describe and provide explanations for the model assumptions and data they provided to me for use in the Strategist modeling runs that I performed. Exhibit MEC-12 summarizes the results of these Strategist runs and identifies the witnesses supporting the modifications, as does Table 1 below.

Q. Do these Strategist runs include the "corrections" to DTE Strategist inputs that you identified in the previous section?

A. To the extent that it is appropriate, yes. For example, Case 1 below corrects the 2% EE modeling performed by DTE, and also includes all of the corrections I discuss above related to the flaws in DTE's modeling of efficiency errors. Cases 2 and 3, however,

include alternative modeling of demand response additions, which override the issues discussed above related to DTE's original demand response modeling. However, Cases 1, 2, and 3 do not include the corrections identified above in DTE's modeling of renewable resources. Likewise, Cases 4, 5, and 6 do not include any of the corrections to demand response, energy efficiency, nor renewable resources that are discussed above. This approach allows for the identification of the impacts of the single issue that is addressed in each case.

Table 1 - MEC-SC-NRDC Strategist Results

Case	Description	Supporting Witnesses	Results: Proposed New CC Plant Deferred until:	Results: NPV Savings Relative to DTE Preferred Plan (2016 $Billion)
0	Corrections to DTE Errors in Demand Response Alternatives, 1.5% Energy Efficiency Modeling and Renewable Modeling	George Evans, Chris Neme and Avi Allison	2029	$1.882
1	Corrections to 2% Energy Efficiency Modeling	Chris Neme	2030	$2.354
2	Low Demand Response Additions	Douglas Jester	2023	$0.322
3	High Demand Response Additions	Douglas Jester	2029	$0.645
4	Increased available MISO market capacity purchases to 600 MW	Bob Fagan	2023	$0.107
5	Increased available MISO market capacity purchases to 1000 MW	Bob Fagan	2026	$0.171
6	Increase MISO capacity purchases to 1000 MW at 2017 Reference capacity price	Bob Fagan	2026	$0.258
7	Combined Analysis 2016 – Cases 1, 2, and 4	Chris Neme, Douglas Jester and Bob Fagan	2030	$2.489
8	Combined Analysis 2017 – Cases 1, 2, and 4	Chris Neme, Douglas Jester and Bob Fagan	2030	$0.823
8a	Combined Analysis with 2017 Heat Rate Correction - Cases 1, 2, and 4	Chris Neme, Douglas Jester and Bob Fagan	2030	$1.272
9	Beach Scenario	Tom Beach	2028	$1.272

Q Please describe the results shown in Table 1 and Exhibit MEC-12.

A. Case 0 shown in Table 1 is the Strategist run correcting all of the flaws and errors discussed in Section III above (with the exception of the heat rate error that is addressing in run 8a).

Case 1 includes all three corrections to DTE's modeling of the 2% Energy Efficiency plan discussed by Mr. Neme in his testimony: (1) cutting in half the amount of new efficiency savings per year that DTE inappropriately assumed to be embedded in its 2016 Reference case forecast is actually embedded; (2) adjusting the future effects of annual efficiency program investments to account for a realistic mix of efficiency measure lives; and (3) capturing 2.0% incremental annual savings every year from 2018 through 2030. With these changes, Strategist deferred the Company's proposed new NGCC plant until the year 2030 at a savings of $2.35 billion over DTE's Preferred Plan. That does not include additional benefits associated with reduced T&D and ancillary services costs that are not captured in Strategist, which Mr. Neme discusses.

Case 2 includes as an available alternative resource to Strategist, the Demand Response additions reflecting the DTE Low DR modeling assumptions provided by Mr. Jester. Strategist selected the added DR, causing the Company's proposed new NGCC plant to be deferred until 2023 with a savings of $322 million over DTE's Preferred Plan.

Case 3 includes as an alternative resource to Strategist, the Demand Response additions reflecting the DTE High DR modeling assumptions provided by Mr. Jester. Strategist selected the added DR, causing the Company's proposed new NGCC plant to be deferred until the year 2029 with a savings of $645 million over DTE's Preferred Plan.

Cases 4 and 5 increase the available purchases of capacity from the MISO market to 600 MW and 1,000 MW respectively, as described by Witness Bob Fagan. DTE's Strategist runs limit the purchases of capacity from the MISO market to 300 MW. Both cases 4 and 5 defer the need for DTE's proposed power plant to 2023 and 2026, respectively, and provide savings to ratepayers of $107 and $171 million, respectively, over DTE's Preferred Plan.

Case 6 increases the available purchases of capacity from the MISO market to 1,000 MW but uses the costs of such purchases from DTE's 2017 Strategist data, as described by Mr. Fagan. This results in the deferral of DTE's proposed power plant until 2026 at a savings of $258 million over DTE's Preferred Plan.

Cases 7, 8, and 8a represent combined assumptions. Specifically, these Cases include the corrections to DTE's 2% Energy Efficiency program, the opportunity to select the minimal level of added Demand Response, and the increase in available purchases of capacity from the MISO market to 600 MW. Case 7 is based on DTE's 2016 reference assumptions while Case 8 is based on DTE's 2017 reference assumptions. The complete Strategist report for Case 7 is provided in Exhibit MEC-16C. Under both cases, the need for DTE's proposed power plant is deferred until 2030. Case 7 results in $2.49 billion in savings and Case 8 results in $0.82 billion in savings over DTE's Preferred Plan. Case 8a is the same as Case 8 except that I also corrected the heat rate errors included in DTE's 2017 Strategist Reference case that are discussed in Section III above. In Case 8a, the Company's proposed power plant is deferred until 2030 at a savings of $1.27 billion over DTE's Preferred Plan.

