

**BEFORE THE  
OKLAHOMA CORPORATION COMMISSION**

**IN THE MATTER OF THE APPLICATION OF )  
OKLAHOMA GAS AND ELECTRIC COMPANY )  
FOR COMMISSION AUTHORIZATION OF A )  
PLAN TO COMPLY WITH THE FEDERAL CLEAN )  
AIR ACT AND COST RECOVERY; AND FOR )  
APPROVAL OF THE MUSTANG MODERNIZATION )  
AND COST RECOVERY )**

**CAUSE NO. PUD 201400229**

**Rebuttal Testimony of  
Tyler Comings**

**On Behalf of  
Sierra Club**

**January 26, 2015**

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1 **I. INTRODUCTION AND PURPOSE OF TESTIMONY**

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

3 **A** My name is Tyler Comings. I am a Senior Associate with Synapse Energy  
4 Economics, Inc. (“Synapse”), which is located at 485 Massachusetts Avenue,  
5 Suite 2, Cambridge, Massachusetts.

6 **Q Are you the same Tyler Comings who filed testimony in this matter on**  
7 **December 16, 2014?**

8 **A** Yes.

9 **Q What is the purpose of your rebuttal testimony?**

10 **A** My rebuttal testimony responds to the following issues raised by Oklahoma  
11 Industrial Energy Consumers (“OIEC”) Witness Scott Norwood and Oklahoma  
12 Corporation Commission (“OCC”) Staff Witness Craig Roach:

13 1. Mr. Norwood’s recommendation of the Company’s scrub compliance  
14 plan (“Scrub Plan”) carries even more risks than Oklahoma Gas and  
15 Electric Company’s (“OGE” or “the Company”) chosen scrub/convert  
16 compliance plan (“Scrub/Convert Plan”). I will lay out the potentially  
17 high costs associated with retrofitting Muskogee units 4 and 5. I will  
18 also explain why Mr. Norwood’s use of nominal dollars instead of net  
19 present value is an incorrect and unorthodox methodology for comparing  
20 investment options.

21 2. Mr. Roach’s and Mr. Norwood’s use of resource diversity in order to  
22 advocate for the Scrub/Convert and Scrub Plans, respectively.

23 In his rebuttal testimony, my colleague Dr. Fisher separately addresses Mr.  
24 Norwood’s concerns regarding carbon dioxide (“CO<sub>2</sub>”) price risk.

25 **Q Are there any exhibits that accompany your testimony?**

26 **A** Yes. I have attached data responses referred to as Rebuttal Exhibits TFC-1, TFC-  
27 2, and TFC-3.

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2 **II. OIEC’S ARGUMENTS IN SUPPORT OF THE SCRUB PLAN ARE**  
3 **FLAWED.**

4 **A. THE COMMISSION SHOULD IGNORE OIEC’S USE OF NOMINAL DOLLARS**  
5 **TO COMPARE ALTERNATIVES OVER A 30-YEAR PERIOD AS IT DOES NOT**  
6 **COMPLY WITH ACCEPTED ACCOUNTING PRINCIPLES.**

7 **Q What are Mr. Norwood’s recommendations regarding the Company’s choice**  
8 **of a compliance plan?**

9 **A** Mr. Norwood recommends that the Company “reconsider the Scrub compliance  
10 plan as an alternative to the Scrub/Convert plan.”<sup>1</sup>

11 **Q Please describe how Mr. Norwood compares the costs of the Company’s**  
12 **compliance options in his testimony.**

13 **A** Mr. Norwood compares the Company’s selected Scrub/Convert Plan to the Scrub  
14 Plan based on a summation of nominal dollar revenue requirements over the 30-  
15 year analysis period.<sup>2</sup> Mr. Norwood advocates for selecting the Scrub Plan (i.e.,  
16 retrofitting Sooner 1 and 2 and Muskogee 4 and 5 with scrubbers) on the basis  
17 that, under the Company’s Base scenario, the plan is “approximately \$700 lower  
18 on a nominal basis than the Company’s proposed Scrub/Convert plan” (i.e.,  
19 retrofitting Sooner 1 and 2 with scrubbers and converting Muskogee 4 and 5 to  
20 natural gas).<sup>3</sup> After comparing these nominal dollar figures, he recommends that  
21 the Company “reconsider the Scrub compliance plan” in part because it “provides  
22 a lower total nominal cost in the base case analysis, [and] only modestly higher  
23 costs in the CO<sub>2</sub> sensitivity analysis case.”<sup>4</sup>

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<sup>1</sup> Responsive Testimony of Scott Norwood, p. 48, lines 20-21.

<sup>2</sup> *Id.* p. 6, lines 6-7.

<sup>3</sup> *Id.*

<sup>4</sup> *Id.* p. 8, lines 1-4.

1 **Q What is a nominal cost?**

2 **A** Nominal dollars are sometimes referred to as “current year dollars” since they  
3 refer to the dollar value in the year being presented. As we all know, prices of  
4 goods and services change over time.

5 **Q Is it appropriate to compare nominal dollars over a 30-year period?**

6 **A** No. Comparing the summation of nominal dollars is not meaningful since it  
7 ignores both inflation and the time-value of money which, for a utility, is typically  
8 the weighted average cost of capital (“WACC”)—that is, the weighted average of  
9 the cost of debt and equity to the company making that investment. In this  
10 proceeding, OG&E discounts the nominal streams of dollars using its own WACC  
11 since costs and revenues which occur further in the future are typically less  
12 meaningful for decisions made today.

13 Discounting takes into account the fact that OG&E shareholders have alternate  
14 avenues to invest capital – in the debt and equities markets. Those investments  
15 would be expected to yield shareholders a return at the weighted average cost of  
16 capital (WACC). Failing to discount implies that the Company has no preference  
17 for spending (or receiving monies) today or thirty years from now. I assume that  
18 the Company’s shareholders and ratepayers would not be amenable to deferring a  
19 return on their investments for 30 years.

20 **Q Please explain how the summation of nominal dollars ignores inflation.**

21 **A** If dollar values from different years are combined, they must be adjusted for an  
22 assumed inflation rate in order to arrive at “real” or “constant” dollars. Otherwise,  
23 changes in price over time are lumped together.

