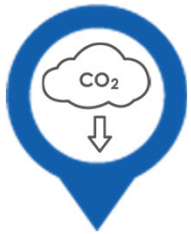
WHO IS NORESCO?

- Acquired by Carrier in 2008
- Member of Carrier Building Technologies Group
- Leading energy services company that provides demand-side management and sustainability consulting services for the built environment
- 475+ staff members nationwide
  - Engineers, Architects, Sustainability Specialists, Energy Analysts, Support Staff
- Corporate commitment to achieving carbon neutrality
- History working with organizations to achieve GHG reduction and carbon neutrality goals

475+
employees;
90+ on SUS Team

$5 billion
in guaranteed energy savings

10,000+
facilities serviced in the U.S. and worldwide

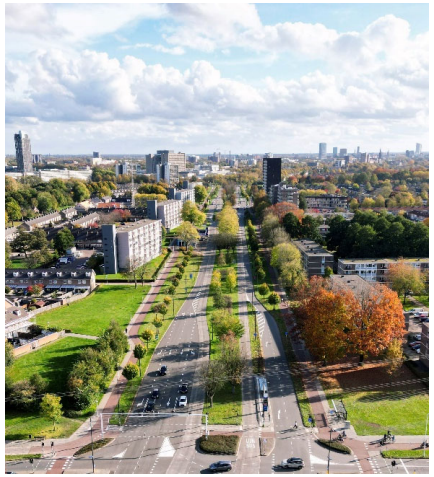


25 million
metric tons of CO_2 emissions reduction

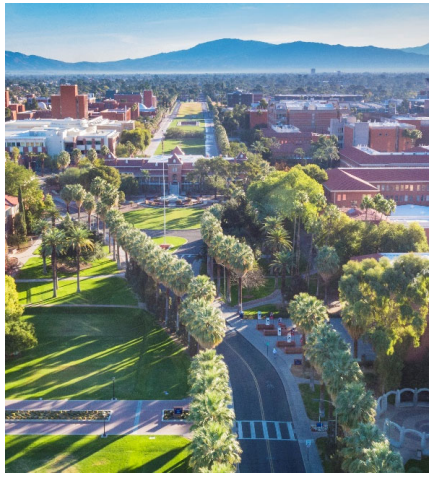
75+
certified energy managers

22,700 kW +
solar photovoltaic arrays and renewable sources installed

PROJECT TYPES



PORTFOLIOS



CAMPUSES

BUILDING

MARYLAND BEPS

STELLA B. WERNER OFFICE BUILDING

Montgomery County project to upgrade the Stella B. Werner Council Office Building (COB) in line with County goals to reduce GHG emissions and obtain LEED Certification. The County braided an energy savings performance contract (ESPC) with utility incentives and other funding mechanisms to implement the project.

PROJECT HIGHLIGHTS:

- **49% reduction** in annual natural gas consumption
- **1,228 tons** annual CO_2 equivalent reduction
- $240k annual utility savings
- $18.8 million total project cost
- Standardized multiple HVAC system vintages/types with a VRF system

