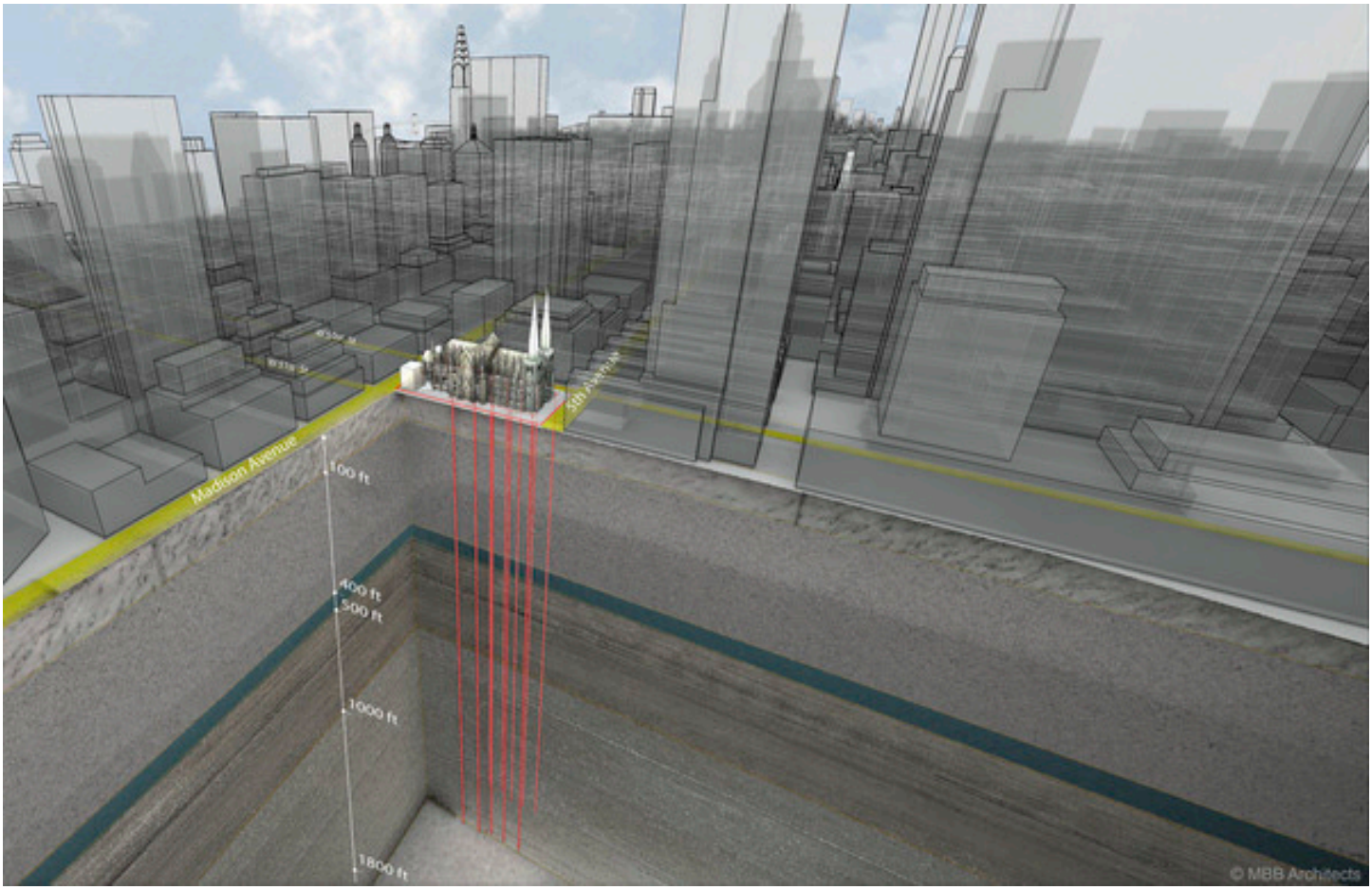
Jerusalem

New York: the new Geothermal Plant for Saint Patrick's Cathedral

An Example of New Environmental Standards: Interview with Jeffrey Murphy, FAIA, LEED AP