Case 9 is a scenario developed by Witness Tom Beach. It includes additions of 1,100 MW (installed) of solar facilities and 1,100 MW (installed) of wind facilities in small increments over the years 2018 through 2026, the Company's 2.0% EE plan and additional DR resources. This case results in the deferral of the need for DTE's proposed power plant until 2028 and savings of $1.27 billion over DTE's Preferred plan. This case is based on DTE's 2016 reference case assumptions.

Additional details for each of these cases are provided in Exhibit MEC-13C (Strategist Results Details) (CONFIDENTIAL), alongside DTE's Preferred Plan.

VI. CONCLUSIONS

Q. What do you conclude?

A. The analytic process used by DTE to support the proposed construction of a proposed 1,100 MW NGCC generating plant to be operational by 2022 is fatally flawed. DTE manually selected and compared various non-optimal resource plans. Furthermore, as further explained above and also by Mr. Neme and Mr. Allison, DTE prevented the possibility of added demand response programs in 2022, improperly modeled the impacts of energy efficiency programs, and penalized renewable resources. Strategist runs based on DTE's modeling but correcting DTE's flaws and properly considering all resources show that DTE has more cost-effective options available to meet the identified need for capacity in 2022. In fact, correcting these DTE Strategist flaws delays the need for DTE's proposed NGCC plant until 2029 and results in $1.882 billion (NPV) in cost savings. In addition, further Strategist modeling shows that there are many scenarios that would also delay the need for the proposed NGCC plant and provide significant savings to ratepayers, compared to DTE's proposed 1,100 NGCC generating facility in 2022. As a

result, DTE has not supported the IRP submitted with its application for Certificates of Necessity for the proposed gas plant. The modeling instead shows that there are cost-effective resources available that could defer, displace, or partially displace the proposed NGCC plant.

Q. Does this complete your direct testimony?

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 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 52 occasions, before the public utility commissions in Pennsylvania, Georgia, Michigan, Arkansas, South Dakota, Colorado, Mississippi, Alabama, Delaware, South Carolina, Utah and Oklahoma; 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.

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
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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-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-3.2
Page: 1 of 1

Question: Please provide the revenue requirements NPV dollar amounts utilized to compute the PV Utility Cost Difference values shown in the last row of Table 11.6.1-2 on page 139 of the Company's 2017 IRP.

Answer:

STRATEGIST REFERENCE SCENARIO RESOURCE PLAN RESULTS

	PV Utility Cost, M$	delta with Base Ref
Base Ref Case	15,768,014	
3x1 in 2022	15,732,856	-35,158
1x1 in 2022/24	15,965,936	197,922
High Renewables*	16,189,557	421,543
2.0 % EE	14,700,509	-1,067,505
1.5% EE	14,763,924	-1,004,090
1.0% EE	15,320,137	-447,877
<1.0% EE	15,602,514	-165,500
High Load Demand	16,305,101	537,087
Low Load Demand	13,694,614	-2,073,400
Commercial Choice Returns	17,237,136	1,469,122
C&I Choice Returns	18,323,408	2,555,394

*The PV Cost for this case includes the ongoing Capital and O&M for 1500 MW of Renewables

MPSC Case No.: U-18419
Respondent: K. J. Chreston/Legal
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-3.1a
Page: 1 of 3

Question: Please provide the Strategist sav files for the Strategist runs described in the Company's 2017 IRP and the Company's filed direct testimony. The results of the Strategist runs provided by the Company via download from the Company's secure site do not match the Strategist results shown in Table 11.6.1-2 on page 198 and 199 of the Company's 2017 IRP. Examples follow.

a. The Strategist run labeled "Ref Base.sav" provided by the Company shows a 3x1 combined cycle unit added in 2022 and a 1x1 combined cycle unit added in 2030, when Table 11.6.1-2 shows a 2x1 combined cycle unit added in 2022 and another 2x1 combined cycle unit added in 2029 for the "Base Resource Plan."

Answer: DTE Electric objects for the reason that the information requested consists of confidential, proprietary research and development of trade secrets or commercial information, the disclosure of which would cause DTE Electric and its customers commercial harm. Subject to this objection and without waiver thereof, the Company would answer as follows: The information is being provided only to those persons who have executed non-disclosure certificates pursuant to the Protective Order issued in this proceeding and were identified as modelers in Attachment 4 to the Protective Order.

As indicated in the response to MECNRDCSCDE-1.2c, the least cost plan determined by Strategist was not always the recommended solution. See U-18419 MECNRDCSCDE-3.1a_Selected Plans.xls for a compilation of the selected plan numbers for each case. This file is not subject to the protective order in this case.

Each Strategist run file was saved after a dynamic programming Proview optimization. The Load Forecast Adjustment (LFA) and Generation and Fuel (GAF) modules automatically run the least cost plan from that optimization. If it is desired to display the results of a plan that is different than the least cost plan, refer to the attached document titled *U-18419 MECNRDCSCDE-3.1a - Strategist Plan Selection*. This file is not subject to the protective order in this case.

MPSC Case No.: U-18419
Respondent: K. J. Chreston/Legal
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-3.1a
Page: 2 of 3

For this response, we have made a copy of all the Strategist .SAV files and saved them after running the Proview Resource Optimization module with our selected plan and Proview run flag set to “S” (PROVIEW Plan analysis option). When you run the standard report for Planning Period Plan Comparison all the plans will have stayed the same. Now you will see the selected plan displayed in the GAF and LFA modules.

