



# 2023-2024 FY Energy Report

**July 2023 – June 2024**

**By Kim Melander, Senior Energy Services Manager**

**Date: August 2024**

## Energy Units of Measure and conversions:

**British thermal unit (Btu)** is a measure of the heat content of fuels or energy sources. One Btu is the quantity of heat required to raise the temperature of one pound of liquid water by 1° Fahrenheit (F) at the temperature that water has its greatest density (approximately 39° F). One British thermal unit (Btu) is approximately equal to the energy released by burning a match. Source: <https://www.eia.gov/>

**Kilowatt (kW)** is a measure of how much power an electric appliance consumes — it's 1,000 watts to be exact. You can quickly convert watts (W) to kilowatts (kW) by dividing your wattage by 1,000:  $1,000 \text{ W} / 1,000 = 1 \text{ kW}$ . Source: <https://www.directenergy.ca/en/learn>

**Kilowatt-hour (kWh)** is a measure of the energy an appliance uses in kilowatts per hour. For example, if you clean your floors with a 1,000-watt vacuum cleaner for one hour, you consume 1 kWh of energy. Source: <https://www.directenergy.ca/en/learn>

**Therm** is the energy content of approximately 100 cubic feet of natural gas at standard temperature and pressure. It is a non-SI unit of heat energy equal to 100,000 BTU. Source: <https://en.wikipedia.org>

BTUh = BTU/hour  
1 kBTU = 1,000 BTU  
1 MMBTU = 1,000,000 BTU  
1 kWh = 3,412 BTU  
1 Ton of cooling = 12,000 BTUh

## RHSD Utility Providers:

### Electricity - City of Rock Hill

- Applied Tech. Center
- Belleview ES
- Castle Heights MS
- Central Child
- Central Office
- Cherry Park ES
- Dist. 3 Stadium
- Dutchman Creek MS
- Ebenezer ES
- Ebinport ES
- Facilities Services
- Finley Road ES
- Flex Learning Center
- India Hook ES
- Northside ES
- Northwestern HS
- Old Pointe ES
- Rawlinson Road ES
- Richmond Dr ES
- Safety/Security Bldg.
- Sullivan MS
- Sunset Park ES
- Sylvia Circle
- Saluda Trail MS
- South Point HS
- Transportation
- York Road ES

### Electricity - Duke Energy

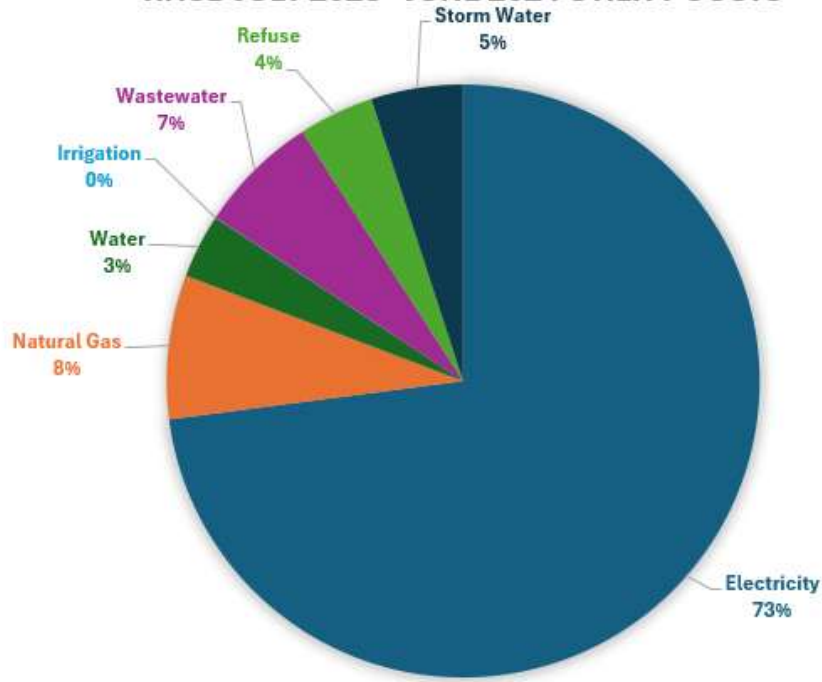
- Carroll School
- Independence ES
- Lesslie ES
- Rock Hill HS

### Electricity - York Electric Cooperative

- Mount Gallant ES
- Mount Holly ES
- Oakdale ES

- All Wastewater, Stormwater, Sewer, Water and Refuse utilities are provided by the **City of Rock Hill**.
- All Natural Gas utilities are provided by the **York County Natural Gas Authority**.