August 7, 2017 by Michela Beatrice Ferri



St. Patrick's Cathedral inaugurated the final phase of its restoration with the full activation of a state-of-the-art geothermal plant in March of 2017. The launch of the geothermal plant is the first in a series of upgrades slated for 2017 intended to adapt one of New York's earliest and most impressive landmarks to the structural and environmental standards of twenty-first century urban life. In his 2015 Encyclical, Pope Francis called for increase energy efficiency and an "ecological conversion" in the hopes of slowing the effects of climate change. The decision to pursue a geothermal plant by the Trustees of St. Patrick's Cathedral speaks volumes to its leadership's commitment to responsible stewardship of a beloved religious symbol and architectural icon, as well as to our planet.

Is this the first time that a cathedral – a church, in general – in the United States of America is provided by a "geothermal plant"?

Trinity Church in Boston used geothermal technology to heat and cool a portion of their church and we looked at this project as an initial paradigm. In New York City, both General Theological Seminary and Union Theological Seminary installed geothermal plants prior to the work at St. Patrick's Cathedral. The design team benefitted from specific "lessons learned" from these two projects in Manhattan as we designed our project. The main take-aways from these projects were to build redundant systems into the St. Patrick's Catheral project and to focus our attention to addressing potential challenging water conditions. Working closely with Zubatkin Owner Representation, geothermal designers, Landmark Facilities Group, well designers PW Grosser and a team of in-house engineers from Tishman Speyer, we compared several systems for delivering heating and cooling to the Cathedral. Using a broad range of criteria, the geothermal plant was determined to be most benefical to the Cathedral.

Which are the first results of the application of the Geothermal Plant? Which are the benefits of this choice, concerning the restoration of Saint Patrick's Cathedral?

Geothermal technology proved to be beneficial to the St. Patrick's Cathedral restoraton project for numerous reasons. Perhaps the greatest benefit is that the system has virtually no visible impact on the architecture of the Cathedral.

We had initially designed a conventional plant using a large fan wall for air conditioning. This would have altered the configuration of the south terrace, making the plant's features visible from the street and adjoining builings. The geothermal plant is entirely under ground and not visible. A geothermal approach proved to be the most sensitive way of providing heating and cooling to this significant architectural icon. An obstacle to building the conventional plant was that a substantial amount of rock, dense New York schist, would be required to be excavated to fit the plant on site at great expense. The compact nature of the geothermal plant enables it to occupy part of the original plant space, requiring minimal excavation and leaving room left over to increase the size of the Parish House. Another benefit of geothermal technology is that it complemented our client's sustainable agenda and interest in being good stewards of the earth. The geothermal system reduces the Cathedral's energy use by 35%.

How the innovative system has been implemented

The innovative engineering plan for the plant was carried out by the Cathedral's design team, Murphy, Burnham, & Buttrick ("MBB"), Landmark Facilities Group, and PW Grosser, who developed and repurposed the existing infrastructure to harness clean, renewable power from an underground system of wells in order to regulate the temperature of the Cathedral and adjoining buildings with increased efficiency and a considerable reduction in CO2 emissions.

The Cathedral's newly active geothermal plant is comprised of ten wells which have been drilled along the north and south sides of the Cathedral to a depth of up to 2,200 feet (670 m). This prodigious drilling project, which included four wells on New York's 51st Street and six wells on 50th Street, was overseen by the prominent construction management firm, Structure Tone of New York. At the heart of the system is a Dedicated Heat Recovery Chiller which extracts thermal energy from the underground system of wells and distributes it throughout the campus for heating and cooling purposes. This is accomplished through a standing column hybrid open loop system. Structure Tone worked with Lane Associates to oversee the installation of the heat pump, as well as the sophisticated distribution network of heat exchangers, air handlers, and fan coils that extract and redirect heat through the 76,000 square feet (7.060 sqm) of space. While most geothermal plants alternate between their warming and chilling functions, this plant is designed to automatically split its cooling and warming functions in order to simultaneously heat or cool the diverse areas it services. When fully activated, the central plant will be able to generate 2.9 million BTU's per hour of air conditioning and 3.2 million BTU's per hour of heating.