STELLA B. WERNER OFFICE BUILDING

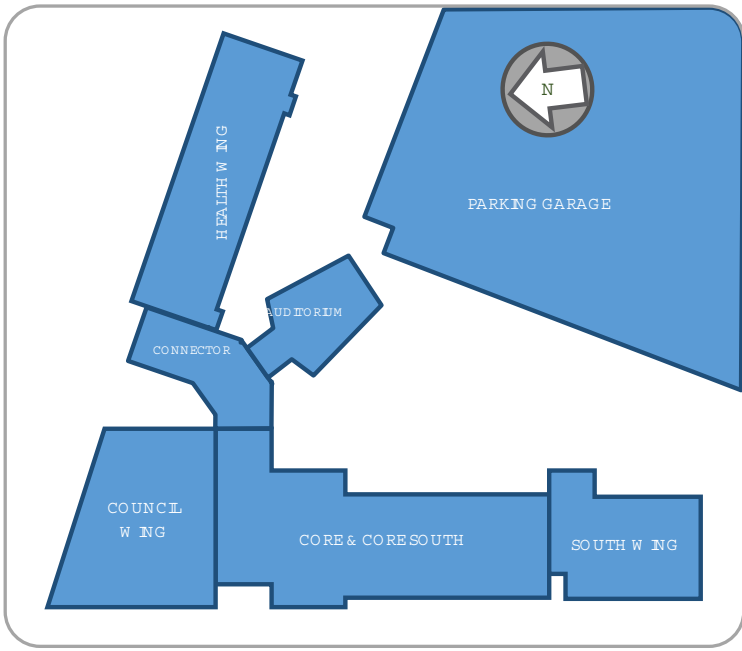
Rockville, MD

142,480 square foot complex

Multiple wings and additions over almost 40 years

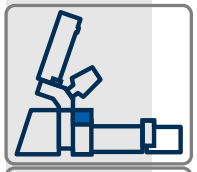
- Central Core – 1952
- South Wing – 1962
- Further Additions – 1970s-1980s

Mechanical, electrical and architectural design varies greatly from one part of the building to another

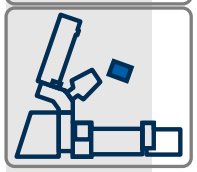


STELLA B. WERNER OFFICE BUILDING

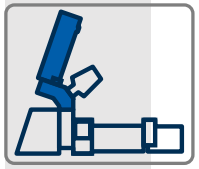
Rockville, MD



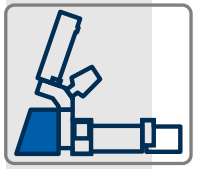
Central Heating Plant – serves majority of building
Six 399 MBH NG condensing boilers
DHW – 360 MBH NG hot water heater



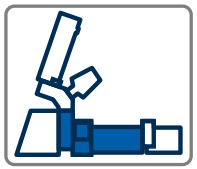
Central Cooling Plant – serves majority of building
Three 110-ton water cooled chillers
DHW – 360 MBH NG hot water heater



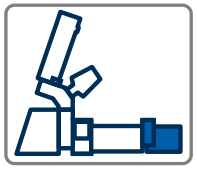
Health Wing – served by central plant
Four-pipe FCUs for perimeter
Four-pipe AHU for central areas



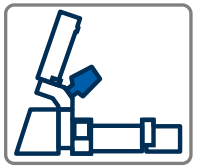
Council Wing – served by central plant and indiv. units
Four-pipe AHU for dining area
Separate heating for AHU and kitchen MAU
Meeting Room
15-ton AHU served by central plant
Public Hearing Room
40-ton Packaged RTU (NG and DX)



Core + Core South – served by central plant
WSHPs served by central boilers and cooling towers
VAV four-pipe RTU
Hearing Room
AHU with DX and electric heat



South Wing – served by central plant and indiv. units
Four-pipe FCUs for perimeter
Four-pipe AHU for central areas
VAV RTU
Dedicated NG boiler
Data Center – served by CRAC units and dedicated 120-ton chiller



Auditorium – served by central plant
Four-pipe AHU

STELLA B. WERNER OFFICE BUILDING Rockville, MD

Load Reduction Measures

- Interior and Exterior lighting conversion to LED with occupancy controls reduced electric demand
- Double-pane insulated windows and insulated exterior doors reduced heating/cooling loads
- Low flow lavatory faucets reduced DHW load

STELLA B. WERNER OFFICE BUILDING Rockville, MD

HVAC System

Option 1 – New Central Plant and Variable Air Volume (VAV) Systems

- Expand central plant to serve entire building
- New water-cooled chillers, new condensing boilers
- VAV AHUs with terminal boxes

Option 2 – New Central Plant, Dedicated Outdoor Air Units and Fan Coil Units

- Expand central plant to serve entire building
- New water-cooled chillers, new condensing boilers
- Four-pipe FCUs
- DOAS with heat recovery for ventilation

Option 3 - New Variable Refrigerant Flow (VRF) with Dedicated Outdoor Air (DOAS)

- Replace central plant with 300-ton VRF system
- DOAS with heat recovery for ventilation
- New Packaged units for Auditorium and Council Wing
- Data Center remains unchanged

STELLA B. WERNER OFFICE BUILDING Rockville, MD

HVAC System

Option 3 - New Variable Refrigerant Flow (VRF) with Dedicated Outdoor Air (DOAS)

