

The New, Green Pride of St. Patrick's Cathedral Is Underground

March 14, 2018 by Sharon Otterman



Jeffrey Murphy, who led the team overseeing the restoration of St. Patrick's Cathedral in Manhattan, in the geothermal plant under the church campus. Credit: James Estrin/The New York Times

Above ground, a 7,855-pipe organ is one of the great splendors of St. Patrick's Cathedral on Fifth Avenue, the luminous church that will be the heart of the action in New York on St. Patrick's Day. But hidden below the cathedral's floor, a new system of pipes just as intricate is a source of equal pride.

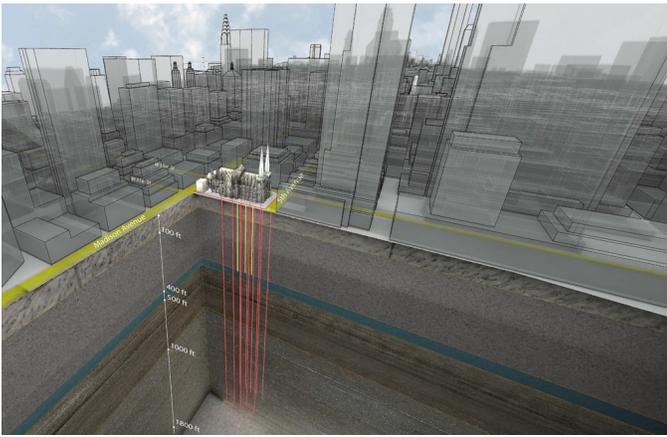
A year ago, as part of its nearly \$200 million renovation, St. Patrick's Cathedral launched a state-of-the-art geothermal heating and cooling system to replace its system of steam radiators and 1960s-era air conditioning. Around the cathedral's perimeter are now 10 wells as deep as 2,200 feet into the Manhattan bedrock, collecting groundwater that helps the church efficiently heat and cool. The cathedral now reaches six times deeper than its Gothic spires soar high.

The system's thousands of feet of pipes and dozens of pumps are invisible to the five million visitors to the cathedral each year, and that was the point. The trustees of the 138-year-old building, the centerpiece of the

Roman Catholic Archdiocese of New York, wanted the church to appear as it always has, even as it was going green.

"It was not only the most sustainable, cost-effective, long-term energy option for the cathedral, but the option that best aligns with the greater good of New York, and not just today, but for generations to come," said Monsignor Robert T. Ritchie, the rector of St. Patrick's Cathedral.

Tucked amid the church's side gardens on East 50th and East 51st Streets are 10 manholes, which cover the eight-inch-wide wells that reach into the bedrock. Hidden behind radiator covers are dozens of fan coils that blow geothermal heat. High above the heads of visitors, in a gallery called the triforium, are 14 larger fan coil units that dump cool air down to sweltering summer visitors. And in the space under the church is a maze of pipes transporting heated and chilled water through the system.



The cathedral's new wells reach as deep as 2,200 feet into the Manhattan bedrock — six times deeper than its spires soar high. Credit: Murphy, Burnham & Buttrick Architects

St. Patrick's standing well geothermal project is the largest ever built in Manhattan, according to its designers. And despite its steep installation cost — about \$35 million — the archdiocese is hoping it will set a precedent for other buildings, particularly historical ones.

“If you are an institution that isn't going to be here for hundreds of years, you may do something less expensive,” said Jeffrey Murphy, who led a team from Murphy Burnham & Buttrick Architects in overseeing the cathedral's restoration. “But if you are interested in sustainability, and you are interested in the long haul, it is a great system.”

It is also in line with Mayor Bill de Blasio's vision for a more sustainable New York. In a 2015 report, the Mayor's Office of Sustainability called on more buildings in New York to consider geothermal power, noting that geothermal systems achieve roughly 25 to 30 percent in energy savings when compared to conventional options.

Sometimes, however, the costs of geothermal can be more than they appear. That was the experience at the General Theological Seminary, the Episcopal seminary in Manhattan's Chelsea neighborhood, which was among the first to undertake geothermal drilling on a major scale in Manhattan, beginning in about 2005. It ended up scaling back, and now uses geothermal in about a quarter of its space.

“If you don't take into consideration the cost of machinery and the maintenance over an 80-year period, sure, it's a great deal,” said the Very Rev. Kurt H. Dunkle, the seminary's dean and president, who shared the lessons he had learned with St. Patrick's. “But when you take into consideration that the submerged pumps have to be pulled out and maintained and sometimes changed out, for us it made less economic sense than any projection ever described.”

At the heart of St. Patrick's new system is its geothermal plant, a tightly packed former boiler room under the

church's campus that is loaded with the pumps, compressors and other equipment that makes the system work.

A computer system automatically determines whether to cool or heat based on thermostats set around the 76,000-square-foot cathedral campus. It can switch various wells on and off, and it can heat some areas while cooling others. That is good news for Cardinal Timothy M. Dolan, New York's archbishop, who likes to keep the sanctuary “on the cooler side,” said Richard A. Sileo, a lead engineer of the system.

Four separate loops of water propel heat and cooling through the system, Mr. Sileo said. The first loop brings the groundwater, measuring about 55 degrees year round, from the wells into the geothermal plant. The second loop leads to a machine that cools the water down to about 45 degrees in summer, or heats it to about 130 degrees in winter. That water is then piped through the campus and into fan coils scattered around the buildings.

The archdiocese did not provide estimates for how much money it believes it saved this year, but the engineers estimate that it will reduce energy use over a traditional system by about 30 percent annually. For St. Patrick's, that totals roughly 94,000 kilograms in carbon dioxide emissions, or about as much created when burning 218 barrels of oil.

According to the mayor's office, approximately 20 geothermal systems have been installed in New York City in the past five years, but St. Patrick's is believed to be the largest. There are a handful of city-managed facilities on geothermal, including the Queens Botanical Garden, the Brooklyn Children's Museum and the Lion House at the Bronx Zoo. And the geothermal plant at Cornell University's new technology campus on Roosevelt Island can produce even more heating and cooling than at St. Patrick's, using a closed loop system that is not open to the bedrock.



Heating vents behind votive candles. Credit: James Estrin/The New York Times

No other churches in the city are known to have converted to geothermal heating and cooling, but Trinity Church in Boston's Copley Square has had a geothermal system in place for about 15 years, a spokeswoman said.

In New York, several options were presented to the archdiocese during the renovation, but it determined that geothermal made the most sense, considering aesthetics, longevity, the high cost of a new traditional system, and the desire to do something green, Mr. Murphy said.

"I think it really showed a profound sense of optimism," he added, "and in some ways audaciousness, that this venerable institution would consider geothermal technology for their building."



The trustees of the 138-year-old cathedral wanted it to appear as it always has, despite the renovated heating and cooling system. Credit: James Estrin/The New York Times



Tucked amid the church's side gardens are 10 manholes covering eight-inch-wide wells. Credit: James Estrin/The New York Times