ENERGY OPPORTUNITIES

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VT 2020 CLIMATE ACTION COMMITMENT UPDATE PROCESS – SPRING 2020

Energy Opportunities Subcommittee

John Randolph, Chair, CAC Working Group

Rob Glenn, Director, Virginia Tech Electric System (VTES)

Shannon Bell, Associate Professor, Sociology
Amanda Morris, Associate Professor, Chemistry

John Beach, Facilities, Director of Utilities
Kim Briele, Facilities, Director, Engineering Assessment
Mary-Ann Ibeziako, Facilities, Associate Vice President, Utilities
Lowell Jesse, Facilities, Energy Engineering

Gaurav Anand, Undergraduate Student, Chemical Engineering
John Shewchuk, Undergraduate Student, Mechanical Engineering
Ryan Berotti, Undergraduate Student, Mechanical Engineering

Energy Opportunities Subcommittee

Purpose:

- Review progress and potential for energy efficiency and reduced GHG emissions in Virginia Tech campus energy systems, including utilities, steam plant, chillers, and distribution system.

- Review and document implementation of existing CAC elements for reducing GHG emissions through energy efficiency and replacement of high-carbon fuels.

- Develop updated alternative CAC goals for VT campus energy systems, including carbon neutral

- Identify pathways to achieve these goals and evaluate energy, GHG, and economic impacts

Energy Opportunities Findings

VT reduced campus GHG emissions 24% from 2006 to 2019 despite a 20% increase in square footage and enrollment. There are three primary reasons for this.

1. **Fuel switching: coal to natural gas in steam plant.**
   - VT's 1 trillion Btu/year steam plant (SP) provides central steam to heat most of the campus and cogenerates 10% of VTES electricity. Coal was the primary fuel until 2015 when Tech worked with ATMOS Energy to install a larger gas pipeline to the plant, and natural gas has become the plant's primary fuel. In 2009, coal provided 97% of SP fuel; in 2019, 20%. Natural gas increased from 3% to 80%. Natural gas has 57% of coal's CO_2 emissions.