Below is a list of the SAV files reconfigured with the chosen plan loaded as the selected plan. These files are subject to the protective order in this case. The selected plan number is indicated in the file name:

U-18419 MECNRDCSCDE-3.1a Agg CO2 Base-Plan 3.SAV
U-18419 MECNRDCSCDE-3.1a Emerg Tech 1 % EE-Plan 13.SAV
U-18419 MECNRDCSCDE-3.1a Emerg Tech 3x1 in 2022-Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Emerg Tech Base-Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a Emerg Tech CC Capital-Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a HI GAS-HI RENEW -Plan 41.SAV
U-18419 MECNRDCSCDE-3.1a HIGH GAS NUCLEAR -Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Agg CO2 1 % EE-Plan 18.SAV
U-18419 MECNRDCSCDE-3.1a Agg CO2 3x1 in 2022-Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a LOW GAS-1% EE -Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a LOW GAS-3X1 IN 2022 -Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Ref 1 % EE -Plan 16.SAV
U-18419 MECNRDCSCDE-3.1a 2017 Ref Base-Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a HIGH GAS BASE -Plan 11.SAV
U-18419 MECNRDCSCDE-3.1a HIGH GAS CC CAPITAL -Plan 20.SAV
U-18419 MECNRDCSCDE-3.1a HIGH GAS 1 % EE -Plan 45.SAV
U-18419 MECNRDCSCDE-3.1a HIGH GAS NEW SOURCE -Plan 12.SAV
U-18419 MECNRDCSCDE-3.1a HIGH GAS-3X1 IN 2022 -PLAN 1.SAV
U-18419 MECNRDCSCDE-3.1a Ref 3x1 CC -Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Ref Base -Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a Ref High Renewables -Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a Ref less than 1% EE -Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Ref Low Load -Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Ref 1.5 % EE -Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a Ref 1x1 CC -Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Agg CO2 1.5 % EE-Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a Agg CO2 Aggressive-Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Emerg Tech 1.5 % EE-Plan 2.SAV

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U-18419 MECNRDCSCDE-3.1a Emerg Tech High Renew-Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a HIGH GAS 1.5 % EE -Plan 6.SAV
U-18419 MECNRDCSCDE-3.1a LOW GAS 1.5 % EE -Plan 4.SAV
U-18419 MECNRDCSCDE-3.1a LOW GAS BASE -Plan 5.SAV
U-18419 MECNRDCSCDE-3.1a LOW GAS CC CAPITAL INC -Plan 2.SAV
U-18419 MECNRDCSCDE-3.1a Ref 2 % EE -Plan 22.SAV
U-18419 MECNRDCSCDE-3.1a Ref CHOICE RETURNS -Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Ref Comm Choice Return Plan 1.SAV
U-18419 MECNRDCSCDE-3.1a Ref High Load -Plan 1.SAV

