Issue Brief:
The Role of Fuel Costs in Duke Energy's North Carolina's Retail Rates From 2017 Through March 2024

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Synopsis
This Issue Brief illustrates the increasing role that fuel costs, principally natural gas costs, have played in electric rate increases on residential customers in the North Carolina service territories of Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) during recent years (2017-Q1 2024). In reference to "fuel costs", we use this term to refer to all fuel costs inclusive of the base fuel component of rates and the fuel-related adjustments.[1] The so-called "base" fuel costs are fixed as a component of rates in utility's general rate cases, while fuel rate adjustments are established in annual regulatory proceedings to both: (i) update projected fuel rates based on new price forecasts, and (ii) true-up fuel revenues collected and actual fuel costs incurred over the prior annual period.[2]

The analysis we have conducted demonstrates the following:

1. Fuel costs as a percentage of a typical residential customer's average monthly bill have increased considerably starting in 2023, in particular in DEC's service territory. A similar dynamic is visible in DEP's service territory, but is less prominent because fuel rates were also relatively higher during 2019 and 2020 and natural gas as a percentage of total generation has remained effectively flat (and historically higher on average than in DEC's territory).
2. Increases in fuel costs account for roughly 68% of the increase in the residential retail volumetric rate from 2017 to Q1 2024 in DEC territory, and roughly 46% in DEP territory. In other words, in the case of DEC, the amount of the total difference in rates between 2017 and Q1 2024 attributable to fuel costs is more than double the amount from all other rate components.
3. Not surprisingly, the recent increase in fuel costs as a percentage of the total average residential rate is correlated with periods of high natural gas prices, accentuated in the case of DEC by an increase in the percentage of total generation provided by natural gas units over recent years. The reverse is of course also true, as periods of lower natural gas

[1] The respective DEC and DEP retail tariffs use different terminologies to reflect fuel-related adjustments, but function in the same manner. We also note that our assessment of fuel-related costs includes certain temporary riders that existed as different points in the past in the Duke Energy utilities' respective tariffs (e.g., Coal Inventory, a discrete and separate fuel cost true-up that was in place for 1 year in DEP's tariff). None of these riders have a material effect on the results of the analysis given their short durations and small magnitudes.
[2] DEC's fuel cost adjustment cycle has a September – August cadence using a calendar year revenue vs. cost test period. This means that the fuel adjustment rate change that took effect September 1, 2023 and is slated to run through August 31, 2024 was based on a revenue and cost true-up for calendar year 2022. For DEP, the rate year cycle runs from December – November and the most recent test period ran from April 2022 – March 2023. Deviations from this cycle occur when base rates are reset.

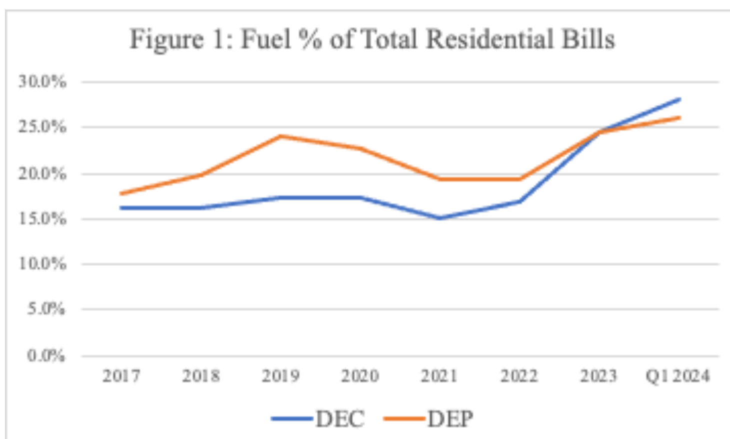
prices coincide with a relatively lower percentage of total residential electricity costs associated with fuel costs, with differences over time accentuated by concurrent changes in natural gas as a percentage of the generation mix (i.e., producing a nadir in this metric for DEC in 2021).

4. The timing and mechanics of the fuel-related cost adjustment mechanism predictably causes changes in retail rates to lag behind changes in actual fuel costs, so customers are not immediately aware of the ultimate costs of their energy use.

Our analysis indicates that a shift towards greater amounts of natural gas generation has predictably meaningful effects on the overall rates paid by electric utility customers, exposing them to greater rate volatility driven by volatility in natural gas prices.[3] This conclusion is illustrated by the relatively smaller differences over time in how fuel costs have affected DEP's overall residential rates compared to DEC's rates over time, accompanied by the fact that the percentage of natural gas generation in DEP territory has been relatively constant whereas the penetration of natural gas generation in DEC's territory has considerably increased over the same time period. To be clear, this is not a conclusion or prediction that natural gas generation is, on average and considering all other factors, a more (or less) expensive option than alternatives. Rather, it points to the uncertainties involved, as natural gas prices have a history of volatility and reliance on natural gas generation requires accepting periods of high prices along with periods of low prices.