The engineering and design team of MBB, Landmark Facilities Group, Silman, and Langan Engineering, in close collaboration with Zubatkin Owner Representation, LLC and the construction manager, Structure Tone, Inc., were tasked with installing a comprehensive geothermal heating and cooling system while maintaining the rigorous standards for the historic preservation of one of New York's most iconic structures. "At the outset, we evaluated a conventional HVAC system, but determined it would pose too many challenges for this historic building," says Richard A. Sileo, Senior Engineer with Landmark Facilities Group. "We conducted a feasibility study and found that a geothermal system let us meet our goals with the smallest impact." Work on the project commenced with the drilling of the wells in June 2015. The plant was finalized and ready to launch by February 2017.

The Archdiocese of New York and St. Patrick's Cathedral saw in this project the opportunity to lead by example in choosing a sustainable energy solution. The geothermal plant represents not only the cleanest and most cost-effective long-term option for power, but also the most responsible. Cathedral Rector Monsignor Robert T. Ritchie noted, "A consistent ethic of life does not compartmentalize these issues. It prioritizes life and the preservation of life at every level. One of the most basic ways in which we are called to do so is through responsible stewardship of our natural resources."

The decision on the part of the Trustees of St. Patrick's Cathedral and the Archdiocese of New York to pursue the geothermal option articulates a vision of restoration and preservation that extends beyond the celebrated walls of America's Parish Church; one that will, hopefully, encourage business leaders and institutions to also consider renewable energy solutions.

Better performances, little energy consumption

In September 2015, architects Murphy, Burnham & Buttrick completed the full restoration of New York's landmarked St. Patrick's Cathedral – its first restoration in more than 70 years. As the final phase of that restoration, in March of 2017, a new geothermal plant went online, which will reduce the Cathedral's energy consumption by more than 30%, and reduce CO2 emissions by approximately 94,000 kilograms. The geothermal plant is comprised of 10 wells in terraces flanking the north and south sides of the Cathedral. Each well is drilled through dense Manhattan schist to a depth of

up to 2,250 feet. When fully commissioned, the central plant will have the capability to support 2.9 million BTUs per hour of air condition and 3.2 million BTUs per hour of heating.

The activation of the geothermal system will allow St. Patrick's Cathedral to serve as an illuminating example to other world-class institutions in how they can harness technology to responsibly address larger environmental issues and how to take a long-term, sustainable approach to architectural stewardship.

This really is a remarkable story – both because the Cathedral is now one of the largest institutions in Manhattan to have a geothermal plant and because it makes one of the NY's most visible landmarks into a leader in sustainability.

Jeffrey Murphy is a founding Partner of MBB Architects. His expertise in design for cultural, civic and educational institutions has led to a range of rich and compelling projects, many of which have been recognized for their design excellence and social engagement.

A LEED-accredited professional, Jeffrey believes sustainability is an integral component of architecture and leads the firm in seeking design solutions that embody both conceptual clarity and environmental responsibility. As partner-in-charge, Jeffrey has led projects for a diverse group of clients including Princeton University, UNICEF Innovations Lab, Ethical Culture Fieldston School and the Trustees of St. Patrick's Cathedral. His work at St. Patrick's Cathedral won a 2016 AIA National Honor Award.

Jeffrey holds a Master in Architecture degree from the Harvard Graduate School of Design and a Bachelor of Science degree from the University of Virginia. At Harvard he was the recipient of the Aga Khan Program for Islamic Architecture Research Fellowship and was awarded the post-graduate Wheelwright Fellowship.

Jeffrey's work in and outside of the office reflects the idea that well-considered design positively impacts communities. He has served as Secretary of the New York Chapter of the American Institute of Architects, a board member of Community District 7 in Manhattan and as a member of the Zoning Board of Appeals for the Village of Saltaire.

Jeffrey was elected to the College of Fellows of the American Institute of Architects in 2016.