Strategist Chosen Plan for all Cases

Case No: U-18419
Question: MECNRDCSCDE-3.1a
Witness: K. J. Chreston
Page: 1 of 1

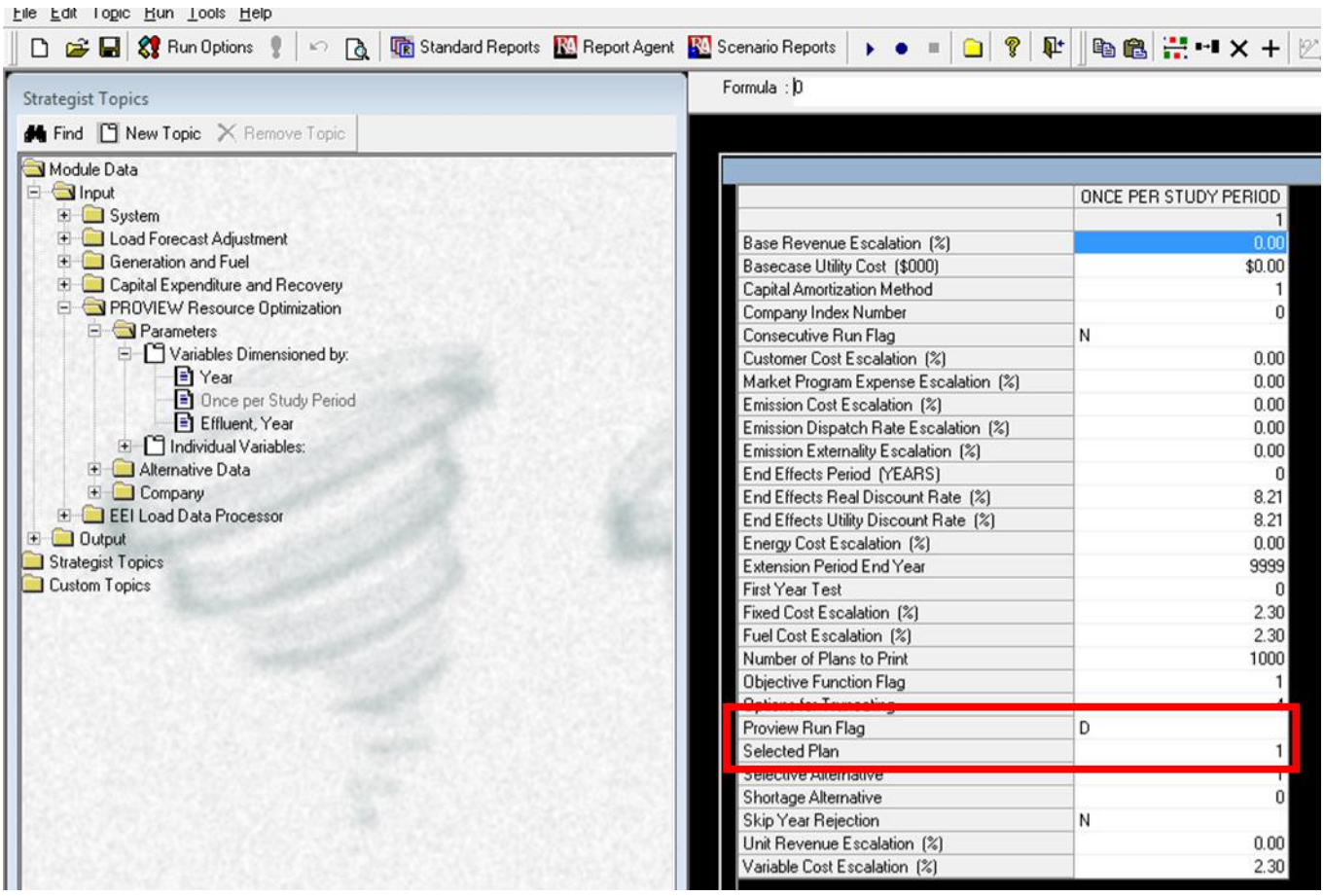
	Scenario	Case	Strategist Chosen Plan #
1	Reference	Base	2
2	Reference	3x1 in 2022	1
3	Reference	1x1 in 2022 and 2024	1
4	Reference	High Renewables	2
5	Reference	2.0% EE	22
6	Reference	1.5% EE	2
7	Reference	1% EE	16
8	Reference	<1% EE	1
9	Reference	High Load Demand	1
10	Reference	Low Load Demand	1
11	Reference	Commercial Choice Returns	1
12	Reference	C&I Choice Returns	1
13	High Gas Price	Base Case	11
14	High Gas Price	Base Case with CO_2 on all	12
15	High Gas Price	3x1 in 2022	1
16	High Gas Price	High Renewables	41
17	High Gas Price	1.5% EE	6
18	High Gas Price	1% EE	45
19	High Gas Price	Fermi 3 in 2030	1
20	High Gas Price	Capital Increase on CCs	20
21	Low Gas Price	Base Case	5
22	Low Gas Price	3x1 in 2022	1
23	Low Gas Price	1.0% EE	2
24	Low Gas Price	1.5 EE	4
25	Low Gas Price	Capital Increase on CCs	2
26	Emerging Technology	Base Case	2
27	Emerging Technology	3x1 in 2022	1
28	Emerging Technology	High Renewables	2
29	Emerging Technology	1.0% EE	13
30	Emerging Technology	1.5% EE	2
31	Emerging Technology	Capital Increase on CCs	2
32	Aggressive CO2	Base Case	3
33	Aggressive CO2	3x1 in 2022	1
34	Aggressive CO2	Optimized EE	18
35	Aggressive CO2	1.5 EE	2
36	Aggressive CO2	Retire Monroe by 2037	1
37	2017 Reference	Base	1

The picture below shows the planning period comparison after a dynamic programming optimization run.

