Navigating the Path to a Smart Campus at the National Institute of Standards and Technology Gaithersburg
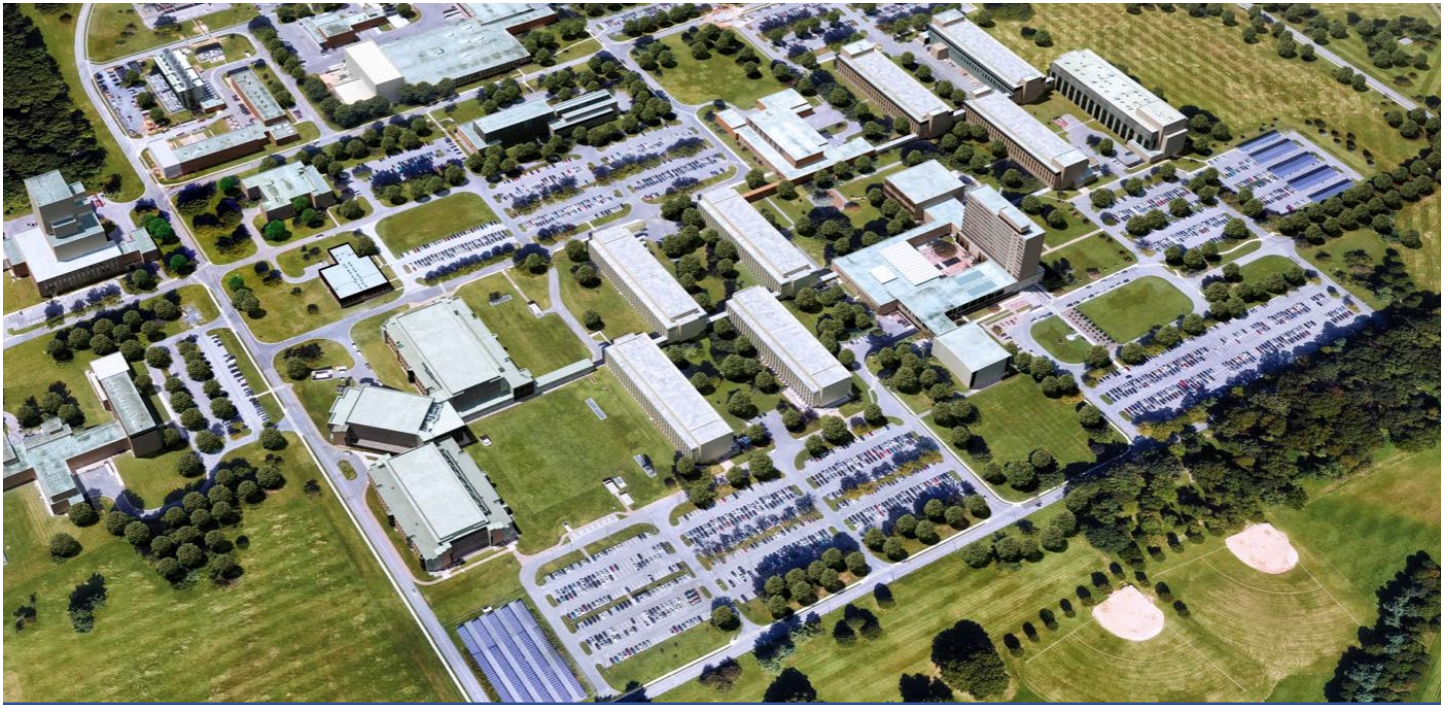

Figure 1. The National Institute of Standards and Technology (NIST) campus in Gaithersburg, Maryland. *Photo courtesy of NIST.*

The Federal Energy Management Program's (FEMP's) Federal Smart Buildings Accelerator team identified many smart campus best practices already in place, along with several new goals for the Department of Commerce's National Institute of Standards and Technology (NIST) Gaithersburg campus.

Project Background

In the summer of 2023, staff from the National Renewable Energy Laboratory (NREL), in partnership with FEMP, visited the NIST campus in Gaithersburg, Maryland. The visit, part of the Federal Smart Buildings Accelerator, was the beginning of an effort to help NIST Gaithersburg create a roadmap to becoming a smart campus by incorporating new technologies such as energy management information systems (EMIS) and grid-interactive efficient buildings (GEB) capabilities.

Best Practices Observed at NIST

The NIST Gaithersburg campus consists of many historic and aging buildings,

including aging infrastructure that can be difficult to operate efficiently and effectively. The campus performs many tasks effectively to keep critical processes operational. Some of NIST Gaithersburg's facility best practices and foundational technologies are listed below:

- Facility staff is highly motivated to update the campus and incorporate new building technologies to support energy efficiency and reduce carbon emissions

- New buildings already incorporate cutting-edge technologies

- A 5-MW solar photovoltaic (PV) array is available to support GEB capabilities and could potentially support peak load shaving.

Figure 2. The NIST administration building is undergoing renovation to add new technologies. *Photo courtesy of J. Stoughton, NIST.*

Opportunities for Improvement

Multiple Building Automation Systems

It can be challenging for facility staff to manage a campus with multiple building automation systems (BASs). All the BASs have their own dedicated network and are not tied into the campus intranet. Connecting the BASs to the NIST Gaithersburg campus intranet would allow for visibility from other locations.

Outdated Equipment and Control Systems

Multiple systems (e.g., lighting, PV, heating, ventilation, and air conditioning [HVAC], and central utility plant [CUP]) need to be updated and connected to a common point—BAS or EMIS. Much of the equipment and controllers at NIST Gaithersburg are outdated; some equipment is from the 1960s. Compressed air and steam systems have multiple leaks due to aging infrastructure.

Lack of Integration and Campus Visibility

You can't manage what you don't measure, and current measurement and verification practices at the NIST Gaithersburg campus limit any insights into operations. This causes waste at NIST in many operational areas such as air handling units simultaneously heating and cooling, dampers improperly working, and more.

Lack of Automatic Fault Detection and Diagnostics

Current operations and maintenance practices are reactive to known issues. Based on energy use intensity and consumption data, there are likely many issues that need to be addressed. Without integrated monitoring systems with fault detection capability at the building and campus level, NIST Gaithersburg facilities are not able to operate efficiently.

Resilience and Smart Buildings Compatibility

The NIST Gaithersburg campus houses critical areas of research, including labs, where resilience and safety are key considerations. As the campus evolves to more modern technologies, including smart buildings technologies, resilience can be increased.

Outdated Master Specifications

NIST needs an updated naming and tagging convention for software and equipment. There is also a need for an updated campus master plan that includes specifications for proper equipment and capabilities for upcoming projects.

Planning a GEB-Ready Future: NIST Technical Assistance

Going forward, NREL and FEMP will continue to partner with the Department of Commerce and NIST to support facility updates and cutting-edge smart buildings technology implementation at the NIST Gaithersburg campus, including the following technical assistance projects:

- NIST strategic roadmap development and master plan updates
- FEMP EMIS program support
- NREL REopt analysis
- NIST master specifications update
- NIST subject matter expert assistance
- FEMP Smart Labs program support.

The NIST Gaithersburg campus is starting the transition to GEB-readiness, and making enhancements to the suggested areas of improvement will offer updated specifications for technology, improvements to controllability and visibility, and power demand flexibility and decarbonization benefits.

Learn More

Learn more about grid-interactive efficient buildings at energy.gov/femp/grid-interactive-efficient-buildings-federal-agencies.

Learn more about energy management information systems at energy.gov/femp/energy-management-information-systems-federal-facilities. ∎

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