24 **Q Please explain how the summation of nominal dollars ignores the time value**  
25 **of money.**

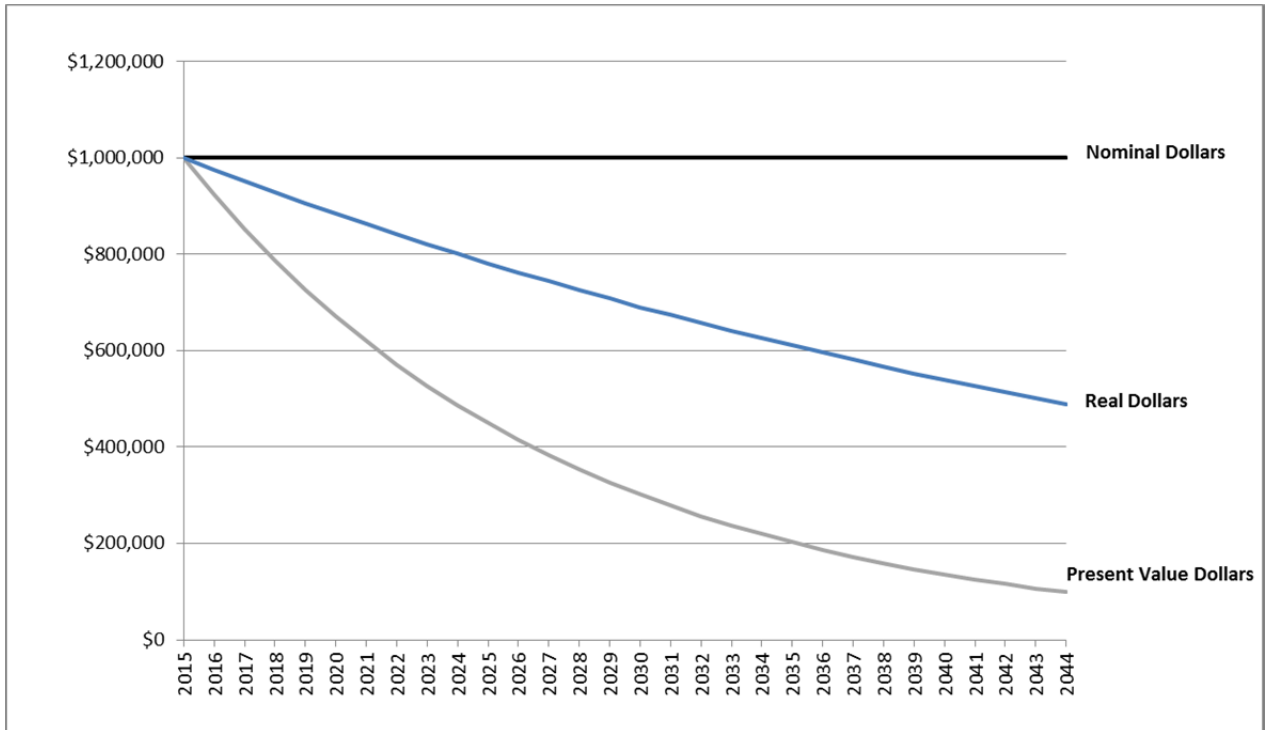
26 **A** Investment decisions that bear costs and benefits over multiple years are typically  
27 evaluated using a “discount rate” which places a value on foregoing benefits or

1 costs for each additional year.<sup>5</sup> The summation of the discounted benefits minus  
2 the discounted costs is equal to the “net present value.” This metric allows for  
3 comparison of different options that bear differing benefits and costs over a given  
4 time period. Unfortunately, Mr. Norwood’s presentation of the summation of  
5 nominal dollar costs and net present value alongside each other implies that these  
6 methodologies are equally useful valuation tools. Because the summation of  
7 nominal dollars ignores the time-value of money, however, this method is not  
8 applied to long-term investment decisions.

9 As an example, Figure 1 shows the difference between nominal, real (i.e. adjusted  
10 for inflation) and present value (i.e. discounted) dollars for an investment that  
11 costs \$1 million per year in each year’s dollars. This is similar to the structure of a  
12 mortgage payment on a house which typically stays the same over the 30-year  
13 term of the loan. As the owner’s income increases over time (as the cost of  
14 everything increases) but the mortgage payment stays the same, that payment  
15 becomes “easier” to pay since it decreases in “real” terms.

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<sup>5</sup> A discount rate can be in nominal or real terms. If the stream of dollars being discounted is in nominal dollars then a nominal discount rate is appropriate. If the stream of dollars being discounted is in real or constant dollars then a real discount rate is appropriate.



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2 **Figure 1: Comparison of Nominal, Real and Present Value Dollars<sup>6</sup>**

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In this proceeding, the difference in the total nominal dollars for the Convert Plan is \$2.4 billion higher than for the Scrub Plan, in the Company’s Base scenario.<sup>7</sup> However, the nominal costs for the Convert Plan only become higher than the Scrub Plan starting in 2027; between 2015 and 2026, the nominal costs for the Convert plan are lower in the Company’s Base scenario. After proper discounting performed by the Company, the Convert Plan is only \$61 million higher cost than the Scrub Plan in terms of net present value (see Table 1). I will discuss later how the net present value results from the Company’s Base scenario are unreasonable, given the underlying assumptions. However, the comparison of portfolio costs on a net present value basis is reasonable, while Mr. Norwood’s comparison of nominal dollar results is unreasonable.

<sup>6</sup> This example uses the Company’s inflation rate to derive real dollars and its WACC to derive present value.

<sup>7</sup> See Responsive Testimony of Scott Norwood, p. 27, Table 7.



1 **Q Was Mr. Norwood able to provide support for comparing the summation of**  
2 **undiscounted, nominal dollars?**

3 **A** No. Mr. Norwood acknowledges that there are no textbook examples or  
4 accounting principles that advocate summing undiscounted, nominal dollars.<sup>8</sup> The  
5 only support Mr. Norwood offers is that these costs “represent costs that  
6 ratepayers would actually pay over time” and that “electricity prices are not  
7 generally billed on a present value basis.”<sup>9</sup> While it is true that electricity is billed  
8 in terms of the dollar year in which they are billed (for instance, a bill today  
9 would be in 2015 dollars), this does not mean that ratepayers would value the cost  
10 of their electricity bill today the same way they would value a bill they are paying  
11 in 30 years (in 2045 dollars). Consumers, like utilities, value dollars more in the  
12 near-term than in the long-term. Also, consumers’ purchasing power changes over  
13 time as their income and price of goods changes through inflation. As I have  
14 discussed, Mr. Norwood’s lumping of nominal dollars over time ignores both  
15 time-value of money and inflation.

16 **Q Should the Commission give any weight to the summation of nominal dollars**  
17 **over a 30-year period as a valuation methodology in this proceeding?**

18 **A** Absolutely not. The Company has correctly compared compliance plans on a net  
19 present value basis. I know of no utility, or any other entity for that matter, that  
20 makes investment decisions by comparing the summation of undiscounted,  
21 nominal dollars over a long-term period.

22 **B. THE SCRUB PLAN CARRIES MORE RISK THAN THE SCRUB/CONVERT**  
23 **AND CONVERT PLANS.**

24 **Q Does Mr. Norwood assert that the Company’s chosen Scrub/Convert Plan is**  
25 **the best choice?**

26 **A** No. Mr. Norwood states that the Company should “reconsider the Scrub  
27 compliance plan as an alternative to the proposed Scrub/Convert plan.” His  
28 reasons include that the Scrub Plan is “\$700 million lower on a nominal basis” in

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<sup>8</sup> OIEC Data Response to Sierra Club’s DR 1-1(a), attached as Rebuttal Exhibit TFC-1.