PROVIEW LEAST COST OPTIMIZATION SYSTEM
PLANNING PERIOD PLAN COMPARISON

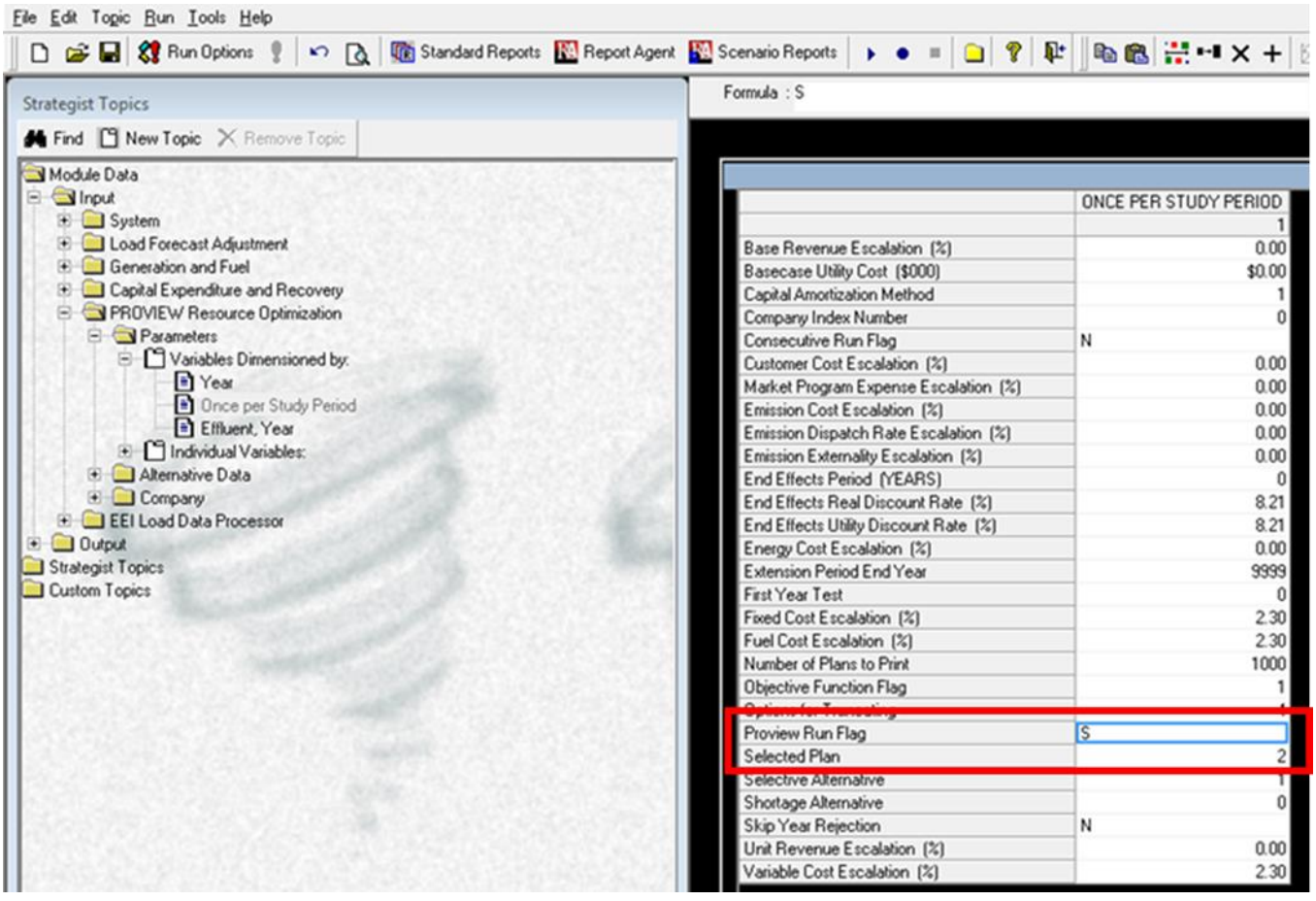
PLAN RANK	1	2	3	4	5	6	7	8
2016	IACB(1)	IACB(1)	IACB(1)	IACB(1)	IACB(1)	IACB(1)	IACB(1)	IACB(1)
	EEB (1)	EEB (1)	EEB (1)	EEB (1)	EEB (1)	EEB (1)	EEB (1)	EEB (1)
	EEZ (1)	EEZ (1)	EEZ (1)	EEZ (1)	EEZ (1)	EEZ (1)	EEZ (1)	EEZ (1)
	DEF(92)	DEF(92)	DEF(92)	DEF(92)	DEF(92)	DEF(92)	DEF(92)	DEF(92)
2017								
2018								
2019								
2020								
2021								
2022	H3X1(1)	7HA2(1)	H3X1(1)	F7CT(1)	H3X1(1)	H3X1(1)	H3X1(1)	F7CT(1)
	H31D(1)	H21D(1)	H31D(1)	DEF(250)	H31D(1)	H31D(1)	H31D(1)	DEF(250)
2023		DEF(245)		H3X1(1)				H3X1(1)
				H31D(1)				H31D(1)
2024		DEF(289)						
2025		DEF(252)						
2026		DEF(248)						
2027		DEF(231)						
2028		DEF(215)						
2029	DEF(176)	7HA2(1)	DEF(176)		DEF(176)	DEF(176)	DEF(176)	
		H21D(1)						
2030	7HA1(1)	DEF(160)	F7CT(1)	F7CT(1)	F7CT(1)	7HA2(1)	41X0(1)	7HA1(1)
	H11D(1)		S30 (1)	DEF(228)	W30 (1)	H21D(1)		H11D(1)
	DEF(158)		DEF(239)		DEF(291)			
2031	DEF(146)	DEF(148)	DEF(227)	DEF(216)	DEF(279)			
2032	DEF(120)	DEF(121)	DEF(201)	DEF(189)	DEF(253)			
2033	DEF(111)	DEF(112)	DEF(191)	DEF(180)	DEF(243)			
2034	DEF(92)	DEF(94)	DEF(173)	DEF(162)	DEF(225)			
2035	DEF(71)	DEF(72)	DEF(151)	DEF(140)	DEF(203)			
2036	DEF(47)	DEF(49)	DEF(128)	DEF(117)	DEF(180)			
2037	DEF(19)	DEF(21)	DEF(100)	DEF(89)	DEF(152)			
2038			DEF(71)	DEF(60)	DEF(124)			
2039			DEF(75)	DEF(64)	DEF(127)			
2040			DEF(77)	DEF(66)	DEF(129)			
P.V. UTILITY COST:								
PLANNING PERIOD	15732856.0	15768014.0	15783295.0	15794394.0	15799462.0	15833350.0	15836775.0	15870197.0
% DIFFERENCE	0.00%	0.22%	0.32%	0.39%	0.42%	0.64%	0.66%	0.87%
STUDY PERIOD RANK	1	2	3	4	5	6	7	8

The dynamic programming settings can be seen in this picture.



If it is desired that Plan Rank #2 be displayed in the GAF and LFA modules, make the following changes to the Proview table.

