

CASE STUDY / UNIVERSITY CAMPUS MASTER PLAN

# CHARTING A CLEAR PATH TOWARD CARBON NEUTRALITY

When Princeton University decided to enact a plan to reduce its carbon emissions — to eventually reach net zero by 2046 — it became clear that the campus would need a specific set of guidelines detailing how to tackle this goal. An infrastructure master plan provided the necessary solution.



# TAKING PRINCETON INTO THE FUTURE WITH A COMPREHENSIVE MASTER PLAN

To provide an actionable plan for reducing carbon emissions on Princeton's campus, our team evaluated technologies, strategies and systems.

## PROJECT STATS

### CLIENT

Princeton University

### LOCATION

Princeton, New Jersey

MORE THAN

# 800K

GSF OF PROJECTED GROWTH OVER 10 YEARS

ANNUAL REDUCTION OF

# 20K+

METRIC TONS OF CO<sub>2</sub>e BY 2026

# 14+

TECHNOLOGIES EVALUATED

## CHALLENGE

Princeton has established itself as an influential leader in the areas of sustainability, energy efficiency and leading-edge technology implementation. In accordance with these goals, Princeton has set a goal to achieve carbon neutrality by 2046, even while increasing building square footage to accommodate world-class research endeavors and an expanded campus population.

By implementing a diverse portfolio of energy conservation projects, Princeton has already been able to meaningfully impact the amount of energy consumed on campus and thus the amount of greenhouse gas emitted. To meet the ambitious future target, however, the method by which Princeton produces and distributes other utilities across campus must shift to a more efficient, less costly and less carbon-intensive method.

## SOLUTION

To assist Princeton in pursuing its goal, our team was charged with developing an infrastructure master plan to identify operational and functional issues on the campus that would require capital renewal or investment in the existing infrastructure. This plan was designed to provide a framework for Princeton to aggressively reduce the carbon emissions associated with providing utilities to the campus over the next 30 years.

Within the plan, our team evaluated technologies and strategies including a campuswide heating/hot water conversion, heat recovery chillers, geothermal/geoexchange systems, solar energy generation, energy storage and smart grid strategies, waste-to-energy technologies and the adoption of biofuels to replace traditional fossil fuels. All options were evaluated on the merits of cost, overall reliability and ability to reduce carbon emissions, with special attention being paid to the conservation of many treasured and architecturally significant structures on campus.

Additionally, information technology (IT) systems were evaluated in coordination with other on-site utilities to maximize the benefit of the plan. Potential IT strategies evaluated included energy savings and carbon reduction options such as Gigabit Passive Optical LAN designs for future buildings and data center/server consolidation.





## RESULTS

Princeton has begun to make strides toward implementation. This starts with an energy plant conversion and expansion project and we are humbled to be working alongside Princeton to implement the first of these design projects.

This first project will focus on creating a new plant on the east edge of campus and updating the existing West Plant, allowing both plants to provide thermal utilities to the new and renovated buildings on campus. Such improvements will provide the

framework for the future production, delivery and consumption of utilities, offering reliable service while minimizing life cycle cost and greatly reducing local and regional greenhouse gas emissions.

The project will also improve campus resiliency, efficiency and sustainability by facilitating the conversion of Princeton's campus heating system from steam to hot water. This conversion will include the installation of geothermal/ground source wellfields, reducing greenhouse gas emissions by either making use

of renewable heat sinks or harnessing waste thermal energy that is not currently utilized.

Princeton personnel have been working with our team for many years toward the university's overall goal of increased sustainability and energy consumption reduction across the campus utility systems. We are heavily invested in the upstream planning, analysis and downstream future success of the program and its projects.



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