<sup>9</sup> OIEC Data Response to Sierra Club’s DR 1-1(a(ii)), attached as Rebuttal Exhibit TFC-1.

1 the Base Scenario case than the Scrub/Convert Plan, and “\$5.6 billion lower under  
2 the high gas price scenario.”<sup>10</sup> In addition, he refers to lost fuel diversity with the  
3 Scrub/Convert Plan – a point I address later in this testimony.

4 **Q Is the \$5.6 billion cited based on the summation of nominal dollars?**

5 **A** Yes. This number cited in Mr. Norwood’s conclusions refers to the nominal cost  
6 difference between the Scrub and Scrub/Convert Plans under the high gas price  
7 scenario. As I have discussed, this nominal value comparison is not a meaningful  
8 method for making long-term investment decisions and the Commission should  
9 ignore it. The proper methodology is comparing net present value, as presented by  
10 the Company and in my testimony.

11 **Q Is the Company’s High Gas scenario a reasonable high bound for natural gas**  
12 **price risk?**

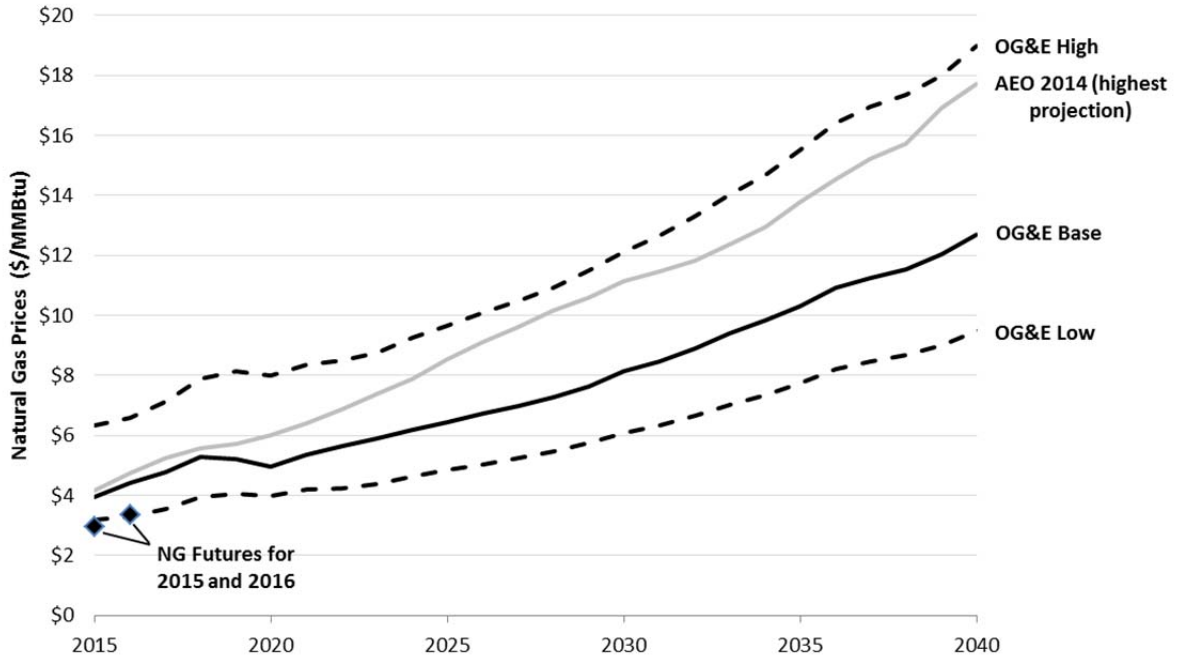
13 **A** No. As I explained in my direct testimony, OG&E inflates its base natural gas  
14 price prices by 50% to arrive at the High Gas price forecast. This forecast is  
15 asymmetric to the Low Gas forecast, which is only 25% lower than the base  
16 natural gas prices. As shown in Figure 2, below, the Company’s High Gas  
17 forecast is higher than the highest of the price scenarios run by the EIA in its 2014  
18 Annual Energy Outlook. This suggests that OG&E’s High Gas price forecast is  
19 too high and so biases the analysis towards continued coal operations.

20 Interestingly, OG&E’s Low Gas price forecast—which is 25% lower than the  
21 base forecast – closely matches recent NYMEX natural gas forward prices for  
22 2015 and 2016. I am not suggesting that the Company’s Low Gas price forecast  
23 be adopted as the base-case – merely that the Low Gas price forecast is reasonable  
24 given recent gas price expectations, while the High Gas price forecast is clearly  
25 not. Aside from the fact that it is well above the EIA bounds that form the basis of  
26 the Company’s projections, the High Gas forecast assumes extremely high gas  
27 prices as soon as today, which is clearly not the case. In early January 2015, gas

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<sup>10</sup> Responsive Testimony of Scott Norwood, p. 48, lines 17-21.

1 prices at Henry Hub are around \$3/MMBtu; throughout 2014, prices hovered at  
2 around \$3-\$4.50/MMBtu.<sup>11</sup>



3

4 **Figure 2: Gas Forward Prices (OG&E Base, High and Low Gas Prices, AEO,**  
5 **and NYMEX) (\$/MMbtu)<sup>12</sup>**  
6

7 **Q Have you compared the value of the Scrub Plan to that of Convert Plan?**

8 Yes. In my direct testimony, I compared the net benefits (on a net present value  
9 basis) of the Scrub/Convert Plan to the Convert Plan. I have used this analytical  
10 method again here to compare the Scrub Plan to the Convert plan. Figure 3 and  
11 Table 1, below, demonstrate the risks associated with Mr. Norwood's suggested  
12 Scrub portfolio. Figure 3 illustrates the difference between the cumulative net

<sup>11</sup> [http://www.eia.gov/naturalgas/weekly/archive/2015/01\\_15/index.cfm](http://www.eia.gov/naturalgas/weekly/archive/2015/01_15/index.cfm)

