County of Fairfax, Virginia

MEMORANDUM

DATE: April 5, 2021

TO: Board of Supervisors

FROM: Bryan J. Hill
County Executive

SUBJECT: Responses to Questions on Building Systems and Equipment from the March 16, 2021 Environmental Committee Meeting

The Office of Environmental and Energy Coordination (OEEC) presented on the energy recommendations of the Joint Environmental Task Force (JET) at the March 16, 2021 Environmental Committee meeting of the Board of Supervisors. Following that presentation, Supervisor Walkinshaw raised questions regarding the decarbonization of energy systems and equipment in buildings that are in design or under construction. The purpose of this memorandum is to respond to those questions.

Introduction

As explained during the March 16 meeting, the JET energy recommendations include an overarching goal of carbon neutrality in county and school operations by 2040. Because buildings have a typical lifespan of 40 or more years, buildings in design or built today will be operational in 2040, with decades of life remaining. Assuming adoption of the JET goal, the energy use and carbon emissions of both the buildings and the energy systems within them should be consistent with carbon neutrality.

Projected Carbon Intensity of the Electric Grid

For many years, natural gas was considered a cleaner fuel than electricity, particularly in areas reliant on coal-fired electric generation. However, as the carbon intensity of electricity drops, natural gas – whose carbon intensity is unchanging – is no longer necessarily considered the cleaner fuel. This is particularly true when the methane emissions associated with natural gas drilling, extraction and transport are considered. Methane is a greenhouse gas that has a global warming potential of at least 28 to 36 times than of carbon dioxide. Because methane is both a powerful greenhouse gas and short-lived compared to carbon dioxide, achieving significant reductions in methane can have a rapid and significant effect on atmospheric warming potential.

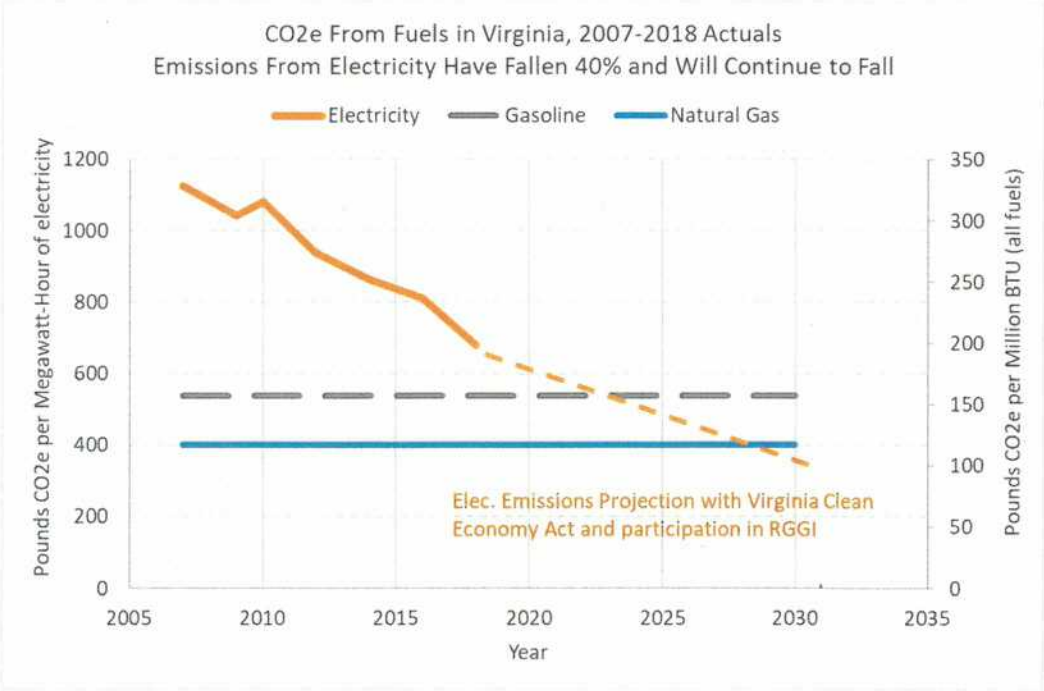
The carbon intensity of the electricity used in Fairfax County has been steadily dropping over the last 15 years, and that drop is expected to continue. Between 2007 and 2018, carbon dioxide equivalent emissions fell 40%, largely as the result of the phase-out of coal and its replacement

Office of the County Executive
12000 Government Center Parkway, Suite 552
Fairfax, VA 22035-0066
703-324-2531, TTY 711, Fax 703-324-3956
www.fairfaxcounty.gov

by natural gas. Now, natural gas is being phased out, as Virginia adopts aggressive renewable energy and carbon reduction goals. The Virginia Clean Economy Act (VCEA), enacted in 2020, requires the state's largest electric utility, Dominion Energy Virginia (Dominion), to be 100% carbon-free by 2045, with the second-largest utility, Appalachian Power, required to be 100% carbon free by 2050. In addition, the VCEA declares 26,200 megawatts (MW) of carbon-free solar and wind power to be in the public interest. This amount of electricity is comparable to Dominion's current generation portfolio. The VCEA also declares 2,700 MW of energy storage to be in the public interest.

Also contributing to the continuing phase out of natural gas is the state's entry earlier this year into the Regional Greenhouse Gas Initiative (RGGI). RGGI is a market-based collaborative effort among 11 Northeast and Mid-Atlantic states to combat climate change and reduce GHG emissions from the power sector. Participation in RGGI will help Virginia power plants to reduce emissions 30% by 2030.