- Eliminated need for chilled water and heating hot water piping runs in low ceiling areas
- VRF allowed for efficient simultaneous heating and cooling
- Modular system design provided significant advantages
  - Phased installation by floor to minimize disruption
  - Zoning flexibility accommodated planned interior renovations
  - Adaptable for any future expansion

STELLA B. WERNER OFFICE BUILDING

Rockville, MD

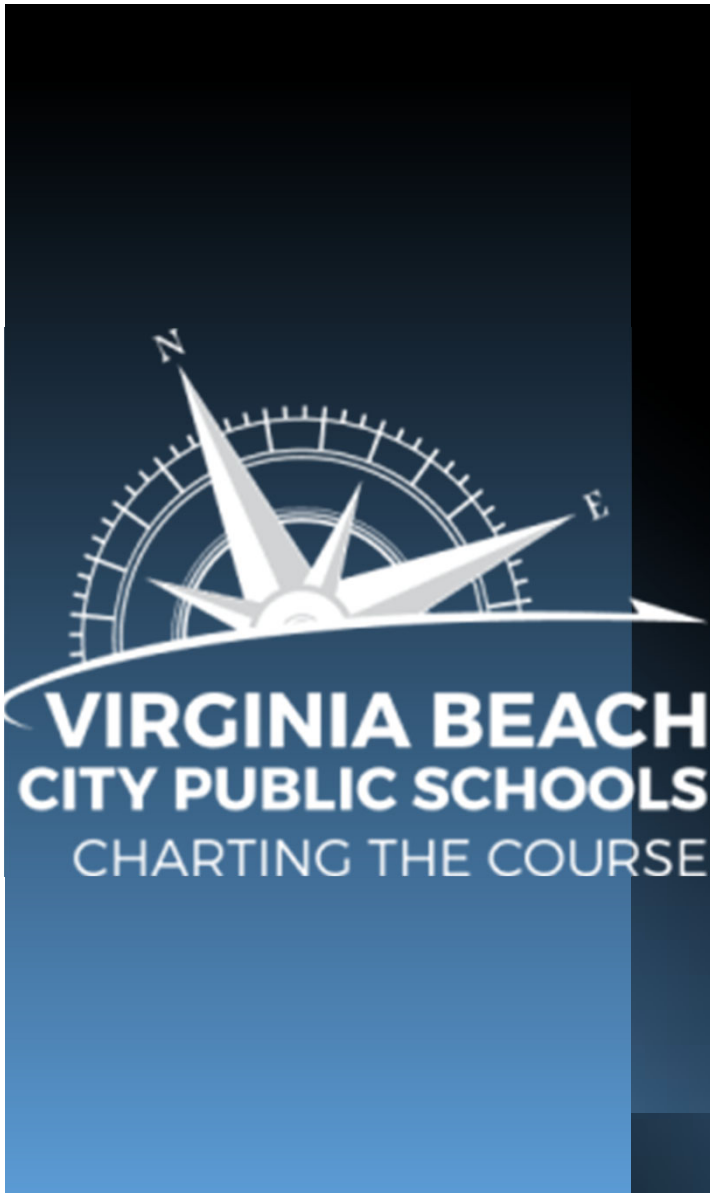
Project Financing

Total project cost of ~$18.8 million with multiple funding sources

- Approximately $5.5 million in savings from 18-year ESPC project
- Approximately $190k in utility rebates for Chillers, VFDs, and LED lighting
- Remaining from Montgomery County capital contribution

VIRGINIA BEACH CITY PUBLIC SCHOOLS

- Long term relationship between school district and NORESCO spanning 20 years through 13 phases. Energy upgrades made to more than 50 schools totaling approximately 4M square feet.
- Majority of schools/campus upgrades are common measures – lighting, envelope, BAS and behavior change curriculum
- Phases 1, 5, 6, and 8 upgraded WSHP loops at three schools with ground source loops
- Replaced NG and electric boilers and cooling towers previously serving WSHP loops