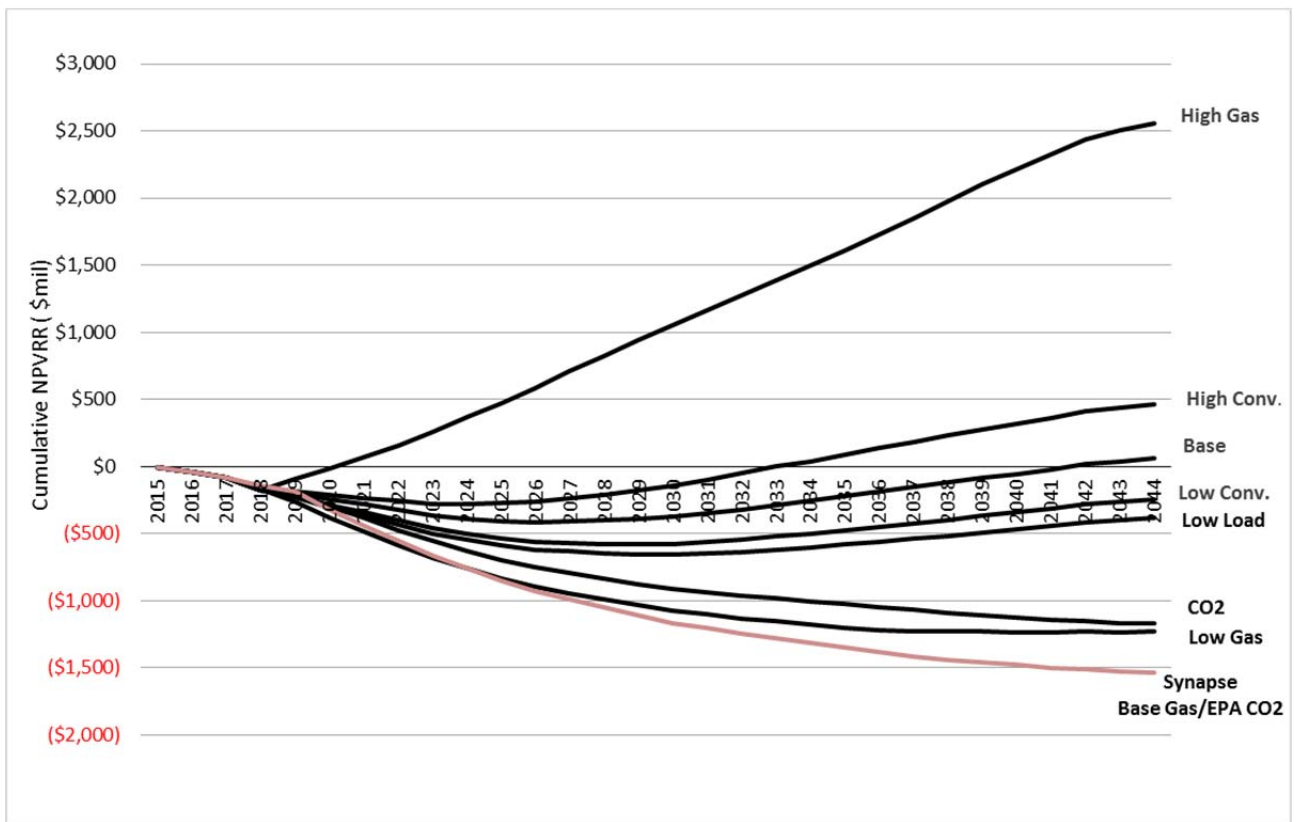
<sup>12</sup> OIEC 1-25\_At1, attached as Rebuttal Exhibit TFC-2, and EIA AEO 2014 data, available here:

<http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2014&subject=0-AEO2014&table=62-AEO2014&region=3-18&cases=ref2014-d102413a>

NYMEX Futures were pulled on January 20, 2015 from:

<http://www.cmegroup.com/trading/energy/natural-gas/natural-gas.html>

1 benefit of the Scrub Plan and the Convert Plan, for each price sensitivity run by  
 2 the Company. A Net Present Value Revenue Requirement (“NPVRR”) difference  
 3 below zero indicates that Scrub Plan is more costly than the Convert Plan, up to  
 4 and including the given year. Table 1 also presents the “breakeven” year. This  
 5 represents the year in which the cumulative net present value of the Scrub Plan  
 6 becomes favorable in comparison to the Convert Plan. These results show that  
 7 Scrub Plan does not become the less expensive alternative in the base-case  
 8 scenario until 2042—around the time the units are expected to end their useful  
 9 lives. In my original analysis, the breakeven year for retrofitting Sooner 1 and 2  
 10 alone (Scrub/Convert Plan) was 2038, as shown in the right column in Table 1. In  
 11 other words, it takes even longer for the Scrub Plan to break even than it does the  
 12 Scrub/Convert Plan.



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14 **Figure 3: Cumulative Net Benefit (Cost) of the Scrub Plan Compared to the Convert**  
 15 **Plan (NPVRR, \$2014 mil)**

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1  
2 **Table 1: Cumulative Net Benefit (Cost) of the Scrub Plan Compared to the**  
3 **Convert Plan<sup>13</sup>**  
4

| Scenario                             | Benefit of Scrub (\$2014, NPVRR) | Scrub Breakeven Year | Scrub/Convert Breakeven Year |
|--------------------------------------|----------------------------------|----------------------|------------------------------|
| Base                                 | \$61                             | 2042                 | 2038                         |
| CO <sub>2</sub>                      | -\$1,170                         | None                 | None                         |
| High Conversion                      | \$465                            | 2033                 | 2031                         |
| Low Conversion                       | -\$247                           | None                 | None                         |
| High Gas                             | \$2,560                          | 2021                 | 2021                         |
| Low Gas                              | -\$1,229                         | None                 | None                         |
| Low Load                             | -\$382                           | None                 | None                         |
| Synapse Base Gas/EPA CO <sub>2</sub> | -\$1,532                         | None                 | None                         |

5  
6 **Q For those scenarios where converting Sooner 1 and 2 and Muskogee 4 and 5**  
7 **to natural gas is lower cost than retrofitting those units, how long does it take**  
8 **for conversion to become cheaper?**

9 **A** As in my original comparison to the Scrub/Convert Plan, the Convert Plan is  
10 always cheaper than retrofitting all four units in the Synapse Base Gas/High CO<sub>2</sub>,  
11 the Company's CO<sub>2</sub>, Low Gas, Low Conversion and Low Load scenarios. This  
12 means that converting Sooner 1 and 2 and Muskogee 4 and 5 bears lower risk  
13 than retrofitting all four units in most scenarios.

14 **Q You say that retrofitting Sooner 1 and 2 and Muskogee 4 and 5 was lower**  
15 **cost in the Company's Base-case scenario. Is that scenario reasonable?**

16 **A** No. As I discussed at length in my direct testimony, the Company's base-case  
17 ignores any costs associated with emitting carbon dioxide—implicitly valuing  
18 carbon emissions at a zero dollar cost. This assumption is unreasonable over the  
19 30-year valuation period presented by the Company.

20 The Company's CO<sub>2</sub> price scenario is a reasonable carbon price forecast as a  
21 base-case, not as a sensitivity. The failure to include a carbon price in the base-  
22 case leads to overvaluation of continued operation of the coal-fired units. (In his

<sup>13</sup> Id.

1 rebuttal testimony, my colleague, Dr. Fisher, addresses Mr. Norwood’s concerns  
2 that the Company’s carbon price forecast overstates this risk.)

