Project Summary (Q35) – The Well Thermal Energy Storage

Located in Toronto's lively King West neighourhood, the redevelopment of the storied Globe and Mail site into The Well neighbourhood was considered one of the most ambitious and innovative large-scale mixed use redevelopment projects in Canada. The site was developed with Allied Properties REIT, RioCan REIT, and DiamondCorp, with Enwave as the energy partner. With approximately 3M square feet of total space, including 1,700 residential units, 1.5M square feet of office space, and 420,000 square feet of retail and food services, the community at The Well is as vibrant as it is visionary.

Beneath parking level six sits an 8-million litre Thermal Energy Storage (TES) tank that serves as a giant battery. The Well TES is a feat of engineering and one of the deepest construction projects in Toronto. The tank is 55 feet in diameter, 150 feet deep, and 3 feet thick. The construction of this project resulted in an Ontario Concrete Award for 'Structural Engineering - Cast-in Place'.

This thermally stratified tank is filled with a rust inhibitor solution (SoCool) that allows water to be stored below freezing (30F) in order to maximize storage capacity and allow for greater energy transfer. A more flexible and sustainable alternative to conventional building and heating, the TES utilizes off-peak available electrical capacity to charge the thermal battery and discharges during peak times. The total colling capacity of the battery is 8,500 Tons, and total heating capacity is 150,000 MBH, which can provide heating and cooling to not only the entire community at The Well but an additional 17M square feet of space beyond The Well development itself.

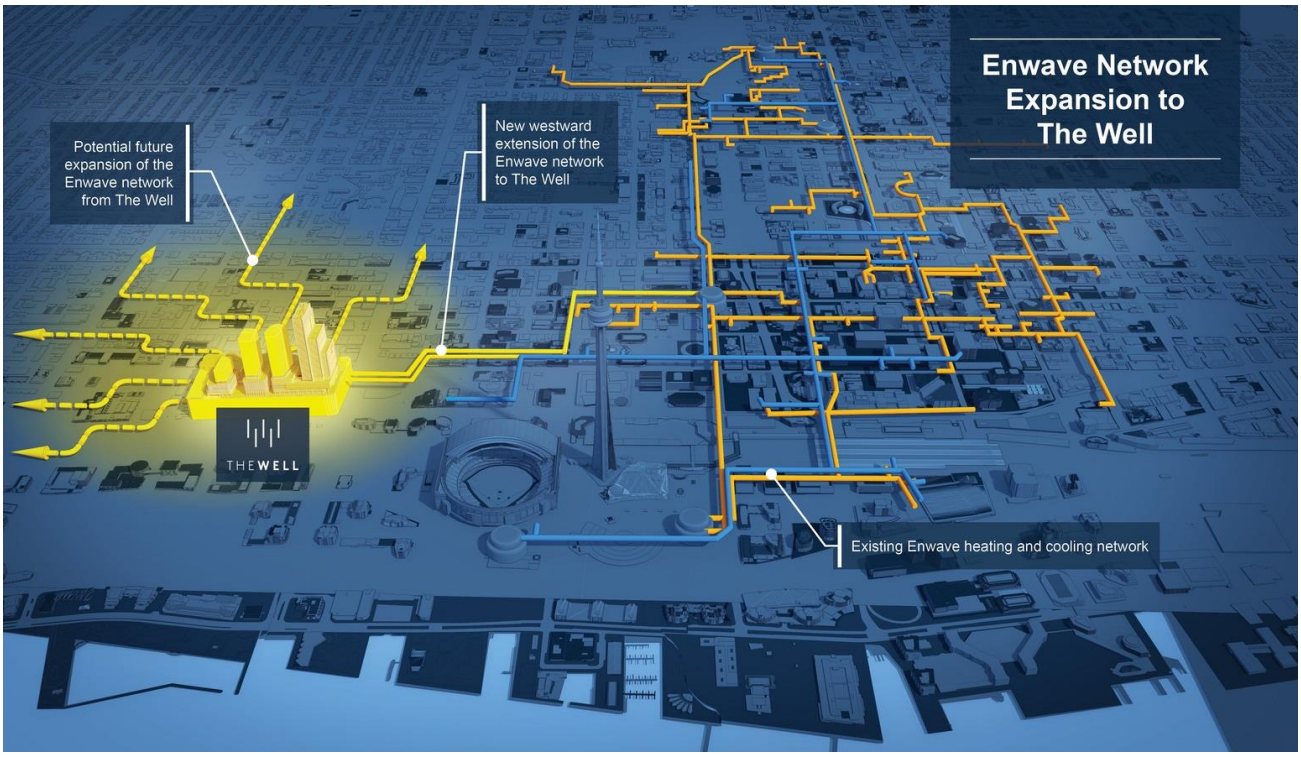
The chilled water feed for the battery comes largely from Enwave's Deep Lake Water Cooling (DLWC) system – a state-of-the-art cooling system that pulls cold water from the bottom of Lake Ontario which is then used to cool over 100 buildings in downtown Toronto. This closed loop system not only provides resilient, reliable and sustainable cooling, it also provides a renewable byproduct, that is, recovered heat from the chilled water, to be used in electrified heat pumps to provide low-carbon hot water to heat buildings. With its connection to Enwave's hot water distribution network, The Well is well-positioned to take advantage of this low-carbon heating throughout its decarbonization transition.