1) Change Proview run flag to S (PROVIEW Plan Analysis Option).
2) Set selected plan to 2
3) Run Proview Resource Optimization Module (2016-2040)



Corrected Figure 4 - Chreston's Direct Testimony

	PV Revenue Requirements (2016 M$)	Delta with Base (2016 M$)	Delta with Preferred Plan (2016 M$)
Base Resource Plan	$15,733	$0	$971
Large CCGT (3x1)	$15,733	$0	$971
Large CCGT (3x1) No Capacity Value	N/A	N/A	N/A
Small Combined Cycle (1x1)	$15,966	$233	$1,204
<1.0% Energy Efficiency	$15,603	-$130	$840
1.0% Energy Efficiency	$15,244	-$489	$482
1.5% Energy Efficiency*	$14,762	-$971	$0
2.0% Energy Efficiency	$14,681	-$1,052	-$82
High Renewables	$16,129	$396	$1,367
High Load Demand	$16,305	$572	$1,543
Low Load Demand	$13,695	-$2,038	-$1,068
Commercial Customer Choice Return	$17,237	$1,504	$2,475
Commercial & Industrial Choice Return	$18,323	$2,591	$3,561

***DTE Preferred Plan**

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-1.2a
Page: 1 of 2

Question: On pp. 9-11 of his testimony, Mr. Chreston describes supplemental criteria considered in the IRP process. Near the end of that discussion (p. 11, lines 18-19) he states that "these factors help select which portfolio was the recommended solution for each scenario/sensitivity run."

a. Please explain how these factors "help select" the recommended solutions?

Answer: When selecting a recommended solution for each scenario/sensitivity run, other factors were considered in addition to least cost. The other factors or planning principles considered in the IRP include reliability, affordability, clean, flexible and balanced, compliant and reasonable risk.

For the purposes of the IRP, all plans were modeled in Strategist to meet the Company's Planning Reserve Margin Requirement for each year. Affordability was measured by reviewing the present value utility costs for each Strategist run. In certain cases, to further assess the financial results of the plan selected, the internal revenue requirement model was utilized. Other quantitative methods for evaluating affordability include the initial screening tools such as the Levelized Cost of Electricity and Market Valuation. For energy efficiency programs the Utility Cost Test (UCT) benefit cost ratio results of the programs were also considered. The planning principle "clean" was measured by reviewing the CO_2 emissions of the various plans. Next, for "flexible and balanced", the plans were reviewed to ensure there were an appropriate mix between dispatchable vs. non-dispatchable units and peaking vs. base load resources. All plans were modeled as compliant to current and known future environmental and legislative regulations. Finally, "reasonable risk" was assessed through scenario and sensitivity modeling of varying assumptions such as energy, fuel, and emission prices to name a few.

For instance, in many of the sensitivities conducted under the 2016 scenarios, the least cost plans from Strategist included a 3x1 combined cycle gas turbine in 2022. The Company used its planning principles to determine that the Strategist resource plans with the 2x1 combined cycle gas turbine would be the better selection for customers. The internal revenue requirement model was used for further assessment of the planning principle "affordability" of the 3x1 combined cycle gas turbine under the Reference Scenario. Even though the 3x1 combined cycle gas

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Respondent: K. J. Chreston
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Question No.: MECNRDCSCDE-1.2a
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turbine resource plan had the lowest overall revenue requirement from 2016 to 2040, it did not become lower on a cumulative basis until 2030, exposing customers to higher costs in the near term. Next, “clean” was analyzed by reviewing the total CO_2 emissions over the 2016 to 2040 period. Over that time horizon, the 3x1 combined cycle gas turbine resource plan produced more CO_2 tonnage. For “flexible and balanced”, the projected capacity positions were reviewed. With the 3x1 combined cycle gas turbine, there was capacity surplus to 2029. The Company did not want to bias the selection of a resource option on overbuilding capacity that is not needed to serve customers. For “reasonable risk”, there was a sensitivity conducted on the 3x1 combined cycle gas turbine resource plan that assumed the capacity credit for excess capacity was at $0/kW-year. This sensitivity significantly reduced the value of the larger combined cycle gas turbine resource plan.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-5.3a
Page: 1 of 1

Question: Strategist portfolio choices: Refer to discovery response MEC-NRDC-SCDE- 3.1a_Selected Plans.

a. Please verify that the column "Strategist Chosen Plan #" represents the numeric position of the portfolio, as created by Strategist, and sorted by portfolio cost (i.e. net present value of revenue requirements). In other words, in line 7 (Reference, Base), the "Strategist Chosen Plan #" of two (2) represents the second most cost-effective plan as determined by Strategist. If the answer to this question is anything but an unequivocal affirmation, provide a detailed explanation of what is represented by this number.

Answer: Yes.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-5.3b
Page: 1 of 1

Question: Strategist portfolio choices: Refer to discovery response MEC-NRDC-SCDE- 3.1a_Selected Plans.

b. Please augment this table by providing two additional columns of data: (a) the total system cost of the Strategist plan chosen by DTE, and (b) the total system cost of the least-cost Strategist plan. Or, if DTE objects to augmenting the table as the creation of a document, identify each of these requested values.

Answer: Please refer to "U-18419 MECNRDCSCDE-5.3b_Selected Plans with system cost.xlsx", attached.

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Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-5.3c
Page: 1 of 1

Question: Strategist portfolio choices: Refer to discovery response MEC-NRDC-SCDE- 3.1a_Selected Plans.

c. Describe in detail all support rationale, or reasons for the selection of Strategist Plan # 2 for the Base Reference case, as shown in line 1 of the attachment to the response.

Answer: Please refer to MECNRDCSDE-1.2a which explains the rationale for the selection of the Strategist Plan #2 as opposed to the Strategist Plan #1 which included the 3x1 combined cycle gas turbine in 2022.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-5.3d
Page: 1 of 1

Question: Strategist portfolio choices: Refer to discovery response MEC-NRDC-SCDE- 3.1a_Selected Plans.

d. Describe in detail all support rationale, or reasons for the selection of Strategist Plan # 2 for the High Renewables Reference case, as shown in line 4 of the attachment to the response.