3 **Q Did any of the Company’s scenarios adequately account for all future**  
4 **environmental risks?**

5 **A** No. As I explained in my direct testimony, the Company’s entire coal fleet faces  
6 significant future environmental compliance obligations due to a number of  
7 current and pending environmental regulations, as well as ongoing Clean Air Act  
8 New Source Review (“NSR”) litigation. These regulations include the recently-  
9 proposed National Ambient Air Quality Standard (“NAAQS”) for ozone, the  
10 reinstatement of the Cross State Air Pollution Rule (“CSAPR”), the final Cooling  
11 Water Intake Structures Rule (“316b”), the final Coal Combustion Residuals rule,  
12 the proposed Effluent Limitations Guidelines for Steam Electric Power  
13 Generators, and future “reasonable further progress” requirements during the  
14 second planning period of the Regional Haze Rule. As these rules are designed  
15 primarily to reduce pollution from coal-fired power plants, all of OG&E’s units  
16 that continue to burn coal face these risks.

17 **Q Did Mr. Norwood account for these risks in his analysis?**

18 **A** No. Mr. Norwood mentions “some concerns regarding future environmental cost  
19 exposure under the Scrub plan.”<sup>14</sup> However, he claims to be more concerned with  
20 fuel diversity.<sup>15</sup> When asked, Mr. Norwood agreed with the assertion that “OG&E  
21 has adequately accounted for future environmental compliance costs.”<sup>16</sup> Although  
22 Mr. Norwood suggests reconsidering the Scrub Plan, he recommends that the  
23 Scrub/Convert plan be adopted “in the event the Commission remains concerned  
24 that future environmental regulations are likely significant.”<sup>17</sup>

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<sup>14</sup> Responsive Testimony of Scott Norwood, p. 31, lines 19-22.

<sup>15</sup> *Id.*

<sup>16</sup> OIEC Response to Sierra Club’s Data Request 1-7(d), attached as Rebuttal Exhibit TFC-3.

<sup>17</sup> Responsive Testimony of Scott Norwood, p. 32, lines 3-5.

1 **Q Do you agree with his statement that the Scrub/Convert Plan is the**  
2 **appropriate way for the Commission to address its concerns about future**  
3 **environmental regulations?**

4 **A** Absolutely not. While the Scrub Plan would subject the Company to more risk the  
5 Scrub/Convert Plan (discussed below), the base case of the Scrub/Convert Plan  
6 assumes zero costs to comply with most future environmental regulations,  
7 including carbon dioxide costs. This fact, along with an analysis of the  
8 environmental compliance cost risk facing the Muskogee and Sooner units, means  
9 the Commission should put no weight on Mr. Norwood’s conclusory statement.

10 **Q What is the largest environmental compliance cost risk of retrofitting**  
11 **Muskogee 4 and 5 (in addition to Sooner 1 and 2)?**

12 As with Sooner 1 and 2, Muskogee 4 and 5 will also likely need significant  
13 reductions in emissions of nitrogen oxides, or NOx, in order to continue  
14 operating. NOx is best controlled using post-combustion controls such as  
15 selective catalytic reduction (“SCR”) technology. If the Company were to pursue  
16 the Scrub Plan and continue to burn coal at Muskogee 4 and 5, these units would  
17 likely also require SCRs in the near future in order to comply with a new ozone  
18 standard. This is because, as I pointed out in my direct testimony, there are a  
19 number of areas in Oklahoma that exceed the 2008 ozone standard of 75 ppb.  
20 While there is no ozone monitor in Muskogee County (where the Muskogee plant  
21 is located), Cherokee and Sequoyah counties, which border Muskogee County,  
22 are currently exceeding 70 ppb and would likely be designated as nonattainment  
23 areas even under the least stringent standard EPA has proposed. Further, if the  
24 Company does not prevail in the NSR litigation, it will likely have to install SCRs  
25 on all of its coal-fired units.

1 SCR's on Muskogee 4 and 5 would cost \$196 million per unit, according to the  
2 Company's estimates.<sup>18</sup> This is similar to the estimates for SCR's on Sooner 1 and  
3 2 referred to in my direct testimony.<sup>19</sup>

4 **Q Did you incorporate costs associated with SCR's at Muskogee 4 and 5 in your**  
5 **updated analysis?**

6 **A** Yes. Figure 4 and Table 2, below, present the effect of adding the original SCR  
7 installation costs from my direct testimony on Sooner 1 and 2, with the additional  
8 SCR costs at Muskogee 4 and 5 in 2020. Therefore, the NPVRR results are based  
9 on the likely event that additional NOx reductions will be required at these units. I  
10 incorporated the Company's previous estimates for Sooner and Muskogee SCR  
11 capital costs and annual fixed operations and maintenance ("O&M") into the  
12 Company's estimate of fixed costs. The results do not include the variable costs of  
13 SCR's or the changes to dispatch that could occur given this incremental variable  
14 cost.

15 **Q How do the net present value results change when incorporating the costs of**  
16 **SCR at Sooner 1 and 2 and Muskogee 4 and 5?**

17 **A** When SCR costs are added to Muskogee and Sooner, the cost of the Scrub Plan  
18 increases by an additional \$915 million in every scenario compared to the Convert  
19 Plan.<sup>20</sup> The results in Figure 4 and

20 **A**

21 **A** Table 2 show that, when SCR costs are added, the Scrub Plan is more costly than  
22 Convert in every price scenario except for the High Gas scenario. The net cost of  
23 the Scrub Plan becomes over \$854 million in the Company's base-case scenario

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<sup>18</sup> OG&E Response to AG Data Request1-5, OG&E Muskogee BART Determination (implied cost of SCR inflated from 2008 to 2014 dollars).