In addition to serving the 20M square feet in The Well development and surrounding area, this site serves as a jumping off point for further expansion of Toronto's district energy network. The Well enabled a major chilled water expansion west of the existing infrastructure and facilitated the development of a new low-carbon hot water district. The growth of the district in downtown Toronto serves not only The Well community, but will enable both new builds and potential retrofits of buildings along the expanded district to tap into low-carbon heating and cooling, driving down greenhouse gas emissions and alleviating further strain on the grid.

As the need to decarbonize building heating and cooling increases, replicating this concept of thermal energy storage in congested urban areas will hopefully become more ubiquitous. Reducing the burden on the constrained Toronto grid during peak heating and cooling days using a giant underground battery has proven to be both innovative and commercially advantageous.

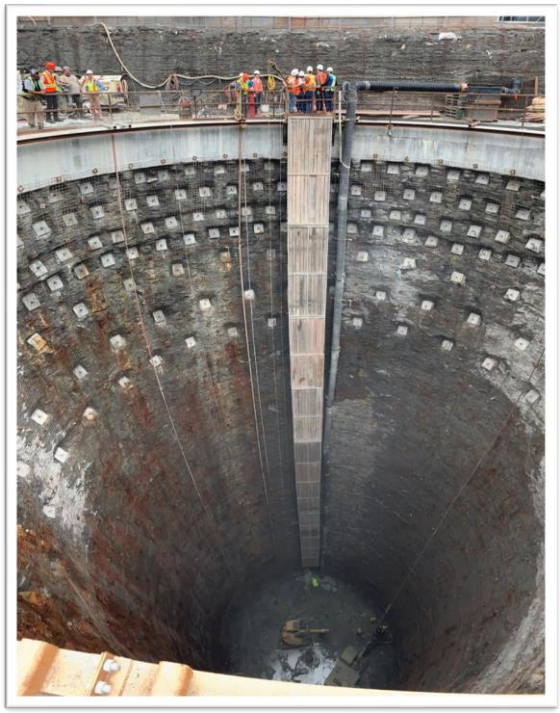
The figures and diagrams below provide visual representation of how and where The Well interacts with the urban infrastructure in Toronto.

Fig 1: Enwave distribution map



This distribution map outlines the benefit and future reach of the western expansion. The Well, denoted in bright yellow, is a jumping off point for the district to expand to the north and west. This will provide opportunities for additional low-carbon heating and cooling building connections in the city of Toronto that are more efficient than individual in-building chillers and boilers. Buildings choose to connect to the district energy network for a variety of reasons – it is efficient, reliable, cost-competitive, and net-zero ready.

Fig 2 and 3: Thermal Storage Tank



Photographs of The Well TES during construction of the tank. The tank, which is 3 feet thick, 55 feet wide, and 150 feet deep, is constructed using high strength concrete and without the use of rebar. The base of the tank is nearly 200 feet below lake level, which at the time, was the deepest construction project in Toronto.