### RHSD JULY 2023 - JUNE 2024 UTILITY COSTS



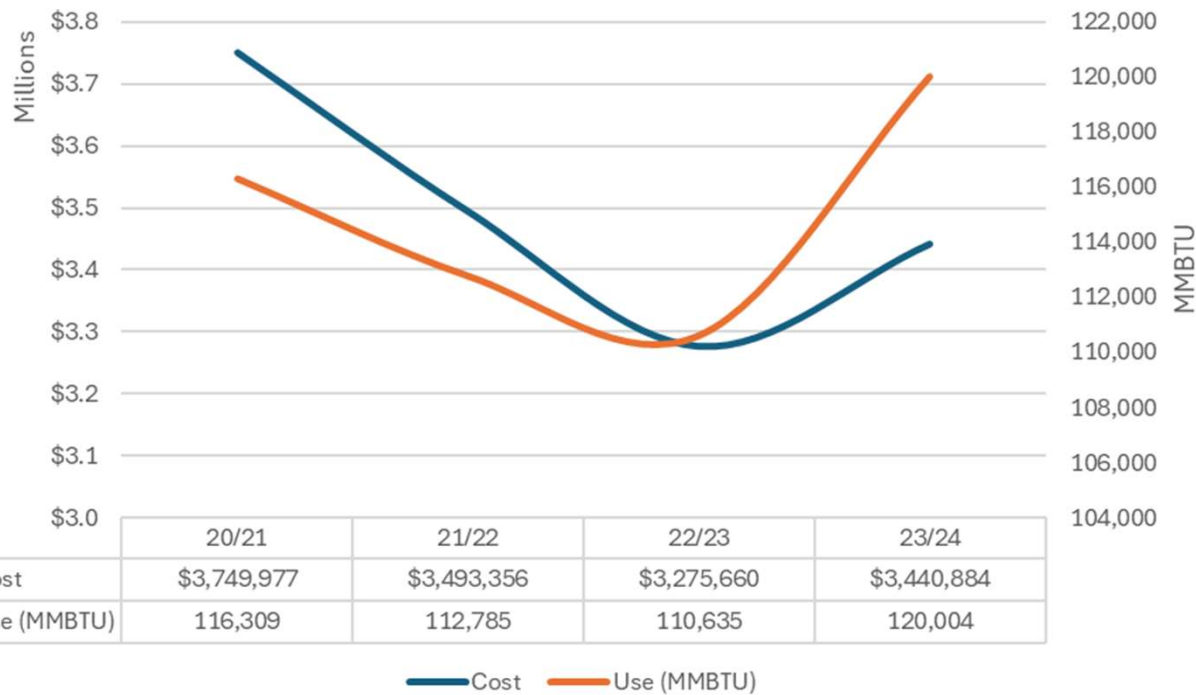
Electricity	Natural Gas	Water	Irrigation	Wastewater	Refuse	Storm Water	Total Cost
\$3,106,316	\$334,568	\$148,733	\$1,073	\$280,373	\$174,756	\$213,469	\$4,259,289

## Energy Budget Performance

	<b><i>EM 23-24 Budget</i></b>	<b><i>23-24 Actual</i></b>	<b><i>*EM 24-25 Budget</i></b>
Heating/Energy Costs	\$4,000,000	\$3,440,884	\$3,500,000
Public Utilities	\$778,000	\$643,649	\$450,000
Total	\$4,778,000	\$4,084,533	\$3,950,000

- \*EM 24/25 Public Utilities budget excludes sanitation and recycling costs.
- \$693k (14.5%) budget surplus 2023/2024.
- \$828k (17%) budget reduction for 2024/2025.

