



REPORT TO

REGULAR BOARD

NET ZERO ENERGY STATUS UPDATE (ALL WARDS)

*"I can do all this through Him who gives me strength."
Philippians 4:13 (NIV)*

Created, Draft	First Tabling	Review
March 30, 2017	April 19, 2017	
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INFORMATION REPORT		

Vision:

At Toronto Catholic we transform the world through witness, faith, innovation and action.

Mission:

The Toronto Catholic District School Board is an inclusive learning community uniting home, parish and school and rooted in the love of Christ. We educate students to grow in grace and knowledge to lead lives of faith, hope and charity.



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A. EXECUTIVE SUMMARY

This report provides a summary status of staff action to investigate opportunities and strategies for implementing the Board's resolution to be a 'Net Zero Energy' school board.

There is a need to define 'Net Zero Energy' and specific energy reduction/energy production/greenhouse gas emission reduction targets for the TCDSB. Funding for any significant energy reduction beyond Building Code and Toronto Green Standard requirements and for on-site energy production for new schools is currently non-existent and uncertain for the future. Measures that do not increase Capital costs need to be identified, as well as strategies to best use additional funding when it becomes available. School Renewal Grant funding can and is being used for energy saving measures in existing schools.

A specialist in energy-efficient building is being retained to assist Board staff with a comprehensive study that will benchmark current TCDSB energy use, define achievable energy conservation and production and greenhouse gas reduction targets, and outline recommendations for, and cost implications of, the implementation of strategies to move the Board 'Toward Net Zero Energy.'

The cumulative staff time dedicated to developing this report was 40 hours.

B. PURPOSE

At the Corporate Services, Strategic Planning and Property Committee meeting on March 10, 2016, the Board resolved the following:

- *That the Chair write to the Minister of Education and both the provincial and federal Ministers of the Environment and Climate Change, on behalf of the board of trustees, of our objective to be a 'net zero' energy school board and our request for financial support in doing so.*
- *Staff to work with the ministries of Environment and Climate Change to determine how we might partner to make the TCDSB a 'net zero' energy school board - supporting our common goal of environmental and financial sustainability.*
- *Staff to report back to the board of trustees on progress as it occurs.*

C. BACKGROUND

1. Following the March 10, 2016 Board resolution declaring the TCDSB objective to become a ‘net zero’ energy school board, Facilities staff began internal discussions regarding strategies to:
 - a) Define targets;
 - b) Achieve those targets.
2. The first issue is that there is no universally accepted definition for *Net Zero Energy Building* (NZEB). A veritable alphabet soup of organizations has generated various definitions—ASHRAE, NREL, DOE, NRCAN, EU-EPBD Directive, IEA, EnOB, to name a few. Staff are uncertain, and no doubt trustees are also uncertain, as to what the actual objective is.
3. According to a research paper by *EnOB: Research for Energy-Optimized Construction*, the idea of a NZEB is understood conceptually as a building with greatly reduced energy demand that can be balanced by an equivalent on-site generation of electricity, or other energy carriers, from renewable resources. However, as the EnOB paper continues, the exact definition may significantly affect the way buildings are designed to achieve that goal.
4. The second issue, is that the cost to achieve, or even come close to achieving ‘net zero’ energy in a new school building is significantly beyond the available Ministry of Education benchmark funding for schools. It is necessary to sift through a vast array of building and energy production technologies and pursue those that will deliver the “biggest bang for the buck” in terms of energy use reduction and energy production.
5. The third issue is that for TCDSB to become a ‘net zero’ energy school board, all existing buildings in the portfolio will require extensive upgrading to improve energy performance and the addition of on-site renewable energy production. Again, cost is a significant barrier, and in many cases existing site/building conditions restrict the options for on-site energy production. For the board as a whole to become ‘net zero’, some buildings will need to produce more energy than they consume in order to balance existing buildings that cannot be upgraded sufficiently.
6. The Ontario government’s *Five Year Climate Change Action Plan*, issued in 2016, includes a commitment to provide funding for existing schools to improve energy efficiency and install renewable energy technologies. To date, the details of this funding have not been announced. TCDSB needs to

be prepared with specific projects to take advantage of funding when it does become available.

7. In March 2017, a letter was sent from the Chair of the Board to the Ontario Minister of Education and the Minister of the Environment and Climate Change requesting additional funding in order to support implementation of initiatives required to achieve 'net zero' energy building performance. A copy of the response letter is provided as Appendix A -1. A second letter has subsequently been sent requesting funding and support specifically for the Board's recently approved school projects, as well as pending capital request projects. A copy of this recent letter is attached in Appendix A-2.
8. The fourth issue is that 'net zero energy' does not necessarily address greenhouse gas emissions by TCDSB buildings and daily operations. The Board must decide to what extent reducing carbon, in addition to reducing energy use/cost, is an important goal. Is there a requirement for example, to have low emission school buses and board vehicles as part of a carbon reduction strategy.
9. As a step towards possible carbon reduction, Board staff met with a private full-service energy management company, on multiple occasions regarding their 'Vision Towards Climate Neutrality'. In November 2016 this firm presented a proposal to staff for achieving 'carbon neutral' buildings within the TCDSB portfolio. 'Carbon neutral' is not the same as 'net zero energy.' However, aspects from a carbon neutral approach may be incorporated into the Board's future Net Zero energy goals – such as providing renewable energy at one site, that serves the needs of other school or community sites.
10. Upon review, staff found that this 'Carbon Neutral' proposal was not well suited to the Board's goals because its primary recommendation was to convert all natural gas powered equipment to electric. Based on current usage, electricity represents 36.7% of the Board's overall energy usage, however, it represents 72% of our overall energy expenditures. At current electricity rates and current consumption rates, the Board would require an additional \$25 million annually to fund our energy costs, excluding capital costs to replace equipment. At this time commodity forecasts for natural gas cost do not indicate a significant increase in pricing in the near future. Therefore, the cost to convert to electricity is significantly higher than the cost of natural gas and associated carbon taxes.
11. Renewal and Maintenance staff have to date completed a significant number of projects, and have several upcoming projects as outlined in the 2016-2018 School Renewal Plan (refer to Appendices B & C for a summary by project

type and year), that improve the energy efficiency of various building components. These projects include the conversion of fluorescent lights to LED lights, boiler replacements to new high-efficiency boilers with Building Automation Systems (BAS) to control use, installation of voltage harmonizers and installation of solar photovoltaic (PV) panels.

