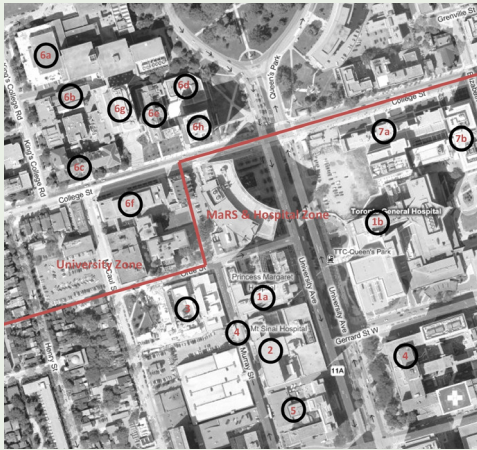


# ENERGY MANAGEMENT PLAN for the Toronto Discovery District

Figure 1. Members of the Toronto Discovery District



- 1a. Princess Margaret
- 1b. Toronto General
2. Mt. Sinai Hospital
3. Toronto Centre for Phenogenomics (TCP)
4. Hospital for Sick Children
5. Toronto Rehab
6. University of Toronto
7. MaRS

\* CAMH, Toronto Western Hospital and Women's College Hospital are not shown.<sup>1</sup>



MaRS and its fellow Toronto Discovery District (TDD) stakeholders agreed in 2008–09 to develop a District Wide Energy Management Plan (EMP) that represents a coordinated and integrated approach to energy management, renewable energy generation and district energy for the 29 buildings within the TDD. The preparation of the EMP was a collaborative process that MaRS facilitated for the TDD stakeholders by engaging the City of Toronto, the Toronto Economic Development Corporation, Enwave, Toronto Atmospheric Fund and Federation of Canadian Municipalities to resource and support the project. The area covered by the TDD and the stakeholders participating in the initiative is shown in Figure 1.

There is a major opportunity for TDD stakeholders to work together to achieve significant energy and water savings and GHG emission reductions. They can achieve these savings through collaboration on energy efficiency, education and awareness, and district energy opportunities, which have been identified through the work carried out in the three phases of the development of the EMP.

The work done in Phase 1 of the EMP provided each building with an energy profile and baseline to establish energy and water use patterns and trends at each building and across the TDD. This data was used to measure savings that could be achieved through implementation of the EMP. Phase 2 identified opportunities for energy and water savings that could be achieved through a variety of measures that include, among others, district energy, retrocommissioning, lighting, plug load and HVAC. Phase 3 produced a Future Infrastructure Plan and a District Wide Action Plan (DWAP). The EMP pulls together and integrates all the work done and provides an overall strategy to guide the TDD in its joint efforts.

The TDD uses significant amounts of energy. Table 1 shows the TDD uses 2,397,785 GJ of energy annually, has an energy intensity of 0.22 GJ/ft<sup>2</sup> and annual energy costs of approximately \$50 million.

Table 1. Total energy use in the TDD and by sector

Sector	Total energy use	Energy use intensity	Cost
Hospitals	1,512,507 GJ	0.19 GJ/ft <sup>2</sup>	\$30,673,264
Research facilities	403,881 GJ	0.31 GJ/ft <sup>2</sup>	\$8,622,571
University Buildings	481,396 GJ	0.29 GJ/ft <sup>2</sup>	\$10,995,267
<b>Total</b>	<b>2,397,785 GJ</b>	<b>0.22 GJ/ft<sup>2</sup></b>	<b>\$50,291,102</b>

If the EMP is implemented, the TDD is expected to achieve a 34% reduction in energy consumption (electricity, natural gas and steam), a 41.4% reduction in electricity demand and a 10% reduction in water usage per year. This translates into an estimated cost savings of \$16.3 million per year. Table 2 shows these savings.