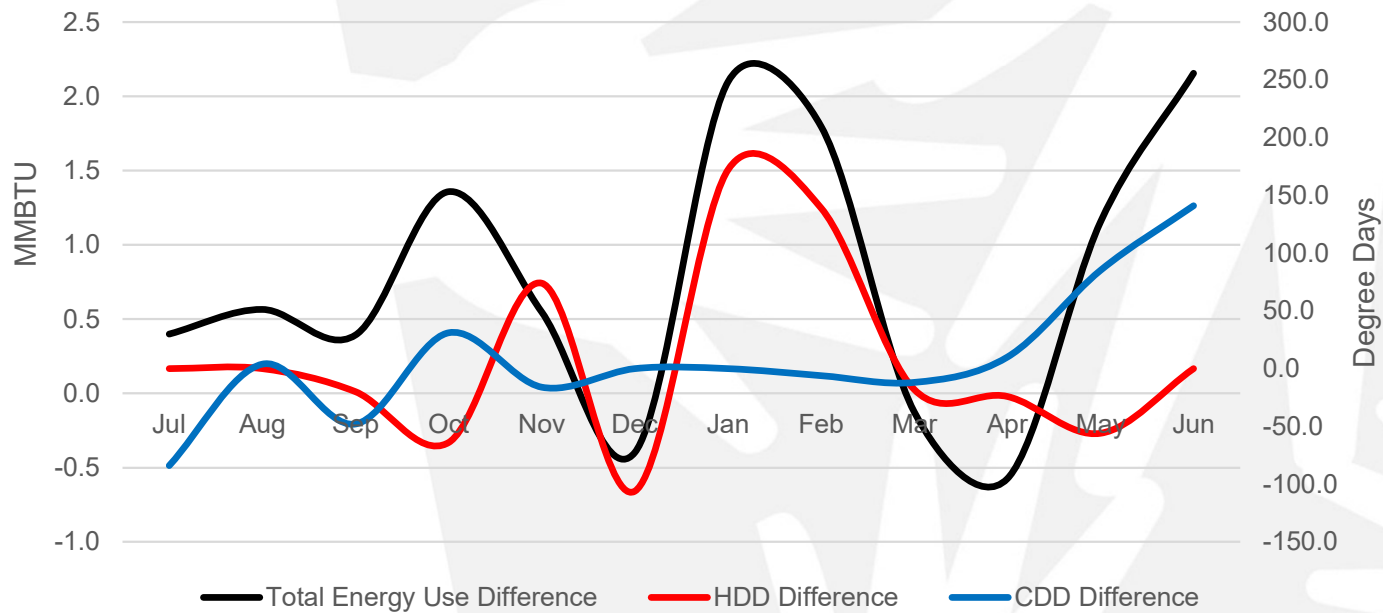
### RHSD Total Energy Use and Cost (July-June)



Total energy usage for the 23/24 year was 8.5% higher than the previous period. Total energy costs were 5% more.

Electricity usage increased 6% while Natural Gas usage increased 17%.

Monthly Difference of Total Energy Usage, HDD & CDD (23/24 value minus 22/23 value)