12. All completed Capital Phase 2 projects (6 new elementary schools), as well as all Phase 3 new elementary schools currently under construction, have incorporated the energy-conserving strategy of radiant in-floor heating with displacement ventilation. Recent capital projects have included use of LED lighting, which reduces electrical consumption. In addition, new Building Code requirements, effective in January 2017, have increased building insulation levels, air tightness and avoidance of “thermal bridging.”
13. This represents real progress towards energy conservation, as compared to our projects in the last decade. However, these projects in and of themselves, although they improve our energy efficiency, are not adequate to achieve overall ‘net zero’ energy use. A larger more comprehensive strategy is required to build on the work to date in order to reach this target goal.

D. VISION

VISION	PRINCIPLES	GOALS
The TCDSB aspires to become a ‘Net Zero’ Energy school board	<ul style="list-style-type: none"> • MYSP: Stewardship of Resources • Pope Francis’ Laudato Si’ • Partner with the ministries of Environment and Climate Change to support our common goal of environmental and financial sustainability. 	<ul style="list-style-type: none"> • Determine where we are now • Reduce energy consumption to below the most efficient buildings in the province • Find affordable strategies to reduce greenhouse gas emissions • Obtain financial support from Provincial and Federal governments toward Net Zero Energy strategies

E. ACTION PLAN

1. TCDSB staff do not have either the specialized expertise or the time resources to adequately address the issues outlined in the Background of this report and develop a road map toward Net Zero Energy for the Board.
Detailed research is required to:
 - .1 Benchmark TCDSB existing schools' energy use, construction standards and Capital costs and compare to other GTA boards
 - .2 Summarize relevant policies and standards
 - .3 Track Capital cost implications of energy-saving design strategies that have been employed by others
 - .4 Set specific short and long term targets and identify risks
 - .5 Make recommendations and identify next steps.
2. To carry out the above-noted tasks and provide the Board with a solid basis for decision-making to move forward with the goal toward net zero energy, staff have recommended that an outside specialist in the field of energy-efficiency be retained. The consultant should be an independent, energy-efficient-design research specialist with no vested interest in selling power-purchase agreements, technologies, materials, building design or project management services to the Board.
3. Staff are in the process of retaining such a consultant with the ability to provide the customized, wide-ranging, independent research required by the TCDSB to assess its current assets and complete a study to provide a report by fall 2017 to define achievable energy conservation and production and greenhouse gas reduction targets and outline recommendations for, and cost implications of, implementation of strategies to move the Board toward net zero energy.
4. Staff have finalized the recommendation for the appointment of the architect for the new school to consolidate St. Raymond and St. Bruno Catholic Schools. Solid experience within the consultant team in energy efficient design and net zero energy strategies was an important factor in the selection of the recommended team. The Request for Proposal also included an optional fee for additional work toward net zero energy in the event that additional funding is received for this purpose.
5. Architects for the St. Leo/St. Louis consolidation and St. Antoine Daniel replacement school, as well as for the new Blessed Cardinal Newman Secondary school, will be selected on the same basis as for St. Raymond. The scope of work for all new projects also includes an allowance for building envelope commissioning, i.e. intensive testing and inspection

during and after construction to ensure the proper installation of insulation and sealing of the building envelope. The results of the Toward Net Zero study will be available to the consultants for all three new projects in the early stages of design.

6. Staff are also investigating the potential of the *TermoBuild* system, which some other Boards in Ontario have used in recent projects to improve the energy efficiency of their schools, with St. Raymond/St. Bruno as a possible pilot project. This system distributes heated or cooled air through the cores of standard hollow core concrete floor slabs, using the slabs' thermal mass to absorb, store and radiate heat, resulting in a smaller mechanical plant. However, like other projects completed to date by the Facilities Department, this system alone does not provide a comprehensive strategy to reach the 'net zero energy' target.

F. METRICS AND ACCOUNTABILITY

1. The Toward Net Zero Energy study will be funded from the School Renewal Grant, under the "Technical Building Audits, Studies and Special Testing" portion of the recently approved Revised 2016-2018 School Renewal Plan.
2. The cost of the study will be recovered many times over by:
 - (i) avoiding the need for consultants for individual projects to carry out the research and evaluation of options for each project;
 - (ii) avoiding spending money on design strategies and technologies that provide very low rates of return

G. IMPLEMENTATION, STRATEGIC COMMUNICATIONS AND STAKEHOLDER ENGAGEMENT PLAN

1. The Toward Net Zero Energy study is expected to take approximately six months. At the conclusion of the study, there will be a presentation to the Board by the consultant.
2. The study is intended to be the first phase in determining the TCDSB path to 'Net Zero Energy'. Once targets have been chosen based on the research results, and the potential for additional funding is perhaps known, a second phase may be needed to provide Facilities staff with more detailed design strategies/standards matching the targets and available funding.

3. A workshop for parents/staff/trustees regarding the TCDSB's Net Zero energy initiatives will be made available in the fall of 2017.

H. CONCLUSION

This report is for the information of the Board.