STRAWBRIDGE ELEMENTARY

- **133 tons** annual CO_2 equivalent reduction
- Approximately $237k annual utility savings
- Approximately $4.3 million in project cost
- **Existing System:**
  - Two-pipe WSHPs (3.5-4 tons) in classrooms
  - 2 central 1,440 MBH NG boilers
  - Two closed circuit cooling towers
- **GSHP System:**
  - Ground source loop 274 bore holes in playground
  - Replaced existing WSHP loop piping
  - WSHP loop served by ground source
  - Eliminated cooling tower, retained 1 boiler for emergency backup
  - Replaced FCUs with GSHP console units
  - Connected RTUs to GS loop

MD BEPS: PROJECTS IN DEVELOPMENT

NORESCO

Baltimore County – *Baltimore County, Maryland*

- 4 buildings
- Approximately 1 Million square feet
- 18 potential energy/emissions conservation measures
  - Range from complete lighting retrofits to central plant upgrades with heat recovery chillers
  - Estimate up to 35% reduction in CO_2 by 2030

Image Source: James G. Howes

Goucher College – *College Park, Maryland*

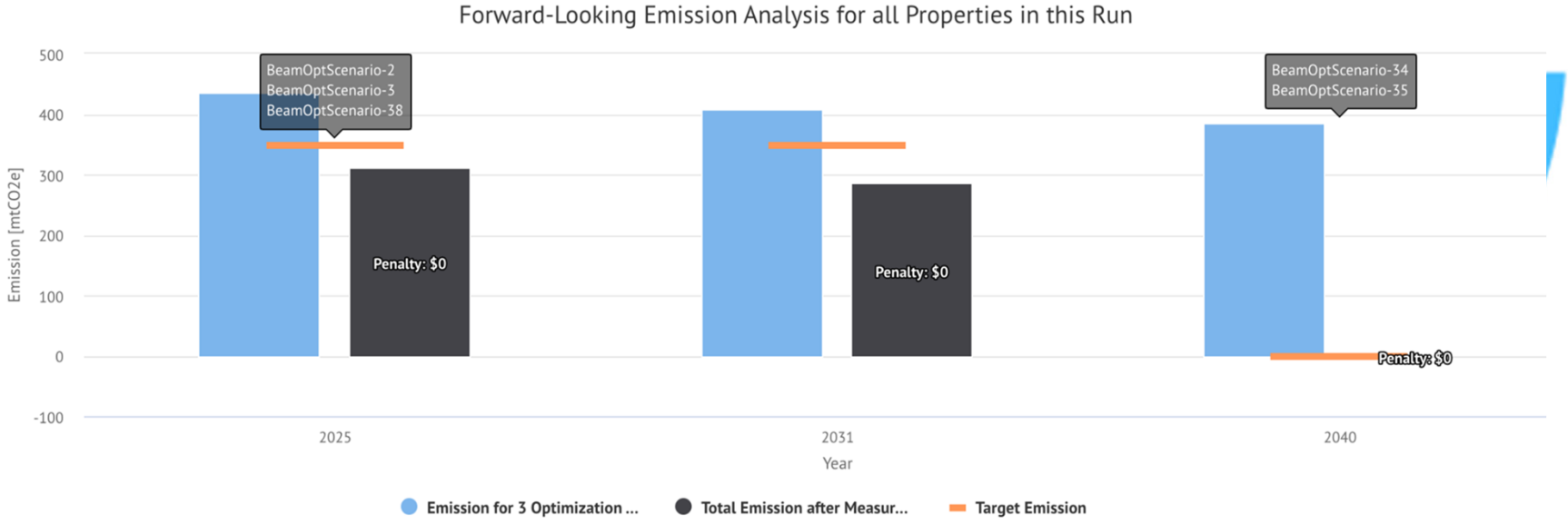
- 53 buildings
- Over 1.2 Million square feet
- 15 potential energy/emissions conservation measures
  - Range from complete lighting retrofits to central plant modernization
  - Include extensive options for PV
  - Energy Conservation through Behavior Change program to improve operational efficiency

Image Source: goucher.edu

Maryland BEPS

2030	2040
20% Scope 1 reduction	Net-zero

- Building specific target
  - Applied to building emissions, not just scope 1
  - High non-compliance penalty assumed
- 2025: HP Hotwater (-106mt Scope 1 reduction), solar (-25mt Scope 2 reduction) and storage
- 2040: Install heat pump (178mt Scope 1 reduction)



Q&A

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