Analysis and Discussion

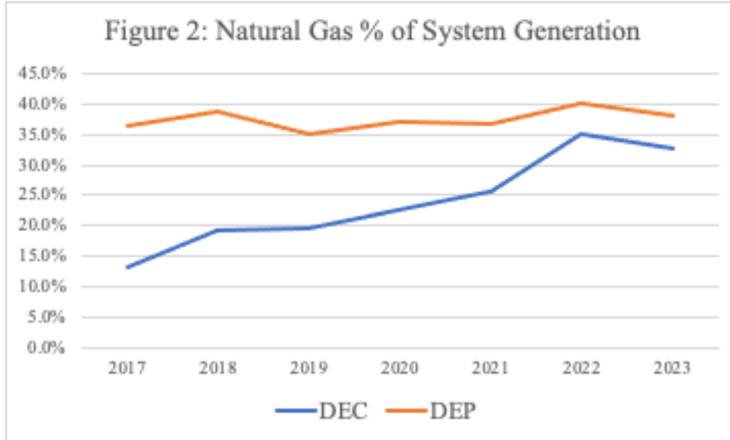
Figure 1 below shows changes over time in the percentage of a typical residential customer's total bill associated with fuel costs, comparing this metric for DEP and DEC customers. As illustrated in Figure 1, fuel costs have historically accounted for a lesser percentage of residential customer bills in DEC territory relative to DEP territory, but within the last several years this difference has been considerably reduced, to the point where the relative positions of the two utilities have switched based on Q1 2024 effective retail rates.

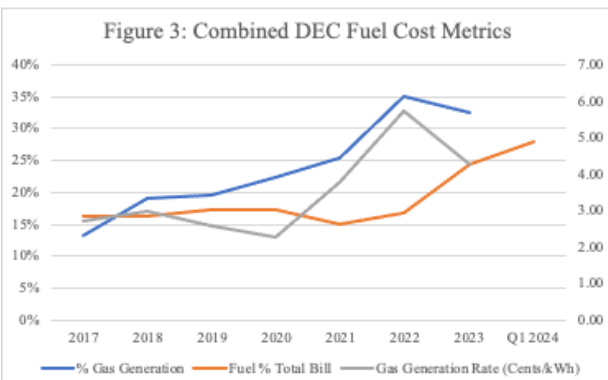


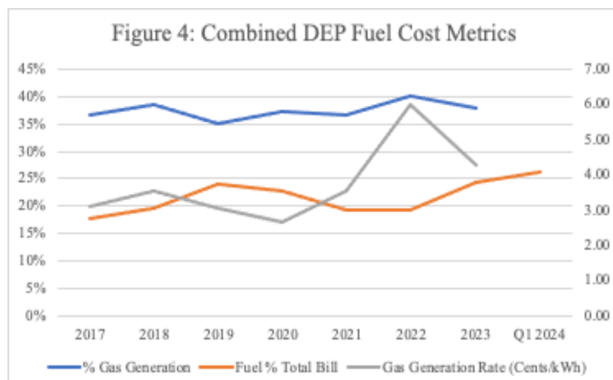
The changes in this historic difference coincide with natural gas generation becoming an increasing portion of the DEC generation mix over this time frame while it has remained relatively flat in DEP territory, accompanied by fluctuations in natural gas prices. Figure 2 provides a comparison between DEC and DEP of natural gas generation as a component of the system generation mix from 2017-2023. The period between 2017 and 2022 largely erases the difference between the two utilities. The primary reason for the change in

[3] Our analysis focuses on residential retail rates for the sake of simplicity, but the results would be the same in terms of general trends for other rate classes.

DEC's generation portfolio is dual-fueling of coal generation with varying amounts of natural gas.[4] Figure 3 and Figure 4 show these two metrics collectively for DEC (Figure 3) and DEP (Figure 4) alongside the aggregate rate associated with natural gas generation in cents/kWh. The inclusion of the aggregate natural gas generation rate, which fluctuates according to natural gas prices, shows both: (i) the sensitivity of the fuel charge bill component to natural gas price volatility, and (ii) the lag between changes in natural gas prices – which drive the aggregate natural gas generation rate – and corresponding adjustments to retail rates as reflected in the fuel rate percentage of total bill metric. As illustrated in Figures 3 and 4, the change in the fuel rate percentage metric (the orange line) is far more pronounced for DEC than DEP even though – not surprisingly – changes in actual real-time natural gas generation rate (the gray line) show the same pattern over time (i.e., decline from 2018 – 2020, followed by a moderate increase in 2021 and peak in 2022.







The difference in timing of changes in actual fuel costs compared to their reflection in customer rates is also visible in Figures 3 and 4 in the relationship between the fuel rate percentage and natural gas generation rate. The natural gas generation rate is calculated based on Duke's monthly natural gas costs and natural gas generation amounts, whereas the fuel rate percentage is a measure of how those costs are reflected in retail rates.[5] Due to the annual fuel rate adjustment cycle, there tends to be a 1-2 year lag in customer rates relative to actual fuel costs, although using calendar year averages tends to smooth out some of the timing difference. For instance, the lowest natural gas generation rates in 2020 show up in 2021-2022 low points of the fuel rate

[4] Generation from natural gas combined cycle and combustion turbine units has remained flat with minor fluctuations from year-to-year, whereas natural gas steam generation increased dramatically from near zero in 2017 to a high of 13.5 million MWh in 2022 (roughly equivalent to generation from combined cycle units).