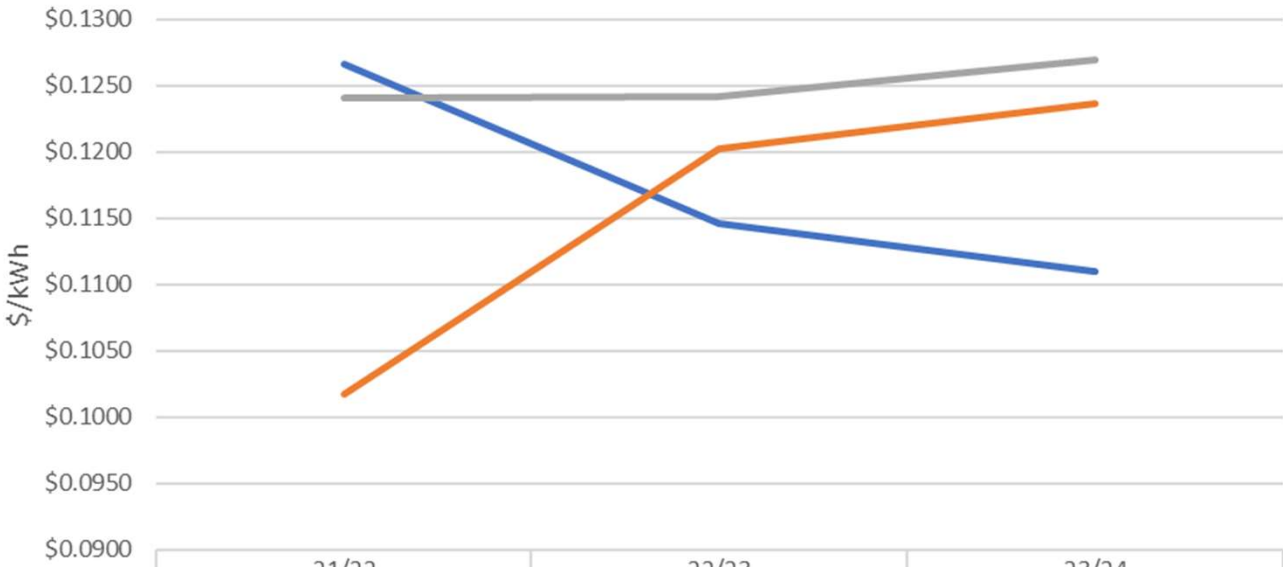


This chart shows the monthly “delta” values for Total Energy Usage, Heating Degree Days (HDD) and Cooling Degree Days (CDD).

Positive plot values indicate an increase and negative plot values indicate a decrease compared to the previous period.

The relationship between energy usage and weather is clearly shown.

RHSD Average Annual Electricity cost/kWh by utility provider  
(July-June)



	21/22	22/23	23/24
CORH	\$0.1266	\$0.1146	\$0.1110
Duke	\$0.1017	\$0.1202	\$0.1236
YEC	\$0.1241	\$0.1242	\$0.1269

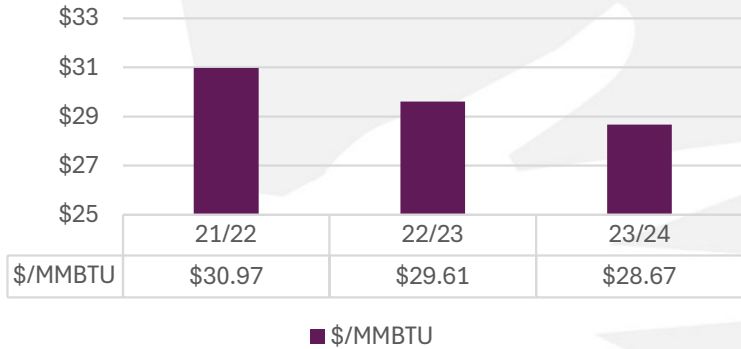
City of Rock Hill average electricity costs have decreased by 3.1% compared to last year. They are down 12.3% compared to 21/22.

Duke Energy average costs have increased by 2.8% compared to last year. They are up 21.5% compared to 21/22.

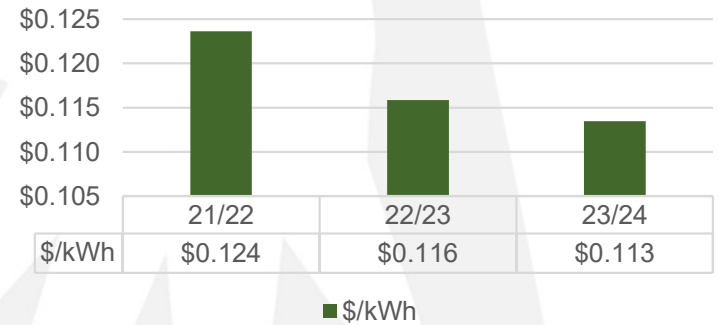
York Electric average costs have increased by 2.2% compared to last year.



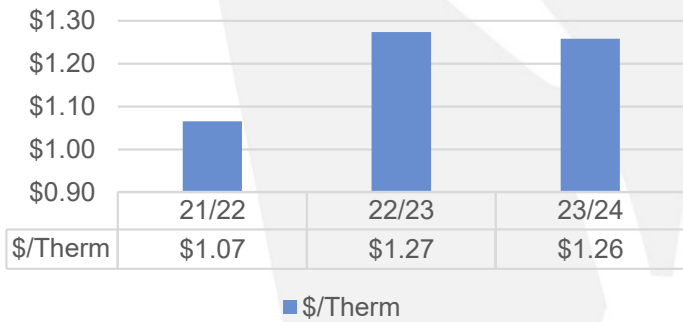
RHSD \$/MMBTU (total energy)



RHSD \$/kWh (electricity)



RHSD \$/Therm (natural gas)



Rock Hill Schools used 27,377,919 kWh of electricity and 265,901 Therm of Natural Gas for the 2023/2024 School Year.