Fig 3: Diagram of water flow between the Enwave district and The Well

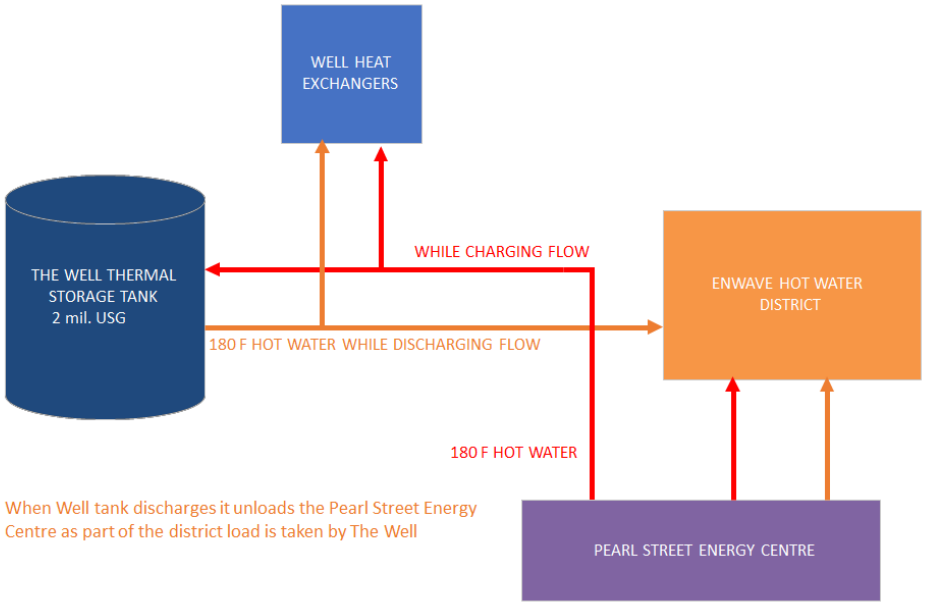
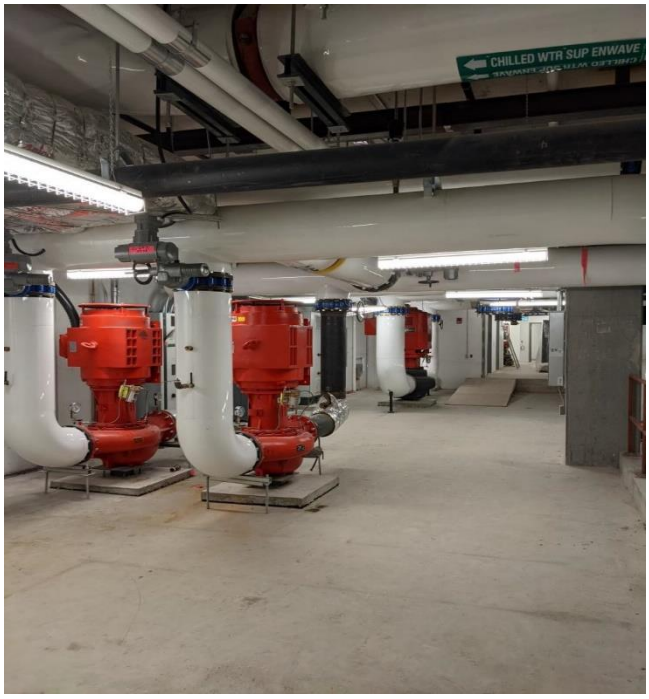


Figure 4: Daytime cooling at The Well

The above diagrams depict the flow of water between Enwave's Pearl Street Energy Centre, which houses a new Enwave Green Heat plant, and The Well storage tank. In the summer, cool water is fed from Enwave's Deep Lake Water Cooling system at night, charging the water in the tank which acts as a thermal battery. The cooling can then be discharged during the day during peak demand hours. Thermal energy is transferred between the tank and the Enwave system through heat exchangers, which draw warmth from the water, transferring it back to the Enwave return loop. Cold water cools office space through an under-floor air system, and then warmer water is returned to the district to go through the cycle again. In the winter, the tank is charged with hot water during the night and discharged during the day. Hot water circulates through the distribution piping and heat is transferred to building hot water loops through heat exchanger. After the hot water warms the building space, it is returned as cooler water to the Enwave system.

Figure 5: Mechanical Room at The Well



The mechanical room at The Well depicts the equipment required on-site. By connecting to the district energy network, there is no need for boilers, chillers, and cooling towers. Space that would typically be designated for building HVAC requirements is often in desirable real estate within commercial and residential buildings – in the case of The Well, this space houses a fine dining restaurant instead of being relegated to mechanical space.