2. **APCO electricity fuel mix becoming less carbon-intensive.**
   - VT buys 90% of its electricity from APCO, which has reduced its fuel mix from 90% coal in 2006 to 63% in 2018
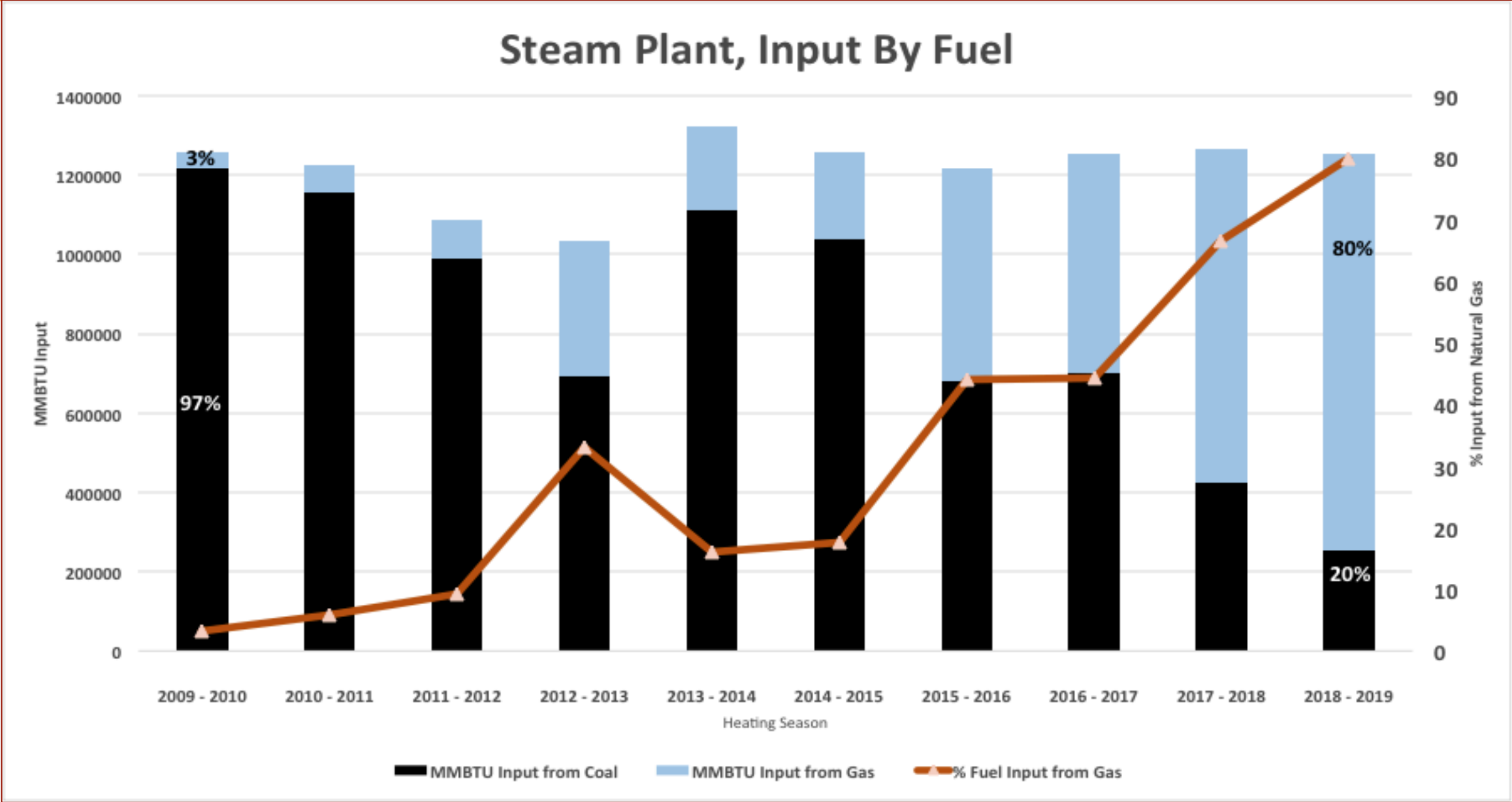