## SC 2023 Annual Energy Report Data

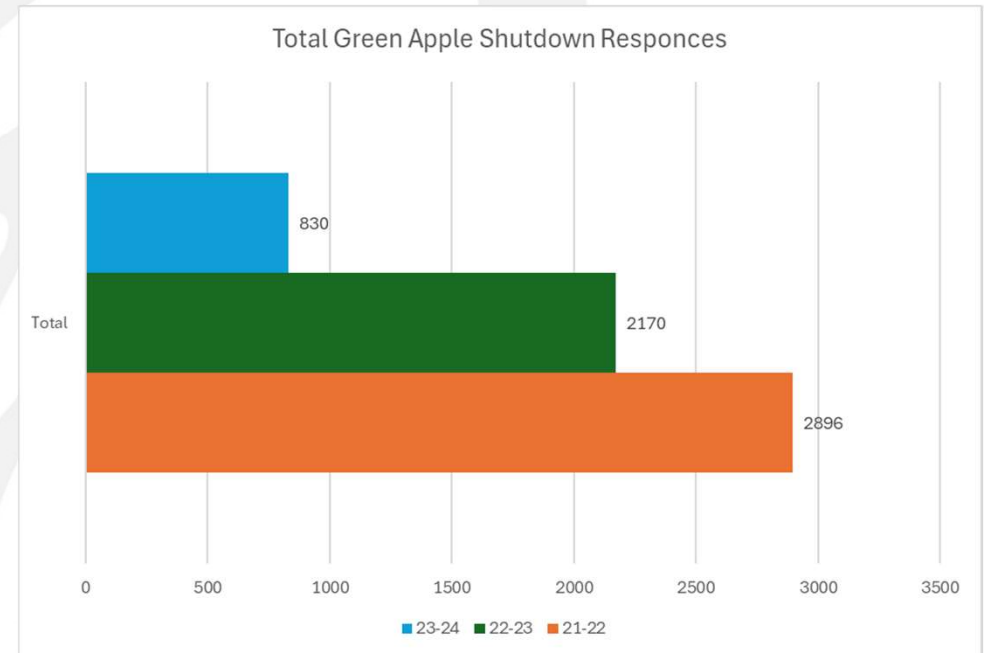
Public Entities by Type	Average Energy Use per Square Foot (site kBtu)			Average Energy Spending per Square Foot (\$)		
	FY 2000	FY 2023	% change	FY 2000 <sup>3</sup>	FY 2023	% change
State Agencies	113	74.92	-34%	\$2.31	\$1.97	-17%
Residential Colleges and Universities	143	112.60	-21%	\$2.25	\$2.22	-4%
Non-Residential Colleges and Universities	80	62.87	-21%	\$2.01	\$1.77	-14%
School Districts	45	34.18	-24%	\$1.46	\$1.15	-24%
<b>Overall</b>	<b>74</b>	<b>55.27</b>	<b>-25%</b>	<b>\$1.77</b>	<b>\$1.48</b>	<b>-19%</b>

*Note: These statistics are based on data submitted by public entities. The Energy Office makes no representation regarding the accuracy of the data it received.*

- 2023/2024 energy use per square foot increased by nearly 2% to 34.4 kBtu.
- Total energy cost per square foot increased by 1% to \$0.99

## Rock Hill Schools Green Apple Energy Conservation Program

- There are 141 prize winners selected for the 2023-2024 school year.
- 830 total responses.
- 17% of respondents are being awarded a prize.
- 62% decline in participation compared to 2022-2023.
- 71% decline in participation from 2021-2022.
- The decline in participation is likely the result of reduced electronic communications leading up to, and especially on the actual day of the shutdown.