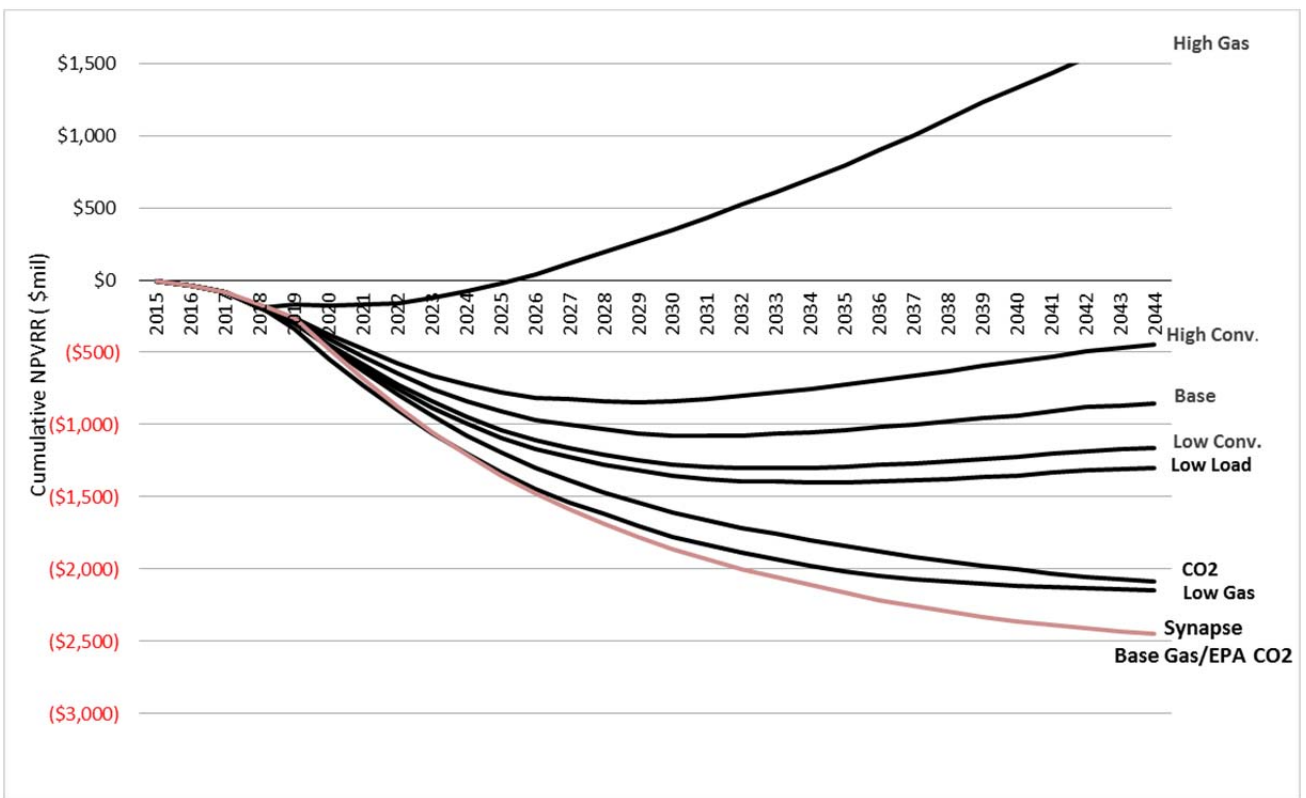
<sup>19</sup> SCR costs for Sooner are also referenced in the Direct Testimony of Robert Burch, p. 7, Table 1. The implied cost of SCR from the table (\$178 million per unit) was adjusted for inflation from 2008 dollars.

<sup>20</sup> Synapse also ran the Company's CO<sub>2</sub> scenario with the addition of SCR variable operating costs. However, the results showed a minimal change in NPVRR based on variable costs alone (approximately \$20 million or less than 0.1% of NPVRR difference). Therefore, in the interest of time, we did not run the increased variable costs due to the SCR in the results presented in Figure 4.



1 (compared to a net benefit of \$61 million without the SCR), over \$2 billion under  
 2 the Company's CO<sub>2</sub> sensitivity, and \$2.4 billion in the Synapse EPA CO<sub>2</sub>  
 3 scenario.

4 Recall that the Company's original base-case scenario analysis found that the  
 5 Scrub Plan without an SCR did not breakeven with the Convert Plan until 2042.  
 6 When SCRs are added at Sooner 1 and 2 and Muskogee 4 and 5, the Scrub Plan  
 7 *never* breaks even, except in the High Gas sensitivity – a sensitivity which, as  
 8 discussed above, has limited value.



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 10 **Figure 4: Cumulative Net Benefit (Cost) of Scrub Plan with SCR Costs Added,**  
 11 **Compared to Convert Plan) (NPVRR, \$2014 mil)<sup>21</sup>**  
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<sup>21</sup> OG&E Response to OIEC Data Request 3-12\_Att86. SCR costs are from Direct Testimony of Robert Burch, p. 7, Table 1.

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**Table 2: Cumulative Net Benefit (Cost) of Scrub Plan with SCR, Compared to Convert Plan<sup>22</sup>**

| Scenario                                 | NPVRR without SCR (\$2014, mil) |                      | NPVRR with SCR (\$2014, mil) |                      |
|--|---------------------------------|----------------------|------------------------------|----------------------|
|  | Benefit of Scrub                | Scrub Breakeven Year | Benefit of Scrub             | Scrub Breakeven Year |
| Base                                     | \$61                            | 2042                 | -\$854                       | None                 |
| CO <sub>2</sub>                          | -\$1,170                        | None                 | -\$2,084                     | None                 |
| High Conversion                          | \$465                           | 2033                 | -\$450                       | None                 |
| Low Conversion                           | -\$247                          | None                 | -\$1,162                     | None                 |
| High Gas                                 | \$2,560                         | 2021                 | \$1,645                      | 2026                 |
| Low Gas                                  | -\$1,229                        | None                 | -\$2,144                     | None                 |
| Low Load                                 | -\$382                          | None                 | -\$1,297                     | None                 |
| Synapse Base Gas/<br>EPA CO <sub>2</sub> | -\$1,532                        | None                 | -\$2,447                     | None                 |

10 **Q Did the Company adequately assess future regulatory risks involved in the**  
11 **Scrub portfolio?**

12 **A** No. As I discussed previously, the Company only included a carbon cost as a  
13 sensitivity and excludes most future environmental compliance costs entirely.  
14 These are gross omissions of future risk in the Company’s analysis. Moreover,  
15 even under the Company’s base-case scenario—where no carbon costs or other  
16 future environmental compliance costs are considered—choosing to retrofit  
17 Sooner and Muskogee does not become economic until 2042. The retrofit of  
18 Sooner 1 and 2 alone did not break even in the Company’s overly optimistic base-  
19 case scenario until 2038. In both cases, this is too long for ratepayers to wait for  
20 returns to materialize and, given the many risks that the Company has not  
21 accounted for, it is likely that the benefits of retrofit will never materialize.

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<sup>22</sup> Id.

1 **III. RESOURCE DIVERSITY IS IMPORTANT BUT DOES NOT JUSTIFY**  
2 **SELECTION OF THE SCRUB/CONVERT OR SCRUB PLAN**

3 **Q How does Staff Witness Roach characterize the Company’s choice of the**  
4 **Scrub/Convert Plan?**

5 **A** Mr. Roach mentions many deficiencies in the Company’s analysis, including  
6 failure to account for future environmental compliance costs. However, citing  
7 concern for “resource diversity,” he nevertheless advocates for approval of the  
8 Scrub/Convert Plan, with conditions.<sup>23</sup>

9 **Q Does Mr. Norwood use fuel diversity in order to justify his recommendation**  
10 **that the Company reconsider the Scrub Plan?**

11 **A** Yes. Mr. Norwood claims that the impact on fuel diversity “should be carefully  
12 considered by the Commission.”<sup>24</sup> He also states that both the Scrub and  
13 Scrub/Convert Plans “would produce additional fuel diversity and operational  
14 flexibility” in order to “better respond to future market changes.”<sup>25</sup>

15 **Q Is resource diversity enough to justify selection of either the Scrub or**  
16 **Scrub/Convert Plans?**

17 **A** No. While I agree that the Convert Plan adds more natural gas capacity and  
18 removes coal capacity, the Company is still procuring all of its energy to serve  
19 ratepayers from the SPP integrated marketplace while selling all of its generation  
20 onto that same marketplace. Effectively, this means that the Company’s  
21 generating assets act as a hedge against the SPP energy market.

