THE DISTRICT OF THUNDER BAY
SOCIAL SERVICES ADMINISTRATION BOARD

BOARD REPORT

	REPORT NO.: **2018-39**
MEETING DATE: **JUNE 28, 2018**	***DATE PREPARED:*** JUNE 6, 2018
SUBJECT: **ALTERNATIVE ENERGY SOURCES**	

RECOMMENDATION

For information only.

REPORT SUMMARY

To provide The District of Thunder Bay Social Services Administration Board (TBDSSAB or the Board) with a report identifying alternative sources of heating in its multi-unit apartment buildings.

BACKGROUND

TBDSSAB owns and operates 10 apartment buildings consisting of 78 units or more in the City of Thunder Bay. When the buildings were constructed during the 1970's and early 1980's, electricity was the most common and economical way to provide a heating source in multi-residential buildings. It was very low maintenance and cost effective to install. A typical system would use a line voltage thermostat, operating an electric baseboard heater, producing 3.5 kilowatts (equivalent to 12,000 BTU) of heat for roughly 500 square feet of apartment space.

Currently natural gas is used for most Make Up Air (MUA) units for common spaces and hot water heating in TBDSSAB buildings. In 2016, Sjolander Court in Nipigon converted from electric MUA and water heaters to natural gas.

In TBDSSAB's 2013 Strategic Plan, a practical vision statement focusing on "Green, environmentally friendly housing" was identified and this is further supported in the current Strategic Plan with a practical vision statement focusing on "Reduction in our carbon footprint and operating costs".

COMMENTS

At the October 26, 2017 Board meeting, Administration was directed to compile information regarding the use of alternate methods and sources to heat existing multi-unit buildings in response to a report presented on TBDSSAB Utility Rates and Strategies.

During the review of information for this report, Administration examined the Ontario Government's 57 page Climate Change Action Plan that details changes to building codes and the significant reduction of the use of fossil fuels by 2030 for homes and buildings to be heated with electricity or geothermal applications. Additional information was collected through industry sources, building organizations and energy review reports.

Following is an explanation of various types of heating sources typically used in multi-unit housing projects.

Hydronic Heating

Boiler systems distribute heat by circulating hot water or glycol which gives up heat as it passes through radiators or other devices in rooms. The cooler water then returns to the boiler to be reheated. Hot water systems are often called hydronic systems.

For the Social Housing Apartment Retrofit Program (SHARP), an energy audit was performed on the two buildings that qualified for SHARP funding, Andras Court and Spence Court. As part of the audit, one of the recommendations was to convert electrically heated units at Spence Court to a boiler system with hot water and glycol heated convection radiators. The presented real cost for performing such a conversion would be $1.4 to $1.7 million dollars, with an expected simple payback of 25.7 to 31.3 years. Rebates through Union Gas could be realized for the boiler upgrades only, up to $2,000 per boiler.

Geothermal Energy

Geothermal energy is the heat generated from the Earth. It is clean and sustainable. A geothermal heat pump system consists of a heat pump, ductwork, and a heat exchanger - a system of pipes buried in the shallow ground near the building. In the winter, the heat pump collects heat from the heat exchanger and pumps it into the indoor air delivery system. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger to dissipate. The heat removed from the indoor air during the summer can also be used to provide a source to heat water.

A typical geothermal system is estimated to cost $10,000 to heat 12,000 BTU (one unit) in a retrofit scenario in multi-residential apartment buildings. In a 50 unit building, the expected retrofit cost would be approximately $500,000. Not only are the systems cost prohibitive to install as a retrofit, there would be a challenge with installing the ground source pipes with limited available land to use, in addition to the mechanical that would be necessary for the equipment. For example, Andras Court would require a 200 ton unit to heat the units in the building. Though geothermal can provide energy efficiency as high as 300% and great savings in utility costs, the simple payback on installation would be at least 25 years. Neither of the Energy Audits performed cited geothermal as a recommended alternative.

Net Zero Energy

Being net zero energy means a building consumes no more energy than is produced on the site, which also means the building is “carbon neutral” and doesn’t contribute to greenhouse gas emissions and climate change. As a case study, the former Ontario Architects Association headquarters underwent an assessment to make their 20,000 square foot (1/5 the size of Spence Court) office building in Toronto a net zero energy building. The building was originally built in the 1990’s with a very tight construction. The project is due to be completed in 2018 with an estimated cost of $3.8 million.

In a retrofit situation, achieving net zero energy would typically involve the addition of exterior insulation and air sealing, the replacement of all windows to ultra-high insulated units, and the upgrade of the mechanical systems to the highest possible efficiency. It could also involve installing solar panels, upgrading appliances and changing all the lighting fixtures to LED (which has been done at Spence Court).
With an estimated cost of $20-25 million for Spence Court, the simple payback would be over 40 years, though the savings going forward from that time would be significant.

Solar Power

Solar panels harness sunlight which transforms into energy through a photovoltaic process. That energy is then sent to an inverter which converts it into usable electricity to power the building. To heat a unit with a 3.5 kilowatt electric baseboard heater, 14 panels would be required for each unit, each measuring about 17.5 square feet, for a total of 245 square feet per unit.

The cost to purchase and install a solar panel system for one unit would be $8,000-10,000. Based on initial cost and energy production, the simple payback would be approximately 11 years. The typical lifespan of solar panels is approximately 15-20 years, then replacement would be required.

Though solar power is beneficial in many applications, using it as an energy source for high consumption electricity demands is impractical. The space required for enough panels to generate the required electricity makes this option impractical, except for properties with vast space (Thunder Bay International Airport is an example of this).

Though each of the noted heating source systems has benefit, there is no current evidence that shows that this benefit would extend to the retrofit of properties currently heated with electric baseboards. The costs involved to alter a building’s structure to support the new systems (hydronic, net zero), or the space required to facilitate the new systems (geothermal, solar), make these options impractical for consideration at this time.

However, when considering new construction, these options may be viable alternatives to consider. The opportunity to integrate new energy efficient technologies into new construction was considered when designing and building the 2 new TBDSSAB 8-plex properties in 2016. Hydronic, in-floor heating systems were installed, using an ultra-high efficiency central boiler system. Additional building insulation and high heat retention

construction materials were also involved. This will contribute to lower than typical energy consumption for the property, and a lower per unit greenhouse gas emission.

TBDSSAB should continue to explore energy efficient processes as it looks at further new construction.

FINANCIAL IMPLICATIONS

There are no financial implications resulting from this report.

CONCLUSION

It is concluded that though there are alternative heating system sources available on the market, these systems do not lend themselves readily to retrofit applications. TBDSSAB will continue to explore alternative heating sources when undertaking new housing construction, to maximize the benefits in cost savings and to reduce greenhouse gas emissions.

REFERENCE MATERIALS ATTACHED

None.

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