[5] This comparison uses the fuel rate percentage, but the pattern would look effectively the same if Figures 3 and 4 used the retail fuel rate.

percentage, and the 2022 peak year for average annual natural gas prices (since 2017) does not begin to show up until 2023.

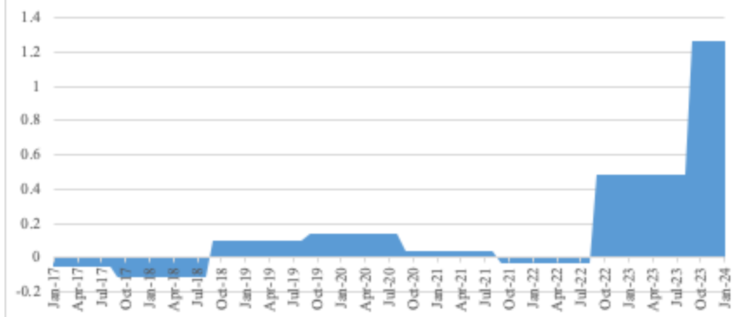


Figure 5: DEC Residential Historic Fuel Cost True-Up Adjustment (Cents/kWh)

The persistence of higher retail fuel rates into 2024 reflects the lingering effects of high 2022 natural gas prices as the retail fuel rates for both Duke utilities still reflect incremental true-up amounts associated with the large deficit between 2022 retail fuel rates and actual 2022 fuel costs. Figure 5 illustrates this timing lag in a different way, showing the amount of DEC's total residential fuel rate that is associated with the recovery of past undercharges for fuel costs (i.e., during 2022).[6] The present amount of this true-up adjustment for DEC is roughly 32.5% of the total current fuel rate (roughly 1.27 cents/kWh out of a total fuel rate of 3.90 cents/kWh).

Finally, another frame from which to view the contribution of fuel costs to customer rates is to directly evaluate how the total volumetric ($/kWh) rate and total fuel rate has varied over time. In DEC's case, 68% of the total increase in the volumetric rate from 2017 (annual average) to March 2024 is attributable to the increase in the fuel rate.[7] While this measure does not represent a permanent condition – natural gas prices have moderated somewhat and the lingering consequences of the 2022 price spike will eventually disappear from rates – it illustrates just how significant the effects of natural gas price volatility can be. Furthermore, it is worth noting that: (i) there is no guarantee that the present price moderation will continue, and (ii) the 2022 natural gas price spike was not unprecedented, nor was it more extreme than other past episodes of volatility.

Methodology

For this Issue Brief, EQ Research conducted two types of rates research from January 2017 – March 2024. as follows:

- Constructing a monthly rates history of all retail rate components of DEC's and DEP's respective rates, including fixed and non-fixed components and base rates and riders.
- Constructing a history of actual fuel costs by resource type and generation mix over time.

The January 2017 start date was intended to ensure that the analysis captured a duration sufficiently long to illustrate mid- to long-term rate trends, including a reasonable amount of time before and after the period during which the COVID-19 pandemic could have had a

[6] This is referred to as the Experience Modification Factor (EMF), reflecting a charge or a credit to true-up the difference between fuel rates charged to customers and actual fuel costs during a historic test period over a subsequent period. The most recent DEC test period was calendar year 2022 and the EMF rates reflected in Figure 5 will apply through December 31, 2024.

[7] For DEP the amount is 46%.

meaningful impact on rates. A secondary consideration was ensuring that the start date did not coincide too closely with the conclusion of utility rate cases given that the establishment of new base rates can introduce a "lumpy" character into overall rate trends over time. The specific rates and other values used in this analysis were sourced from publicly available tariff updates and fuel cost reports filed by DEP and DEC with the North Carolina Utilities Commission.

Elements of the analysis referring to fuel costs as a percentage of an average residential customer's total monthly bill are based on the following basic methodological parameters and assumptions:

- A hypothetical typical residential customer that uses 1,000 kWh per month on average.[8]
- Annual average retail rates were based on the simple average of 12 monthly rates using the rate in effect for the majority of a given month. This means that a rate change effective on the 10th day of a month is assumed to have been in effect for the entire month whereas a rate change on the 20th day of a month is assumed to take effect on the 1st day of the following month.
- In order to account for DEP's seasonal, tiered rate base rate structure, an annual average rate was calculated based on historical monthly use using the average percentages of total annual use in each tier during each month based on monthly average residential usage amounts from 2017 – 2023 for DEP residential customers.[9]

[8] The percentages would differ slightly if a different average usage assumption was used because fixed charges would account for a lesser or greater portion of a customer's totally monthly bill. Seasonality of usage could also play a role, but any seasonal variations are assumed to even out over time because the timing of rate changes themselves is not tethered to any specific seasonal characteristic.

[9] Data for this calculation was sourced from U.S. Energy Information Administration Form 861M, available at: https://www.eia.gov/electricity/data/eia861m/