**Geothermal Heating System for Public Housing:** Lockport Housing Authority, City of Lockport in Niagara County, NY

Lockport Housing Authority (LHA) won the New York Geothermal Organization’s GeoStar Top Job competition in 2017 for converting all 72 apartments in its Autumn Gardens housing complex to geothermal energy. It is the third public housing project in New York State to acquire this type of heating system. Executive Director of the LHA Kevin Bancroft estimates a reduction in total energy consumption of 40% from the project over the previous electric heating system, plus it has also provided affordable air conditioning in the summer, saving residents charges for renting window units for their apartments. The LHA is expecting to save 50% to 75% of the costs of electricity with the new system, which could be $40,000 to $50,000 per year. The Authority also converted its office building to geothermal the year before the housing complex.

Lockport is the county seat of Niagara County, NY. It was named for the locks of the Erie Canal running through this small city within a mostly rural Western NY county. The Lockport Housing Authority itself provides services to over 500 limited income families and seniors through direct housing as well as Section 8 vouchers. It is governed by a board made up of two resident commissioners elected by the residents and other commissioners appointed by the Mayor for five year terms.

Because of the high energy costs for the electric heating and hot water systems in their buildings, LHA first explored solar and wind options but decided it was not feasible for their properties because of technical and cost limitations. They then explored geothermal energy and realized that in the main office building, due to the amount of land around it, they could install a lower-cost parallel geothermal system, which involves relatively shallow excavation. Further research revealed they could also install a deeper geothermal system in one of their main residential buildings for nearly the same cost as natural gas, since to use gas, they would have to add a boiler room onto each building and install piping for carrying hot water to each apartment. The projects also included energy efficiency upgrades in both buildings.

Geothermal heat pumps send a glycol solution down through piping into the ground to get warmed or cooled, depending on the season, by the earth’s year-round underground temperature of about 50 degrees Fahrenheit. Once the liquid returns to the building, it is compressed, which brings it to a temperature where it can effectively heat an apartment in winter or cool it in the summer. There continue to be electricity costs because of the electric heat pumps and fans to disperse the air into each room, but the high efficiency of heat pumps that heat and cool from ground temperature saves money and reduces the Authority’s carbon footprint tremendously. The geothermal system is also used to heat water for the building.

Each geothermal project took about 2-3 years from initial conception to completing the construction; some of the residents of Autumn Gardens began receiving geothermal heat during the winter of 2015-16. The LHA board had to approve the projects several times during the journey. Some residents were skeptical that this system could provide adequate heating and cooling for the apartments and some did not want contractors in their apartments. However, Buffalo Geothermal, the contractor on-site which implemented the projects, spent a lot of time
with the LHA board and held numerous tenant meetings to ensure people understood the project and to build support amongst residents. According to Bancroft, the tenant meetings went a long way towards getting residents excited about the residential project, especially because they realized the heat pumps would be a vast improvement over the window air conditioning units they used to rely on in the summer, for which they had to pay an extra charge above their rent.

The residential project was only made feasible when the capital funding was allocated from U.S. Department of Housing and Urban Development Project Improvement funds. The Authority was not going to explore New York State Energy Research and Development Authority funding due to past challenges where they put in a lot of work on an application to then be rejected. However, Buffalo Geothermal helped LHA put together a funding request to NYSERDA that was approved. While the entire project, including carpentry, lighting and other construction work, cost about $1.7 million, the actual geothermal portion for the conversion of the heat pumps ended up costing $800,000. NYSERDA provided a $68,400 grant when the project was completed, plus another $25,200 if it showed a savings of at least 29% in energy costs in the first year of operation, which it has more than accomplished. This cost reduction will also save the Authority money that it can invest in other areas like general maintenance.

Executive Director Bancroft suggests the following tips:

- When space is available, install a parallel geothermal system which only needs to be dug down about 8 feet, below the frost line.

- Plan the project out far in advance.

- Choose a good, professional contractor! Buffalo Geothermal went above and beyond in engaging residents and making them feel comfortable, especially important because workers needed to be in people’s apartments to install the heat pumps. Buffalo Geothermal also worked to secure the NYSERDA grant, which the Authority would have been less likely to be able to do on their own.

- If you have to drill, be ready for some surprises! For example, a smell came from the drill areas due to hydrogen sulfide. At first there were major concerns about health and safety and it was necessary to bring in an outside geologist to ensure that everything was fine, which it was.

By capturing warmth from the sun that has been absorbed by the ground, geothermal heating systems drastically reduce the need for burning fossil fuels, which produce greenhouse gases that contribute to climate change. In New York State, about a third of greenhouse gas emissions come from heating and cooling of homes and other buildings, so geothermal heating is an important technology to get us to 100% renewable energy across all sectors. With the help of federal and state grants to install the systems, the Lockport Housing Authority expects to save thousands of dollars in heating and cooling costs over the 50-year life of the systems, while making their office and residential buildings more comfortable.

Municipal leaders who wish to know more details may contact Kevin Bancroft at kbancroft@lockporthousingauthority.com or (716) 434-0001 Ext. 205.

The Executive Director of the Lockport Housing Authority sent the following photo, used with permission.

Drill rig for geothermal installation at the Autumn Gardens site (Lockport Housing Authority)