22 While I agree with Mr. Roach and Mr. Norwood that fuel diversity is generally a  
23 consideration, further investments in coal generation would not serve as an  
24 effective hedge against the market given that, as I have shown, required retrofits  
25 in coal do not break even for more than two decades even under the Company’s  
26 overly optimistic base-case. When accounting for future environmental cost risks,  
27 coal investments never break even in the 30-year period.

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<sup>23</sup> See Responsive Testimony of Craig Roach, p. 11, lines 2-18.

<sup>24</sup> Responsive Testimony of Scott Norwood, p. 23, lines 13-14.

<sup>25</sup> Responsive Testimony of Scott Norwood, p. 30, lines 10-11.

1 **Q Has fuel diversity been quantified sufficiently in this case?**

2 **A** No. If fuel diversity is to be used as a key argument for selection of a portfolio, it  
3 should be explored and quantified. Modeling fuel diversity could be done by  
4 running a stochastic analysis (sometimes referred to as “Monte Carlo simulation”)  
5 that would allow for multiple variables to fluctuate based on ranges of values and  
6 probabilities of those values occurring. This type of analysis runs many  
7 simulations (or “futures”) incorporating key risks such as (but not limited to)  
8 natural gas prices, coal prices, carbon prices, and market prices. The result can  
9 provide average NPVRR costs, as well as low and high-tailed risks based on the  
10 many simulations modeled. Fuel diversity could be indicated by a wide  
11 distribution of results from this modeling.

12 For instance, a low-diversity portfolio may offer the lowest cost average NPVRR  
13 result but have a large enough high-tailed risk that it may be too risky an option to  
14 pursue due to lack of diversity. Mr. Norwood implies that Scrub/Convert Plan is  
15 risky from a fuel diversity perspective. However, neither the Company nor Mr.  
16 Norwood has conducted an analysis to quantify this diversity. Mr. Norwood’s  
17 conclusions are based on the Company’s modeling of select, individual  
18 sensitivities such as natural gas price and carbon price in isolation. The Company  
19 has not accounted for coal price risk or most future regulatory risks (as I have  
20 discussed). Without a more rigorous analysis that properly accounts for all key  
21 risk factors, fuel diversity cannot be properly quantified or used as sufficient  
22 justification for any of the Company’s compliance plans.

23 **Q Do you agree with Mr. Norwood that wind energy would be a “low-cost**  
24 **hedge” against energy market prices?<sup>26</sup>**

25 **A** Yes. I agree with Mr. Norwood’s statement that:

26 In fact, due to the very low level of current wind energy prices and the  
27 threat of new carbon regulations, the Company should immediately move  
28 forward to evaluate the acquisition of additional wind energy resources

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<sup>26</sup> Responsive Testimony of Scott Norwood, p. 22, line 22.

1           regardless of the environmental compliance plan which is ultimately  
2           selected.<sup>27</sup>

3           As I discussed in my direct testimony, wind is also not subject to fuel price  
4           volatility, nor is it subject to high environmental compliance cost risk. For these  
5           reasons, significant additions of wind should be considered by the Company.

6   **Q     Would additional demand-side management (“DSM”) also insulate the**  
7   **Company and its ratepayers from fuel price and environmental cost risks?**

8   **A**Yes. In my direct testimony, I outlined reasons that the Company has not  
9           sufficiently modeled further investments in DSM. DSM would provide further  
10          insulation from fuel prices and environmental costs by reducing the demand for  
11          fossil-generation on OG&E’s system.

12 **IV.   FINDINGS AND RECOMMENDATIONS**

13 **Q     What are your findings?**

14 **A**My conclusions have not changed from those stated in my direct testimony. The  
15          Company has not provided sufficient justification for the retrofit of Sooner units 1  
16          and 2. I also find that, based on the Company’s own NPVRR analysis and when  
17          other environmental compliance risks are considered, the additional retrofits of  
18          Muskogee units 4 and 5 would not be prudent.

19 **Q     What is your recommendation to the Commission?**

20 **A**I continue to recommend that the Commission deny the Company’s application  
21          for approval to retrofit Sooner units 1 and 2, given the inherent risks I discussed in  
22          my direct testimony. I disagree with OIEC that the Scrub Plan should be  
23          reconsidered, given that it likely carries even higher risks and costs than the  
24          Scrub/Convert Plan. I also recommend that the Commission ignore Mr.  
25          Norwood’s presentation of the summation of nominal dollars over a 30-year  
26          period in comparing the Company’s compliance plans.

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<sup>27</sup> Responsive Testimony of Scott Norwood, p. 23, lines 2-5.

1 Q **Does this conclude your testimony?**

2 A It does.

**BEFORE THE CORPORATION COMMISSION OF OKLAHOMA**

|                                       |   |                         |
|---------------------------------------|---|-------------------------|
| IN THE MATTER OF THE APPLICATION OF   | ) |                         |
| OKLAHOMA GAS AND ELECTRIC COMPANY     | ) |                         |
| FOR COMMISSION AUTHORIZATION OF A     | ) |                         |
| PLAN TO COMPLY WITH THE FEDERAL CLEAN | ) | CAUSE NO. PUD 201400229 |
| AIR ACT AND COST RECOVERY; AND FOR    | ) |                         |
| APPROVAL OF THE MUSTANG MODERNIZATION | ) |                         |
| AND COST RECOVERY                     | ) |                         |

**OKLAHOMA INDUSTRIAL ENERGY CONSUMERS'  
RESPONSE TO SIERRA CLUB'S  
FIRST SET OF DATA REQUESTS AND INTERROGATORIES**

- 1.1. Refer to Responsive Testimony of Scott Norwood, Tables 6, 7, 8, and 9.
- a. Is Mr. Norwood aware of any general accounting principle or textbook that recommends reporting the summation of nominal dollars that occur in different years?
    - i. If so, please provide such a citation.
    - ii. If not, please explain why Mr. Norwood provided these summations.

**OIEC's Response:**

- a. No.
  - i. Not applicable.
  - ii. The nominal amounts provided represent costs that ratepayers would actually pay over time for electricity under the forecasted compliance scenarios. Electricity prices are not generally billed on a present value basis.

**Response Prepared by:** Scott Norwood

Date: 1/14/15

By responding to these Data Requests, OIEC is not indicating that the provided information is relevant or material and OIEC is not waiving any objection as to relevance or materiality or confidentiality of the information or documents provided or the admissibility of such information or documents in this or in any other proceeding.