Answer: Please refer to MECNRDCSDE-1.2a which explains the rationale for the selection of the Strategist Plan #2 as opposed to the Strategist Plan #1 which included the 3x1 combined cycle gas turbine in 2022.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-5.3e
Page: 1 of 1

Question: Strategist portfolio choices: Refer to discovery response MEC-NRDC-SCDE- 3.1a_Selected Plans.

e. Describe in detail all support rationale, or reasons for the selection of Strategist Plan # 22 for the 2.0% EE Reference case, as shown in line 5 of the attachment to the response.

Answer: Please refer to MECNRDCSDE-1.2a which explains the rationale for the selection of the Strategist Plan #22 as opposed to the Strategist Plan #1-11 which included the 3x1 combined cycle gas turbine in 2022. Plans #12-21 were not selected because it delayed a combustion turbine from coming online with the inclusion of Demand Response programs. For purposes of evaluating different energy efficiency levels, the focus was on value of the energy efficiency versus the value of delaying a combustion turbine in 2034. Plan #22 was the first plan that included a 2x1 combined cycle gas turbine and did not have a delay in the later combustion turbine build.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-5.3f
Page: 1 of 1

Question: Strategist portfolio choices: Refer to discovery response MEC-NRDC-SCDE- 3.1a_Selected Plans.

f. Describe in detail all support rationale, or reasons for the selection of Strategist Plan # 2 for the 1.5% EE Reference case, as shown in line 6 of the attachment to the response.

Answer: Please refer to MECNRDCSDE-1.2a which explains the rationale for the selection of the Strategist Plan #2 as opposed to the Strategist Plan #1 which included the 3x1 combined cycle gas turbine in 2022.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-5.3g
Page: 1 of 1

Question: Strategist portfolio choices: Refer to discovery response MEC-NRDC-SCDE- 3.1a_Selected Plans.

g. Describe in detail all support rationale, or reasons for the selection of Strategist Plan # 16 for the 1% EE Reference case, as shown in line 7 of the attachment to the response.

Answer: Please refer to MECNRDCSDE-1.2a which explains the rationale for the selection of the Strategist Plan #16 as opposed to the Strategist Plans #1-15 which included the 3x1 combined cycle gas turbine in 2022.

Strategist Chosen Plan for all Cases

Case No: U-18419
Question: MECNRDCSCDE-5.3b
Witness: K. J. Chreston
Page: 1 of 1

				SYSTEM COST,$000		
	Scenario	Case	Strategist Chosen Plan #	Least Cost plan	Strategist chosen plan	delta
1	Reference	Base	2	15,732,856	15,768,014	
2	Reference	3x1 in 2022	1	15,732,856	15,732,856	-35,158
3	Reference	1x1 in 2022 and 2024	1	15,965,936	15,965,936	197,922
4	Reference	High Renewables	2	16,129,098	16,189,557	421,543
5	Reference	2.0% EE	22	14,680,627	14,700,509	-1,067,505
6	Reference	1.5% EE	2	14,762,187	14,763,924	-1,004,090
7	Reference	1% EE	16	15,244,147	15,320,137	-447,877
8	Reference	<1% EE	1	15,602,514	15,602,514	-165,500
9	Reference	High Load Demand	1	16,305,101	16,305,101	537,087
10	Reference	Low Load Demand	1	13,694,614	13,694,614	-2,073,400
11	Reference	Commercial Choice Returns	1	17,237,136	17,237,136	1,469,122
12	Reference	C&I Choice Returns	1	18,323,408	18,323,408	2,555,394
13	High Gas Price	Base Case	11	17,296,974	17,476,036	
14	High Gas Price	Base Case with CO_2 on all	12	17,034,562	17,218,968	-257,068
15	High Gas Price	3x1 in 2022	1	17,296,974	17,296,974	-179,062
16	High Gas Price	High Renewables	41	17,054,433	17,319,980	-156,056
17	High Gas Price	1.5% EE	6	15,971,273	16,000,981	-1,475,055
18	High Gas Price	1% EE	45	16,941,942	17,102,008	-374,028
19	High Gas Price	Fermi 3 in 2030	1	19,257,118	19,257,118	2,038,150
20	High Gas Price	Capital Increase on CCs	20	17,523,212	17,722,064	246,028
21	Low Gas Price	Base Case	5	15,319,147	15,387,282	
22	Low Gas Price	3x1 in 2022	1	15,319,147	15,319,147	-68,135
23	Low Gas Price	1.0% EE	2	14,900,013	14,907,693	-479,589
24	Low Gas Price	1.5 EE	4	14,355,177	14,396,709	-990,573
25	Low Gas Price	Capital Increase on CCs	2	15,629,565	15,633,309	246,027
26	Emerging Technology	Base Case	2	15,508,495	15,541,266	
27	Emerging Technology	3x1 in 2022	1	15,508,495	15,508,495	-32,771
28	Emerging Technology	High Renewables	2	15,950,860	16,020,472	479,206
29	Emerging Technology	1.0% EE	13	15,006,174	15,077,035	-464,231
30	Emerging Technology	1.5% EE	2	14,530,563	14,533,797	-1,007,469
31	Emerging Technology	Capital Increase on CCs	2	15,777,210	15,787,299	246,033
32	Aggressive CO2	Base Case	3	16,018,979	16,054,234	
33	Aggressive CO2	3x1 in 2022	1	16,018,979	16,018,979	-35,255
34	Aggressive CO2	Optimized EE	18	15,549,654	15,623,002	-431,232
35	Aggressive CO2	1.5 EE	2	15,047,971	15,052,962	-1,001,272
36	Aggressive CO2	Retire Monroe by 2037	1	16,276,374	16,276,374	222,140
37	2017 Reference	Base	1	13,640,761	13,640,761	