3. **Investment in efficiency: LEED-Silver new buildings and retrofit of existing buildings.**
   - LEED and ASHRAE standards are continually upgraded to become more energy efficient.
   - 5-year Energy Management Plan 2015-2020 invested $3 million/year in energy efficiency with 5-year payback
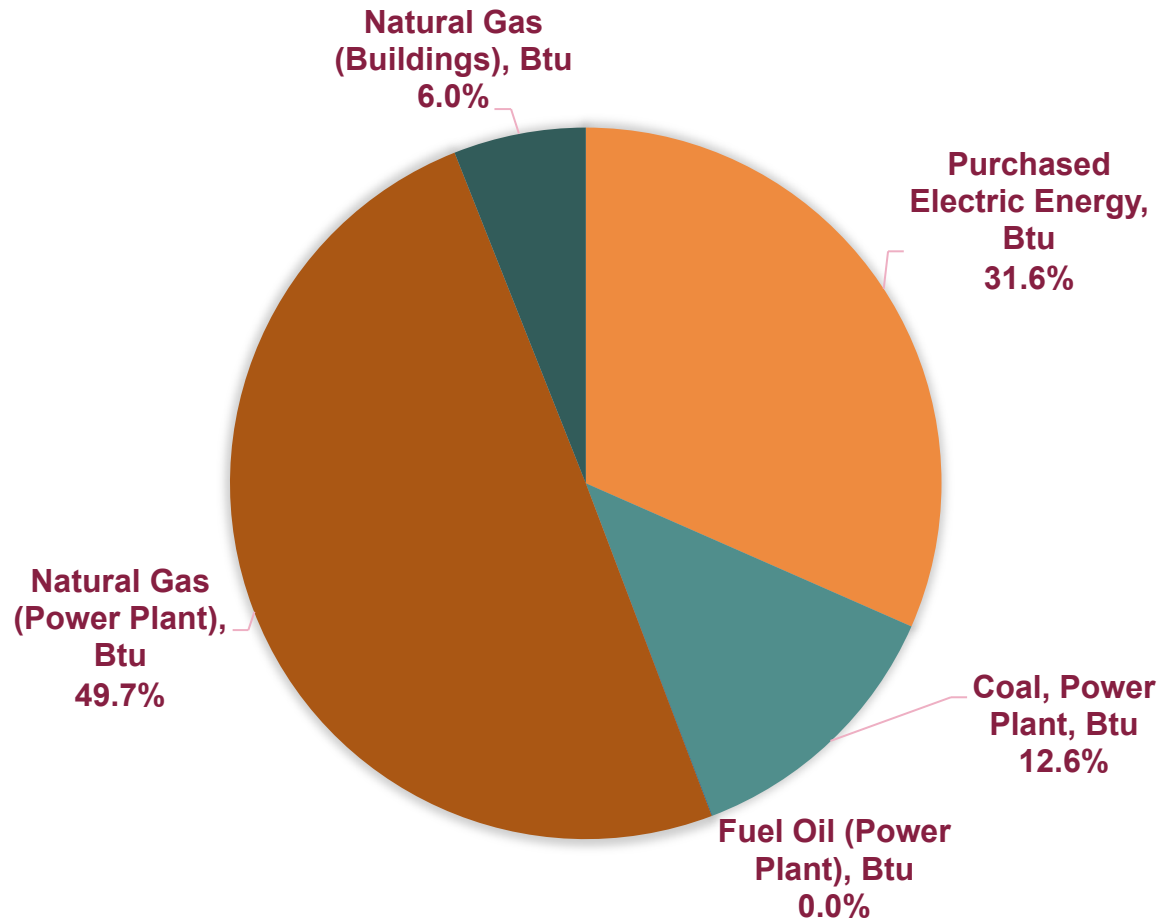
Virginia Tech GHG Emissions Progress
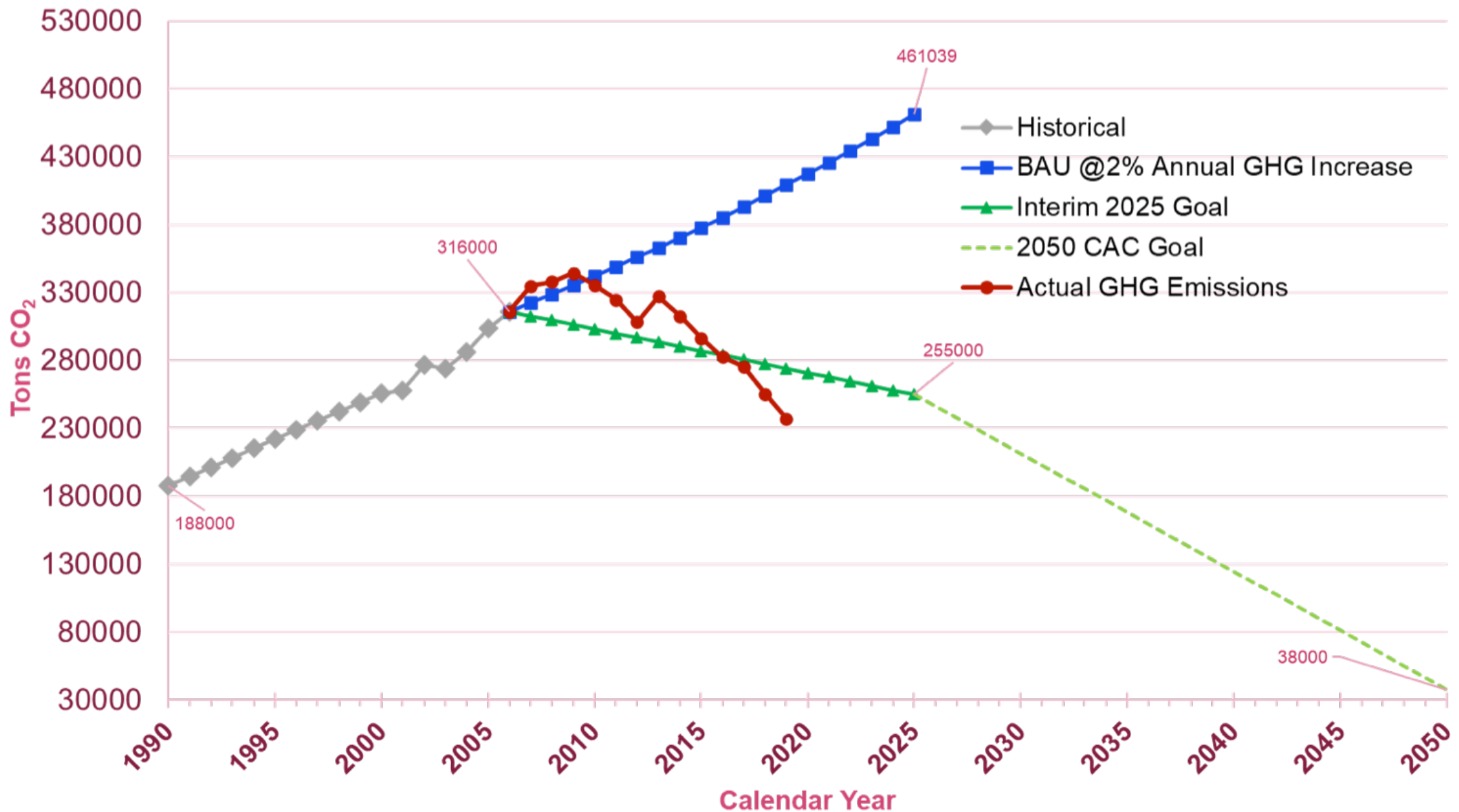
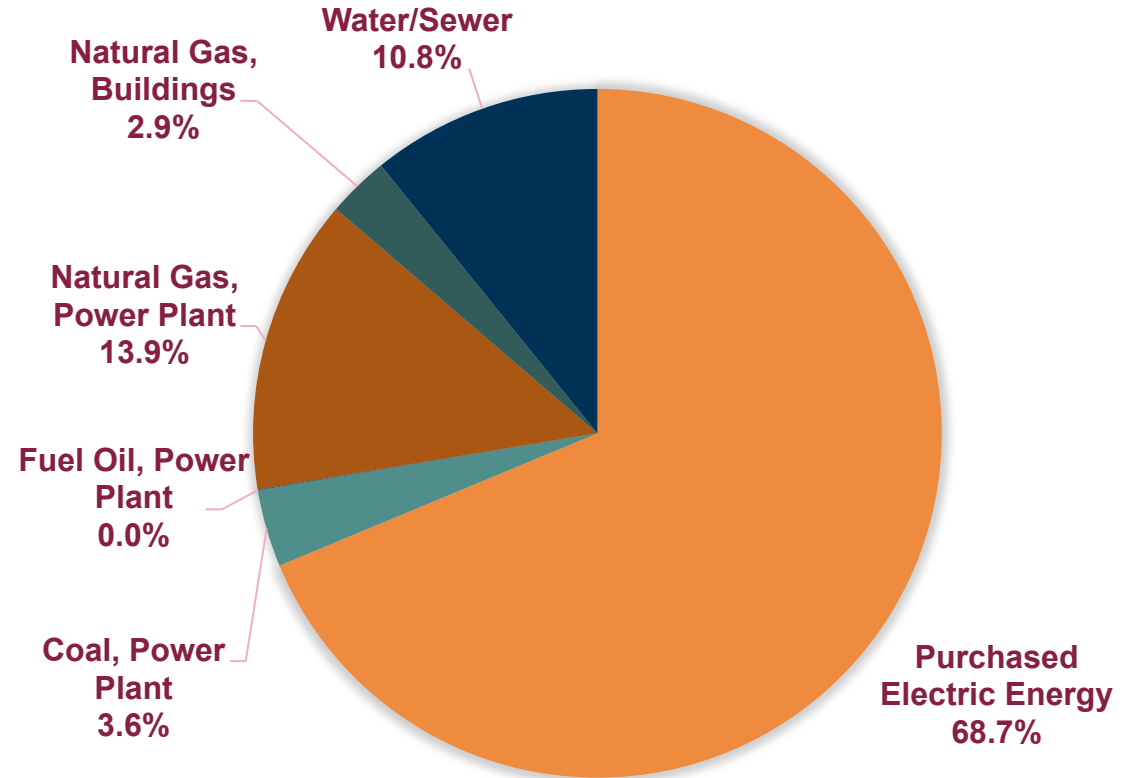# Steam Plant from Coal to Natural Gas 2009-2019