Table 2. Achievable annual savings through implementation of the EMP

	Estimated savings	Estimated cost savings
Energy savings	875,282 GJ or 34.1%	\$15.9 million
Demand savings	23,900 kW or 41.4%	
Water savings	215,809 m <sup>3</sup> or 10.0%	\$0.4 million
<b>Total</b>		<b>\$16.3 million</b>

<sup>1</sup> These members are not shown as they are outside of the geographic area presented on this map.

The energy, water and cost savings achieved as a proportion of the total usage are shown in Figures 2 and 3 below.



Figure 2. Total energy and related cost savings as a proportion of total usage

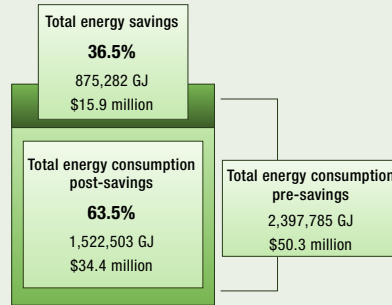
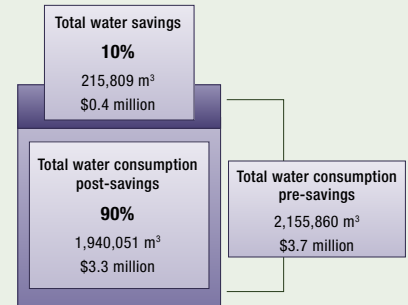


Figure 3. Total water and related cost savings as a proportion of total usage



Implementing the EMP is also expected to achieve large environmental benefits, including reducing GHG emissions by 127,735 tonnes or 61% per year, which is the equivalent of taking 27,648 cars off the road. Table 3 shows these GHG reductions. These estimated savings and GHG reductions are only based on TDD stakeholders participating in this study. Extending these measures throughout the District and also including new TDD developments will increase the savings exponentially.

Figure 4. GHG reductions as a proportion of total emissions

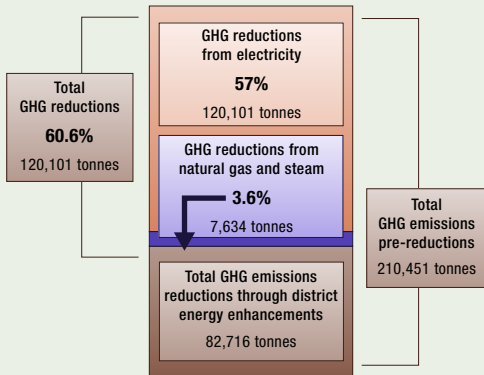


Table 3. Achievable annual GHG reductions through implementation of the EMP

	<b>Estimated savings</b>	<b>Equivalent no. of cars off the road</b>
Electricity	120,101 tonnes or 57%	25,996
Natural gas and steam	7,634 tonnes or 4%	1,652
<b>Total</b>	<b>127,735 tonnes or 61%</b>	<b>27,648</b>

The GHG savings achievable as a proportion of the total emissions are shown in Figure 4.

In addition to GHG reductions through reduced energy consumption, the EMP proposes enhancements to the District's infrastructure involving efficiencies to the Deep Lake Water Cooling (DLWC) system and the introduction of District Wide energy Cogeneration from heat through a new hot water primary distribution system supplied by multiple Combined Heat and Power (CHP) units.

Stage 1 involves connection to the DLWC infrastructure, which already runs through the area under the west sidewalk of University Avenue for at least the base load cooling and the undertaking of a detailed feasibility study to examine meeting peak load demand through the bundling of existing cooling infrastructure. Stage 2 looks to link the buildings of the District to a new hot water primary distribution system and to cogenerate 20 MWe power from the new heating units. The CHP units would ideally be located all together in a new district energy centre located somewhere close to the pipe route.

Achieving these savings and benefits is dependent on the successful implementation of the actions recommended in the DWAP starting with a high level commitment by all of the TDD stakeholders to work to deliver the DWAP. It will need to include a commitment to ongoing performance monitoring; to work together through a secretariat of stakeholder representatives; to secure the funding, incentives and other resources needed; and to report regularly on best practices in all relevant areas from retro-commissioning and procurement practices to education and training.

