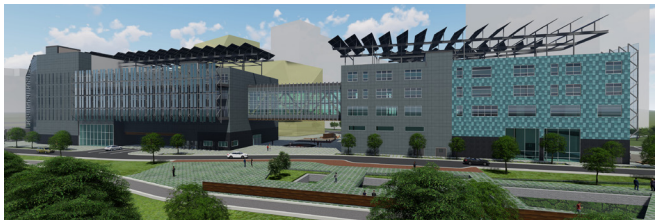
POINT PRESENT



PROJECT SUMMARY -

What is Point Present High?

Point Present High is a satellite Career and Technical Education (CTE) campus for Alexandria City Public Schools (ACPS), to be located in the redeveloping brownfields of Potomac Yards, adjacent to Virginia Tech's Innovation Campus. Focused primarily on high school students, Point Present will offer a suite of STEAM classes, with an emphasis on computer science and information technology. The City of Alexandria, unusual for a city of its size, has one high school with several campuses, distributing learning throughout the city. Projected growth in enrollment suggests that the city will need to accommodate 400 additional students in the next 10 years. Point Present is designed for 500. With easy access by bus, rail, and a network of bike and walking trails, Point Present will also serve the local community with evening classes and public programs. By locating adjacent to Virginia Tech's Innovation Campus, Point Present High is an integral part of the pipeline for the university and the Commonwealth of Virginia.

What makes Point Present High different?

Point Present High shares its site with a multi-storey datacenter, and together the two programs feed each other pedagogically, technologically, and environmentally.

PROJECT DATA

Location: Alexandria, VA, USA

Climate Zone: 4A

Lot size: 6.8 Acres

Building size: 231,035 ft2; 5 stories

Occupancy: 650

Construction Cost:
$360/ft2 (weighted average of school and data center)

Average Utility Cost For School: $49,167 /year

Energy Performance:

HIGH SCHOOL:
Site EUI: 11.76 kBtu/ft²/yr
Source EUI: 37.04 kBtu/ft²/yr

Source EUI with renewable energy:
WITH On Site Renewable Energy
6385485.42 kBtu - 30,848,175.9 kBtu
= -24,462,690.5 kBtu
Source EUI: **-141.91 kBtu/ft²/yr**

WITHOUT Microgrid
6,385,485.42 kBtu - 12,121,754.1 kBtu =
-5,736,268.58 kBtu
Source EUI: **-33.28 kBtu/ft²/yr**

DATA CENTER:
PUE of Data Center Facility: 1.08 DCiE 93%

TECHNICAL SPECIFICATIONS

New construction wall, roof, and foundation R-value: 35.19, 62.74, 4.32

New window U-value, SHGC:
.14 Btu/h ft2 F, .30
Curtain wall U-value, SHGC:
.17 Btu/h ft2 F, .24

Building Technologies: High efficiency windows, on site PV, Dedicated Outdoor Air System (DOAS Unit), Distributed heat pumps (one per classroom), Immersive Liquid Cooling regulated by geothermal heat exchange.

On site PV: PV Wall Cladding, Louvers, Pavers.

DC Power of 3930 kW (Using 65% of the roof area for all the three project sites including Data Center, the school and the proposed microgrid system)

The need for data centers is growing exponentially, but they are too often developed on greenfield sites in automobile-dependent, ex-urban locations. While technologies for data storage and for power usage have become more efficient, those efficiencies are instantly consumed by our insatiable demand for more data.Point Present High brings the data center into the city, offering a new model for hands-on education, dispersed data storage, joint research with Virginia Tech, and a new micro-grid for distributed energy, heat, and power, turning the data center into a resource, rather than a liability. The multi-functional building will transform Potomac Yards into a destination for learning, with a high-performance net-positive building that is itself also a teaching tool. At Point Present, with the high school + data center + eco-district, the future is already present.

DESIGN STRATEGY -

The Cloud 10 team began by asking questions: How can we incorporate a high energy-consuming building such as a data center and convert it into an energy-generating resource for the campus and community? Can we take data centers seriously as an architectural, urban, and environmental problem—and opportunity? Can we shorten the supply lines, increase the use of renewables, use their waste heat, and make them more resilient by being distributed? Can a data center become part of an educational campus? Our answers are in the proposal, guided by five clear design objectives: Normalize high performance design, which should be the rule, not the exception; design a building that teaches, and tells its own story; use all the heat--there is not such thing as "waste" heat; share with the neighborhood through a microgrid; and remember, passive strategies come first.

