Existing conditions

Quantum Institute for Quantum Science & Engineering and School of Engineering and Applied Science Concept Design
Quantum Institute for Quantum Science & Engineering and School of Engineering and Applied Science

Concept Design

1" = 50'-0"
Aerial view of proposed projects
Internal courtyard view looking East
FitzRandolph Road view looking North
What is Geo-Exchange?

Think of geo-exchange as a thermal piggy bank. During summers, we take heat out of buildings and store it in the ground using geo-exchange bores to slightly warm the rocks below campus. During winters, we use the same geo-exchange bores and warmed rock as a heat source for our buildings. Most bores will be about 850’ deep and eventually there will be over 1,000 bores under campus in borefields.

Why Geo-Exchange?

As part of our goal to achieve a zero carbon footprint, NetZero by 2046, Princeton University is investing in geo-exchange technology, both logistically and financially. The immense scope of projects to create and convert systems to geo-exchange technology (see other sides), with enough capacity to serve the entire campus, will enable Princeton to phase out nonrenewable energy sources such as natural gas burned today to produce steam heat and electricity. Drilling bores, installing new pipes and converting old building systems can be noisy and dirty. The drilling will end; we promise, and our commitment to geo-exchange will bring us closer to NetZero, and be a model of what’s possible.

Where is Geo-Exchange on Campus?

Geo-Exchange projects

- CUB
- Lakeside Apartments
- Lawrence Apartments
- Lewis Center for the Arts
- TIGER
- West Plant

Geo-Exchange shines brighter on the NIPMUC and is the heart of our new campus

Geo-Exchange Projects

Geo-Exchange Borefields

We have drilled over half of our 2,000 planned geo-exchange bores to expand the use of geo-exchange technology campus-wide. Lewis Center for the Arts, Lakeside Graduate Housing, Lawrence Apartments, Bloomberg, Butler, College, New College West, and Ye’i college are already using this technology today.

TIGER & CUB

These new buildings will house the heat pumps and electrical equipment necessary to expand our geo-exchange heating and cooling systems. Rather than back-of-house service buildings, TIGER (Thermally Integrated Geo-Exchange Resource) and CUB will be integrated into campus and support Princeton’s commitment to sustainability. Two thermal energy storage tanks (TES) near each building are used to store hot and chilled water.

Converting to District Hot Water

We are installing over 13 miles of new underground hot water distribution pipes to convert from steam to hot water heat. The piping design needed for hot water is different from what is currently used for steam distribution, as it is the science behind the two technologies. Eventually, new hot water pipes and new systems will enable every campus building to use geo-exchange heating and cooling.

Converting Princeton’s Chilled Water Plant

We have converted our Cogen Plant, already well known for its reliability and energy efficiency, from a chilled water plant and combined heat and power (CHP) steam plant to a renamed West Plant with hot water geo-exchange technology. Cogen will operate together with TIGER to efficiently decommissionally and thermally meet the campus heating, cooling, and partial electric load needs.

The two plants will also be interconnected so each plant can partially backup the other.

Converting Buildings Systems

An important step in completing geo-exchange on campus will be converting the heating and cooling systems in existing campus buildings. These conversions will take place over many years. When fully converted, the University will use

Advancing Sustainability Goals

Net Zero C0.5 by 2046 (300th Anniversary)

In addition to geo-exchange technology, TIGER is powered with renewable electricity with the intent of significantly reducing the University’s carbon footprint. TIGER will also significantly reduce water use needed for the University’s energy systems due to the reduction in cooling tower water requirements.

Solar Technology

Taking advantage of above ground space, new solar panels have been installed above parking lots, parking garages and in fields. Over the last two years our Solar Expansion project has added 16 Megawatts AC of new solar photo-voltaic systems. This expansion has tripled our capacity to satisfy campus electrical needs through solar power, from approximately 5.5% to 20%.

Campus in Three Dimensions (3D)

Campus planning, especially sustainability planning, considers all three dimensions of our campus footprint. One piece of land has the potential to be used on three levels: below ground, ground level and above structures. Buildings with a green roof take advantage of this three dimensionality. A parking garage with geo-exchange bores underground, parking spaces at and above ground level, and solar pv panels above the roof use all three dimensions of the land. Projects with layered land use include: Roberts Soccer Stadium, Poe Field, Hobson College, Meadowlands Softball Field and Meadowlands Drive Garage.

For information on campus impacts, contact Facilities Unification Team.

Contact us with concerns or questions, 609-258-8823.
Princeton University is converting the campus from a district scale steam system to a district scale chilled and hot water system using geo-exchange technology.

Geo-exchange is an essential element in the University’s plan to achieve carbon neutrality by 2046.

The entire Quantum and SEAS site will be used for geo-exchange bores located approximately 20 feet on center. (Exact number of bores still being determined).

Advanced sound attenuation techniques will be used to reduce noise impacts from drilling.

Hauling route to remove soil will avoid neighborhood streets using Fitzrandolph Road to Faculty Road to Alexander Street.

To prepare for geo-exchange installation, the site will be excavated using blasting and mechanical digging techniques.

Drilling will be completed in two phases which may or may not be sequential.

Area for installation of geo-exchange wells