MEC-7C

CONFIDENTIAL EXHIBIT

MEC-8C

CONFIDENTIAL EXHIBIT

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-3.3x
Page: 1 of 1

Question: Please provide a precise and detailed description for each of the "Alternatives" included in the Company's Strategist runs, which are the following.

x. EEZ

Answer: EEZ is modeled to remove the base 1.15% energy efficiency savings from the demand forecast. If we wanted to evaluate 1% EE for example, EEZ would be forced in, effectively removing energy efficiency savings. 21EE is forced in as well, which represents the total savings for the 1% EE program.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-11.7a
Page: 1 of 1

Question: In response to MECNRDCSCDE-4.5e, DTE explains that in modeling its 1.5% savings scenario in Strategist it "effectively adds back the 1.15% energy savings embedded in the load forecast."

a. Does that effectively mean that in modeling the 1.5% savings scenario the Company is adding into the model the difference in savings between the 1.5% scenario and the 1.15% savings level assumed to be in the forecast?

Answer: No.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-11.7b
Page: 1 of 1

Question: In response to MECNRDCSCDE-4.5e, DTE explains that in modeling its 1.5% savings scenario in Strategist it "effectively adds back the 1.15% energy savings embedded in the load forecast."

b. When the Company "adds back the 1.15% energy savings embedded in the load forecast", does it also add back the cost of achieving the 1.15% energy savings embedded in the forecast so that only the difference in cost between the 1.5% scenario and the 1.15% savings level is captured in the model?

Answer: No.

MPSC Case No.: U-18419
Respondent: K. J. Chreston
Requestor: MECNRDCSC
Question No.: MECNRDCSCDE-11.7c
Page: 1 of 1

Question: In response to MECNRDCSCDE-4.5e, DTE explains that in modeling its 1.5% savings scenario in Strategist it "effectively adds back the 1.15% energy savings embedded in the load forecast."

c. If the answer to part "b" of this question is no, please explain why.

Answer: For each energy efficiency sensitivity within Strategist, an energy sales transaction is created (EEZero) that effectively adds back the 1.15% energy savings embedded in the load forecast at no cost.

1.5% energy efficiency programs were modeled with the total program savings and costs (EPEE). With EEZero and EPEE both enabled, the combination will result in the total energy savings and costs for the 1.5% energy efficiency program.

MEC-11C

CONFIDENTIAL EXHIBIT

MEC-SC-NRDC Strategist Results

			Results			
Case	**Description**	Supporting Witnesses	Proposed New CC Plant Deferred until:	NPV RR (2016 $Billion)	NPV Savings Relative to DTE Preferred Plan (2016 $Billion)	Percent Savings
0	Corrections to DTE Errors in Demand Response Alternatives, 1.5% Energy Efficiency Modeling and Renewable Modeling	George Evans, Chris Neme and Avi Allison	2029	$12.88	$1.882	12.7%
1	Corrections to 2% Energy Efficiency Modeling	Chris Neme	2030	$12.410	$2.354	15.9%
2	Low Demand Response Additions	Douglas Jester	2023	$14.442	$0.322	2.2%
3	High Demand Response Additions	Douglas Jester	2029	$14.119	$0.645	4.4%
4	Increased available MISO market capacity purchases to 600 MW	Bob Fagan	2023	$14.656	$0.107	0.7%
5	Increased available MISO market capacity purchases to 1000 MW	Bob Fagan	2026	$14.593	$0.171	1.2%
6	Increase MISO capacity purchases to 1000 MW at 2017 Reference capacity price	Bob Fagan	2026	$14.506	$0.258	1.7%
7	Combined Analysis 2016 - Cases 1, 2 and 4	Chris Neme, Douglas Jester and Bob Fagan	2030	$12.275	$2.489	16.9%
8	Combined Analysis 2017 - Cases 1, 2 and 4	Chris Neme, Douglas Jester and Bob Fagan	2030	$12.818	$0.823	6.0%
8a	Combined Analysis with 2017 Heat Rate Correction - Cases 1, 2 and 4	Chris Neme, Douglas Jester and Bob Fagan	2030	$13.024	$1.272	9.3%
9	Beach Scenario	Tom Beach	2028	$13.492	$1.272	8.6%

MEC-13C

CONFIDENTIAL EXHIBIT

MEC-14C

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MEC-15C

CONFIDENTIAL EXHIBIT

MEC-16C

CONFIDENTIAL EXHIBIT

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of **DTE ELECTRIC COMPANY** for approval of Certificates of Necessity pursuant to MCL 460.6s, as amended, in connection with the addition of a natural gas combined cycle generating facility to it generation fleet and for related accounting and ratemaking authorizations	U-18419 ALJ Suzanne D. Sonneborn

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PROOF OF SERVICE

On the date below, an electronic copy of **the PUBLIC Direct Testimony of George Evans with Exhibits MEC-1 through MEC-16C on behalf of Michigan Environmental Council, Natural Resources Defense Council, and Sierra Club** was served on the following:

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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: January 12, 2018

By: 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: 2018.01.12 22:10:14 -05'00'

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