Steam Plant, Input By Fuel

Energy Use and Cost Breakdown, FY 2019

Energy Breakout by Utility (FY 2019)
- Natural Gas (Buildings), Btu 6.0%
- Purchased Electric Energy, Btu 31.6%
- Natural Gas (Power Plant), Btu 49.7%
- Fuel Oil (Power Plant), Btu 0.0%
- Coal, Power Plant, Btu 12.6%

Cost Breakout by Utility (FY 2019)
- Natural Gas, Buildings 2.9%
- Water/Sewer 10.8%
- Natural Gas, Power Plant 13.9%
- Fuel Oil, Power Plant 0.0%
- Coal, Power Plant 3.6%
- Purchased Electric Energy 68.7%
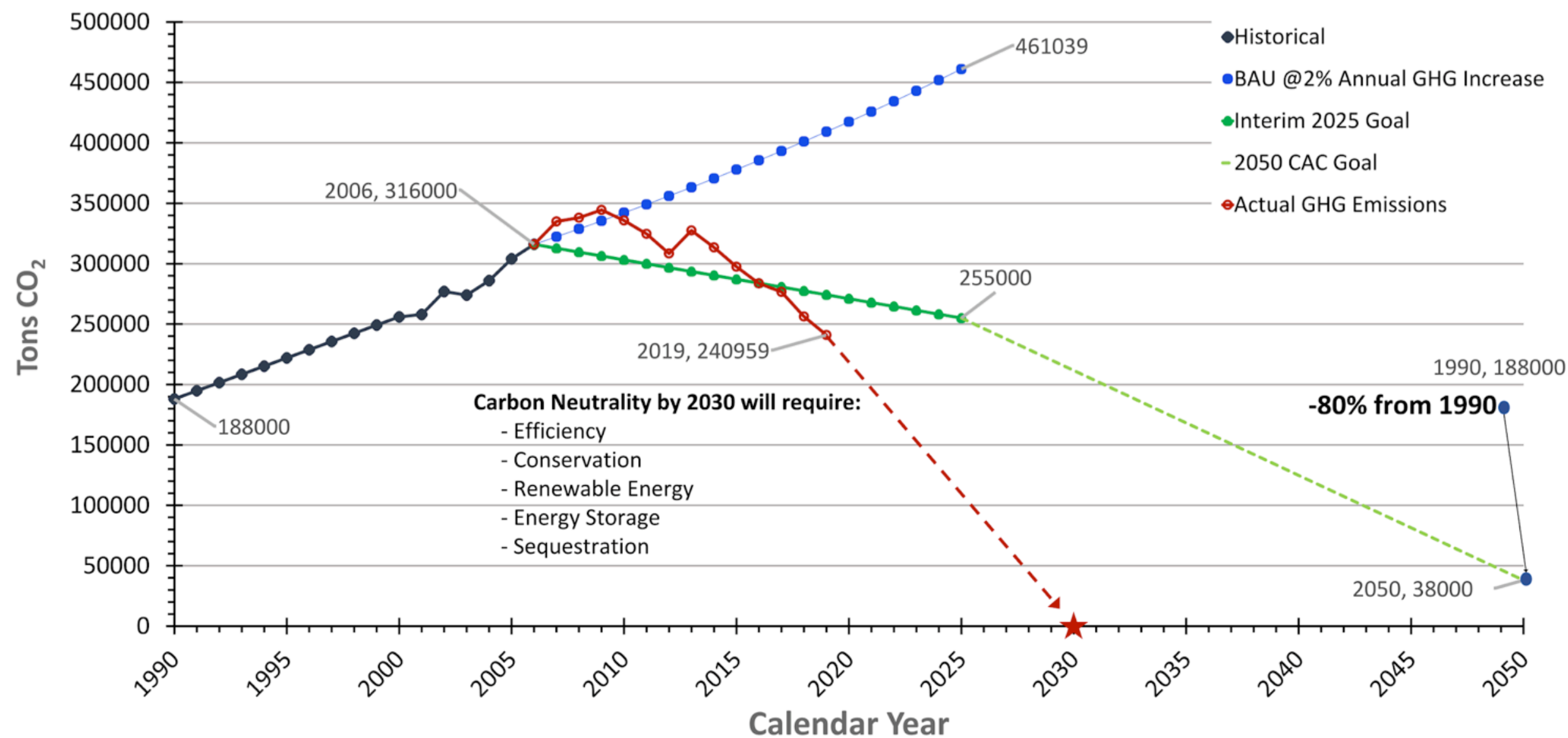
Preliminary Goals and Pathways: Energy