## **EM HVAC Project Management & Project Engineering**

### **Saluda Trail MS - A, B & C Building HVAC replacement project:**

This area of the school has an elevated mechanical mezzanine which runs the length of the building over A, B and C areas. Each classroom was served by a single zone, split system heat pump with electric back-up heat. The equipment was more than 20 years old and beyond its useful service life. There were frequent failures and critical replacement parts were no longer available. The mezzanine was overly crowded with mechanical equipment and access was severely restricted creating a difficult and dangerous environment for maintenance staff. Project scheduling constraints were a major challenge. We utilized several unconventional and innovative strategies to successfully execute this project including system design, equipment pre-purchase and alternative procurement methods. The new units were selected to improve indoor air quality through more efficient air filtration.

- Installed summer 2023
- Floorspace = Approx. 68,200 square foot.
- Budget Estimate = \$5.75 million
- Project Cost = \$6.23 million
- Total refrigeration tonnage (TR) = 315
- Cost/square ft. = \$913
- Cost/TR = \$19,778
- A/E cost = 6% of total cost
- GC cost = 82% of total cost
- Pre-purchased equipment cost = 12%
- Funding source: ESSER3

## **EM HVAC Project Management & Project Engineering**

### **Leslie ES A-building and Gym HVAC replacement project:**

The existing packaged single zone systems in this area had exceeded 20 years in operation and were beyond their useful service life. They utilized R22 refrigerant, which has been phased out of production and is expensive to purchase. This refrigerant poses an environmental hazard because it contributes to the depletion of the earth's ozone layer and has a high global warming potential (GWP). Replacing this equipment increases energy efficiency, reduces operational and maintenance costs. It eliminates the hazard of releasing R22 into the atmosphere and increases operational reliability. The new units were selected to improve indoor air quality through more efficient air filtration.

- Installed winter 2023/spring 2024
- Project Area = Approximately 15,000 square foot.
- Budget Estimate = \$575k
- Project Cost = \$518k
- Total refrigeration tonnage (TR) = 64.5
- Cost/square ft. = \$34.50
- Cost/TR = \$8,031
- A/E cost = 8% of total cost
- MC cost = 92% of total cost
- Funding source: ESSER3

## **EM HVAC Project Management & Project Engineering**

### **Independence ES HVAC Chiller replacement project:**

The existing chiller and supporting infrastructure were approaching 20 years in service. The chiller utilized R22 refrigerant, which has been phased out of production and is very expensive to purchase. This refrigerant poses an environmental hazard because it contributes to the depletion of the earth's ozone layer and has a high global warming potential (GWP). Replacing the equipment increased energy efficiency, eliminated the hazard of releasing R22 into the atmosphere and increased operational reliability.

- Installed Summer 2022
- Budget Estimate = \$230k
- Project Cost = \$237k
- Total refrigeration tonnage (TR) = 190
- Cost/TR = \$1,247
- Chiller pre-purchase cost = \$139k
- A/E cost = 8% total cost
- MC cost = 33% total cost
- Funding source: ESSER3



# EM Building Control Systems Project Management & Project Engineering

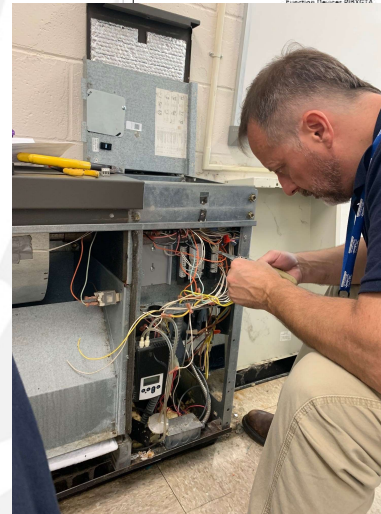
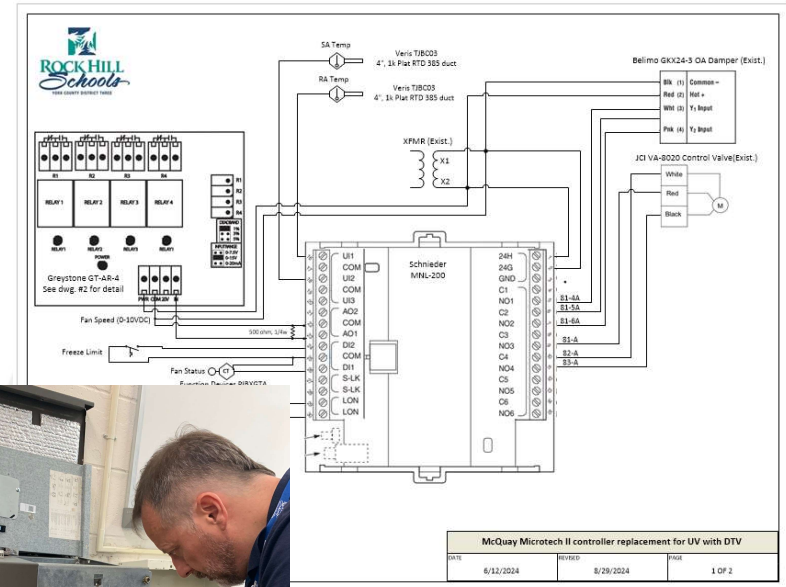
## McQuay Unit Ventilator Controls Replacement