As shown in the graph below, due to the increasing role of renewable resources in electricity generation, by about 2028 the carbon emissions associated with electricity used in Fairfax County are projected to be approximately equivalent to the carbon emissions associated with natural gas. By 2030 and beyond, electricity-related carbon emissions will be below those of natural gas.



Customer Bill Trends

Given Virginia's regulatory framework, utility customers will pay for this transition to a cleaner electric grid. As a rate-regulated monopoly utility, Dominion is entitled to recover most of its

costs from its ratepayers. Over the 10-year period following Virginia's "re-regulation" of the electricity market, the typical residential bill increased about 29%, rising from $90.59 in July 2007 to $116.69 in July 2020. Utility rates are expected to increase even further as a result of the enactment of the VCEA. According to an August 2020 report of the Virginia State Corporation Commission to the Governor and others, Dominion estimated that by 2030 a typical residential customer bill will increase between $52 and $55 per month, or about 46%, due to the impact of the VCEA and additional legislation passed by the 2020 General Assembly. The customer bill is expected to rise from $116.69 in 2020 to about $171.00 in 2030. However, advocates for the VCEA argue the energy efficiency provisions of the law will reduce average customer electricity consumption, mitigating some of the increase expected in rates. No estimates were provided for customer classes other than the residential class.

Natural gas, unlike electricity, operates in a largely deregulated market and there is little ability to project natural gas prices over the upcoming decade with any confidence. While the U.S. Energy Information Administration has not yet released its 2022 Annual Energy Outlook, its 2021 edition noted that although natural gas production continued to grow, end-use consumption and liquified natural gas (LNG) trade, both of which affect pricing, "remains uncertain."

Current Building Design Practice

In 2020, the county updated its Sustainable Development Policy to require achievement of LEED Gold Certification and a minimum 30% energy performance improvement for new construction and a 25% energy performance improvement for major renovations. Beginning in FY 2024, the policy incrementally strengthens the energy performance improvement criteria and the reduction in GHG emissions in future years with a target of achieving net zero energy (NZE) eligibility by FY 2031, at the latest.

Based on the updated policy, the Capital Facilities Division of the Department of Public Works and Environmental Services (DPWES) is currently designing all facilities to maximize building envelope performance, energy efficiency, and renewable energy production. DPWES is currently progressing towards the goal of achieving NZE eligibility for four projects that are currently in design.

The selection of building equipment and systems within the facilities currently reflects consideration of various factors. One is facility type, with an increased focus on resiliency and redundancy. For example, natural gas equipment may be appropriate in a fire station due to demands for apparatus bay heating, gas cooking, and so forth. Other factors include the better thermal comfort experience that gas can provide, especially when the outside temperature falls below a certain threshold, and the level of operational resiliency that natural gas provides for mission-critical facilities in the event of outages on the electric power grid. Finally, natural gas, which is a raw fuel, is currently a significantly more cost-effective choice than electricity. Use of natural gas provides operating cost savings of around 20-30% of building energy costs.

System and Equipment Conversion
Preliminary evaluation of conversion from natural gas to all-electric for projects beginning design indicates a system cost premium of approximately 20-25% for electrical gear, additional and larger conduits, conductors, larger electrical rooms and upsizing the generators in mission-critical building types. This equates to an overall project first-cost impact of one to two percent. In addition, DPWES expects that annual energy costs will be at least 20%-30% higher due to the higher electric utility rates as compared to natural gas rates.

Alternatively, conversion from natural gas to electric at the end of the lifespan of the building equipment or system (i.e., approximately 12 to 15 years) will provide for nearer-term energy cost savings of 20%-30% but will also require that projects initially provide sufficient space for larger electrical room(s) and the capacity for future installations of equipment, electrical gear, conduits, and so forth. Initial changes to the building infrastructure to facilitate the future conversion from natural gas to electricity can be incorporated without significant cost increase and will also provide redundancy for the initial 12 to 15 year period.

Recommendation
Although natural gas currently offers financial and other advantages, continuing use in county facilities will add carbon emissions that both impact the county and make it more difficult to achieve the JET goal of carbon neutrality by 2040. Eliminating natural gas use in new county buildings is a straightforward way to reduce building carbon emissions given that before 2030 the electricity used by the county will be less carbon-intensive than natural gas. Making electrification even more attractive for new buildings is an overall project first-cost impact of just one to two percent.

Based on consultations with the Capital Facilities Division of DPWES, OEEC recommends a phased electrification of county buildings and facilities. Specifically, OEEC recommends that (1) for all new facility construction, additions, and major renovations beginning design in FY 2022 or later, buildings shall be electric-ready and (2) for all new facility construction, additions, and major renovations beginning design in FY 2024 or later, buildings shall use only electric equipment and appliances, unless no alternative can be identified. Consistent with the existing Sustainable Development Policy, requested variances will be evaluated on a case-by-case basis and determined by the Director of Office of Environmental and Energy Coordination or by the Department Director responsible for design and construction management. OEEC recommends that a comparable timeline and approach apply with respect to capital renewal projects, so that by FY 2024 all buildings undergoing capital renewal use only electric equipment and appliances, unless no alternative can be identified.

During its March 16, 2021 presentation on the JET energy recommendations, OEEC recommended revising the current Sustainable Development Policy to accelerate the NZE goal. Assuming that recommendation is accepted, this electrification policy can be included at the time the Sustainable Development Policy is revised.

If you have questions, please contact Kambiz Agazi at 703-324-1788 or via email at Kambiz.Agazi@fairfaxcounty.gov.

cc: Joseph M. Mondoro, Chief Financial Officer
Rachel Flynn, Deputy County Executive
Kambiz Agazi, Director, Office of Environmental and Energy Coordination
Randolph W. Bartlett, Director, Department of Public Works and Environmental Services