Goal: Carbon Neutral Virginia Tech campus by 2030

- ○ **Eliminate Steam Plant Coal after 2024**

- ○ **Upgrade to reduce Chiller energy by 20% by 2023**

- ○ **10-year energy plan to reduce campus energy use by 20%**

- ○ **100% Renewable electricity by 2030**

- ○ **Create a Campus Energy Dashboard for data to support instruction and research**

Energy Opportunities Subcommittee

Overall Goal:

Carbon Neutral Campus

by 2030

Virginia Tech GHG Emissions Progress and Needed Reduction to Carbon Neutral by 2030

Preliminary Goals and Pathways: Energy

POTENTIAL PATHWAYS TO GOAL:

- **Carbon neutral definition**: net-zero emissions of CO_2, CH_4, NO_2 by VT operations at Blacksburg campus based on 2020 CAC geographic and GHG scope
- **Elimination of coal** use can reduce GHG by 10% below 2019; steam plant resilient backup fuel to LNG by 2024
- **100% renewable electricity** by 2030 can reduce emissions by 50% below 2019
- **Reduction of energy use** in existing and new buildings and steam and chiller systems can result in further emissions reduction by 15% despite campus growth.
- Reduction of GHG from **waste/recycling, transportation, and agriculture,** forestry, and land use described below can further reduce emissions.
- Develop **Campus Energy Dashboard** to enable energy data integration into instruction and research programs
- In 2030, remaining emissions can be negated by carbon offsets.

Preliminary Goals and Pathways: Energy

PRELIMINARY GOALS:

- **Carbon neutral Virginia Tech campus by 2030**
- **Minimize Steam Plant Coal emissions by 2021 and eliminate Coal after 2024**
- **Achieve 100% Renewable Electricity by 2030**
- **Create a Campus Energy Dashboard for data to support instruction and research**

POTENTIAL PATHWAYS TO GOAL:

- **Carbon neutral definition**: net-zero emissions of CO_2, CH_4, NO_2 by VT operations at Blacksburg campus based on 2020 CAC geographic and GHG scope
- Elimination of coal use can reduce GHG by 10% below 2019; steam plant resilient backup fuel to LNG by 2024
- 100% renewable electricity by 2030 can reduce emissions by 50% below 2019
- Reduction of energy use in existing and new buildings and steam and chiller systems can result in further emissions reduction by 15% despite campus growth.
- Reduction of GHG from waste/recycling, transportation, and agriculture, forestry, and land use described below can further reduce emissions.
- Develop Campus Energy Dashboard to enable energy data integration into instruction and research programs
- In 2030, remaining emissions can be negated by carbon offsets.

CLIMATE ACTION COMMITMENT UPDATE

Thank you for your attention.
We invite you to engage.

Please visit the CAC website (link below) to:

- Watch the other committee videos
- Read the CAC Interim Report
- Complete the climate action survey
- Register for a Zoom forum
- Engage through an online bulletin board
- Contact us

https://svpoa.vt.edu/index/VTCACRevision.html