Arielannia Walker - Betul Agcayazi - Beyza Kastan - Catherine Smith - India Young - Kathleen Cullen - Komal Autkar - Sara ElFallah - Sarah Piccoli - Takeru Kanahara - Trevor Wardell - Zheyu Zhang

UMC VIRGINIA TECH

ARCHITECTURE -

The Point Present HS neighborhood won't be built out until 2040. The architecture must be designed to respond to the environmental and social needs of the future. The design maximizes daylighting, natural ventilation, biophilic views, and community engagement. The building, which straddles two sites, serves as a gateway icon for metro and bus riders, bikers, and drivers entering the city from the north. With Virginia Tech's Building #1, it shapes a central plaza and makes an urban campus.

ENGINEERING -

The primary challenges are excess heat from the 5 MW data center, cooling the equipment, and uninterrupted power. The heat is harvested to benefit the school and neighborhood for heat and hot water. An immersion cooling system keeps the equipment cool. A closed loop geothermal system transfers and gains heating/cooling throughout the year. Hydrogen generators and other technologies are used to ensure uninterrupted power.

MARKET ANALYSIS -

Based on projected enrollment, Alexandria City Public Schools' current CIP leaves 400 students without adequate educational facilities. The project addresses these capacity needs and creates a direct pipeline from high school students into computer science and other related fields through CTE training, on-site Data Center learning tools, and VT partnerships The estimated construction cost is 360/ft2. To help offset upfront costs, Point Present includes a tight thermal envelope, highly efficient mechanical systems, and heat siphoned from the data servers and redirected to district heating and hot water to reduce the building's energy demand, enabling our PV array to fully cover the school's energy needs.

DURABILITY+RESILIENCE -

With a program that produces endless heat and requires uninterrupted power, the proposal takes several measures to weather hardship scenarios. From an array of hydrogen generators to an interconnected electric and thermal micro-district, the Point Present Innovation District is a cohesive sustainable network that ties the community to the Potomac River through geo-thermal exchange below and an urban reorientation above.

EMBODIED ENVIRONMENTAL IMPACT -

The project celebrates innovation in building systems and infrastructure with the integration of thoughtful construction practices and materials throughout the entire building life cycle. The design incorporates sustainable and high thermal performance materials such as Insulated Concrete Forms with low carbon concrete, Structural Insulated Panels and mass timber components for the main building structure. Other materials include photovoltaic faced skins and surfaces.

INTEGRATED PERFORMANCE -

In our efforts to establish a gateway to a new identity for a historic city, we aim to bring the integrative systems to the forefront of the classroom. Our advanced energy management system encourages collaboration between heating, cooling, ventilation, and lighting. Resulting in improved system performance and strengthening intellectual curiosity.

OCCUPANT EXPERIENCE -

Students of Point Present will have biophilic interior access to terraces with views of the river. Through our design we are engaging with the public using a LED digital display at a major intersection of the site. In addition, we are designing our own way-finding system using photovoltaic pavers on sidewalks, crosswalks, and along the trail by our site. The site offers expansive views of the Potomac River and transit connections to Amazon's headquarters, to Old Town Alexandria, to the nation's capital, and to a network of parks and trails.

OCCUPANT COMFORT + ENVIRONMENTAL QUALITY -

Distributed outdoor air systems ventilate spaces through an underfloor air system based on tailored load demands, conditioned by waste heat from the data center. This is supplemented by natural air flow through windows during good weather. Reductions in air handler sizing and noise suppression techniques increase productivity in building occupants. Materials will be chosen that are non-carcinogenic, do not contribute to bioaccumulation, and have low embodied energy. Biophilic elements include exposed structural CLT panels, views to the Potomac river, and walkable terraces.

ENERGY PERFORMANCE -

The energy performance of the integrated solar PV system depends on several factors such as orientation of panels, climate and actual site conditions. Solar potential, both passive and active, is the foundation for design decisions. We developed careful analysis of the expected shadows from our future neighbors to guide the locations of shading devices and PV.