Rock Hill HS, Northwestern HS and Rawlinson Road MS have roughly 150 of these units which are about 18 years old. The factory replacement controller + accessories will cost the district approximately \$4,000 each. Add \$1,300 each for McQuay install them. That's approximately \$5,300 per unit to replace a failed controller. There were 2 that needed to be repaired. We decided to engineer, program, install and commission them ourselves. Room A102 at RHS and Room C108 at NHS were completed July 31, 2024. We now have drawings and program files to complete future repairs that will save the district about \$4k for each unit.

- Installed Material Cost = \$600
- Installed (District) Labor = 8 hours
- Approximate Savings per Unit = \$4,100

Daikin Applied Americas, Inc. is pleased to offer the following Parts Quote for your consideration. Thank you for selecting Daikin Applied Service Group to care for your building's system. Our service personnel have the knowledge and experience to deliver the best support available. Daikin is pleased to offer this Quote for your consideration.

- Daikin Applied will provide the following OEM replacement control boards:
  - p/n 106103101 Ctrl Brd Com Module MTII LON SCC \$552.76
  - p/n 106372101 Ctrl Brd Interface Board (LUI) \$174.51
  - p/n 106450625 Ctl Retro M2-M4 1/4 HP HW & CW Valve AV \$1,890.75
  - p/n 106451207 Controller M2 to M4 1/3 3/4 HP 2 Pipe Valve AH \$1,438.41



## **EM Building Control Systems Project Management & Project Engineering**

### **Trane VAV terminal Units at Saluda Trail MS**

Three units serving the Media Center, Home Arts classroom, and Art classroom experienced controller failures at the end of the school year. This prevented them from functioning correctly, resulting in very cold room temperatures and excessive energy waste. The replacement controllers were obsolete and unavailable. We replaced the controllers with new programmable units, re-wired and commissioned them.

- Installed Material Cost = \$600
- Installed (District) Labor = 8 hours
- Estimated contractor cost = \$4k
- Approximate Savings per Unit = \$3k





## Looking Forward – Observations, Suggestions & Comments

- Aging mechanical systems coupled with EPA refrigerant restrictions are elevating the risk of higher costs and increased disruptions in operations. A large percentage of our current HVAC equipment falls under this risk category.
- Large capital project renovations like the Saluda Trail HVAC project highlighted in this report are increasingly difficult to accomplish due to scheduling constraints, equipment lead-time and workforce availability.
- According to the US Energy Information Administration, national electricity consumption is expected to increase 3% in 2024 and 1% in 2025. Residential electricity rates are expected to increase 1% this year and about 2% for 2025. Natural Gas consumption is forecast to decline through the fall season with prices also declining. Source: [https://www.eia.gov/outlooks/steo/report/elec\\_coal\\_renew.php](https://www.eia.gov/outlooks/steo/report/elec_coal_renew.php)
- Rock Hill Schools Energy Management Program has pursued and delivered several meaningful programs and projects yielding significant cost savings. This year we returned \$828k back to the 24/25 general fund budget. Given opportunities to reinvest in energy efficiency projects, these returns would be compounded. For example, Independence ES total electricity costs for the last 3 years are \$52k. Mt. Gallant total electricity costs for the last 3 years are \$184k. The school buildings are nearly identical in construction and floorplan. Independence ES electricity cost are 71% less because it utilizes a PV solar power generation system located on its roof.



# ROCK HILL *Schools*