Rebuttal Exhibit TFC-2

CAUSE NO. PUD 201400229

Data Request

OIEC 1-25\_Att1

Base Forecast is used unless otherwise specified

|                        | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   | 2022   | 2023   | 2024   | 2025   | 2026   | 2027   | 2028   | 2029   | 2030   | 2031   |
|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>Coal (\$/MMBTU)</b> | \$2.14 | \$2.18 | \$2.24 | \$2.33 | \$2.41 | \$2.49 | \$2.57 | \$2.66 | \$2.76 | \$2.85 | \$2.95 | \$3.05 | \$3.15 | \$3.25 | \$3.35 | \$3.47 | \$3.58 |
| <b>NG (\$/MMBTU)</b>   | \$4.23 | \$4.38 | \$4.74 | \$5.26 | \$5.42 | \$5.33 | \$5.58 | \$5.66 | \$5.84 | \$6.17 | \$6.45 | \$6.71 | \$6.99 | \$7.28 | \$7.66 | \$8.09 | \$8.43 |

Prices are from EIA's Annual Energy Outlook 2014

The source file is located:

<http://www.eia.gov/oiarf/aef/tablebrowser/#release=AEO2014&subject=0-AEO2014&table=62-AEO2014>

Near bottom of chart under Fuel Prices (nominal dollars per million Btu)

For High Gas Sensitivity 1.5

|                      | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   | 2022   | 2023   | 2024   | 2025   | 2026    | 2027    | 2028    | 2029    | 2030    | 2031    |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| <b>NG (\$/MMBTU)</b> | \$6.35 | \$6.57 | \$7.12 | \$7.88 | \$8.13 | \$7.99 | \$8.36 | \$8.48 | \$8.77 | \$9.26 | \$9.67 | \$10.07 | \$10.49 | \$10.92 | \$11.49 | \$12.13 | \$12.65 |

For Low Gas Sensitivity 0.75

|                      | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   | 2022   | 2023   | 2024   | 2025   | 2026   | 2027   | 2028   | 2029   | 2030   | 2031   |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>NG (\$/MMBTU)</b> | \$3.17 | \$3.29 | \$3.56 | \$3.94 | \$4.07 | \$4.00 | \$4.18 | \$4.24 | \$4.38 | \$4.63 | \$4.84 | \$5.04 | \$5.25 | \$5.46 | \$5.75 | \$6.07 | \$6.33 |



Rebuttal Exhibit TFC-2

CAUSE NO. PUD 201

Data Request

OIEC 1-25\_Att1

Base Forecast is used unl

|                        | 2032   | 2033   | 2034   | 2035    | 2036    | 2037    | 2038    | 2039    | 2040    | 2041    | 2042    | 2043    | 2044    |
|------------------------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Coal (\$/MMBTU)</b> | \$3.69 | \$3.81 | \$3.92 | \$4.05  | \$4.18  | \$4.31  | \$4.45  | \$4.60  | \$4.75  | \$4.90  | \$5.06  | \$5.22  | \$5.38  |
| <b>NG (\$/MMBTU)</b>   | \$8.86 | \$9.35 | \$9.79 | \$10.34 | \$10.95 | \$11.30 | \$11.56 | \$12.01 | \$12.65 | \$13.32 | \$14.04 | \$14.78 | \$15.57 |

[&region=3-18&cases=ref2014-d102413a](#)

For High Gas Sensitivity

|                      | 2032    | 2033    | 2034    | 2035    | 2036    | 2037    | 2038    | 2039    | 2040    | 2041    | 2042    | 2043    | 2044    |
|----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>NG (\$/MMBTU)</b> | \$13.29 | \$14.02 | \$14.69 | \$15.51 | \$16.42 | \$16.95 | \$17.34 | \$18.02 | \$18.97 | \$19.99 | \$21.05 | \$22.18 | \$23.36 |

For Low Gas Sensitivity

|                      | 2032   | 2033   | 2034   | 2035   | 2036   | 2037   | 2038   | 2039   | 2040   | 2041   | 2042    | 2043    | 2044    |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|
| <b>NG (\$/MMBTU)</b> | \$6.65 | \$7.01 | \$7.35 | \$7.76 | \$8.21 | \$8.47 | \$8.67 | \$9.01 | \$9.49 | \$9.99 | \$10.53 | \$11.09 | \$11.68 |

1.7 Refer to Responsive Testimony of Scott Norwood, page 31, lines 19-20.

- a. Please explain Mr. Norwood's "concerns regarding future environmental cost exposure under the Scrub plan," including supporting analyses and documentation for these concerns.
- b. Please describe Mr. Norwood's understanding of potential environmental compliance costs to which OG&E could be exposed under the Scrub plan.
- c. Please describe Mr. Norwood's understanding of environmental regulations that OG&E could be subject to under the Scrub plan.
- d. Does Mr. Norwood assert that OG&E has adequately accounted for future environmental compliance costs that would be incurred at Sooner 1&2 and Muskogee 4&5?
  - i. If so, please provide the supporting analyses and documentation for this assertion.
  - ii. If not, please explain what future costs should have been incorporated in OG&E's analysis.

**OIEC's Response:**

- a. The referenced testimony simply reflects the fact that future EPA regulations could increase the cost of coal-fired power plant operations beyond the levels presently assumed and thereby diminish the significant advantages of OG&E's existing coal-fired generating units as low-cost and relatively stable energy resources.
- b. OG&E could potentially be exposed to more stringent than currently proposed carbon regulations, as well as proposed and future increased regulation of other emissions such as SO<sub>2</sub>, NO<sub>x</sub>, mercury and particulates, as well as increased regulation of coal combustion residuals and cooling water intake systems.
- c. OG&E's proposed environmental compliance plan is intended to address requirements of the EPA's Regional Haze Rule ("RHR") and Mercury and Air Toxics Standards ("MATS") Rule. The Company could also be subject to increased regulation of NO<sub>x</sub> emissions under the Cross State Air Pollution Rule; increased regulation of SO<sub>2</sub> and NO<sub>2</sub> under the National Ambient Air Quality Standards ("NAAQS") for Ozone; increased regulation under the Coal Combustion Residuals rule ("CCR"); increased regulation of carbon emissions under EPA's proposed regulations for carbon emissions from existing generating units (111.d); increased regulation of cooling water intake structures under Section 316(b) of the Clean Water Act; and increased regulation of emissions related to Sierra Club's claims of New Source Review ("NSR") violations. See Section II.C. Of the Company's 2014 IRP and the direct testimony of OG&E witness Turner for further discussion of environmental regulations that OG&E could be subject to under the Scrub plan.
- d. Yes.
  - i. See the discussion of environmental risks presented in direct testimonies of OG&E witnesses Turner and Howell in this proceeding and Section II.C of OG&E's 2014 IRP report.

ii. Not applicable.

Response Prepared by: Scott Norwood

Date: 1/15/15

By responding to these Data Requests, OIEC is not indicating that the provided information is relevant or material and OIEC is not waiving any objection as to relevance or materiality or confidentiality of the information or documents provided or the admissibility of such information or documents in this or in any other proceeding.