

To: Mr. William D. Lovallo, PE, Chair  
Belmont High School Building Committee

From: Belmont residents Jonathan Abe, Jacob Knowles and David Beavers

Date: 7/28/18

Re: Support for Financially Prudent BHS Zero Net Energy (ZNE) Investments, Geothermal and Rooftop Solar

Thank you for the opportunity to share our support for the BHS Zero Net Energy (ZNE) investments that would provide the best financial benefits to Belmont, specifically geothermal and rooftop solar. We appreciate the work you and the BHS Building Committee are doing on behalf of the town.

We offer these thoughts as Belmont residents with deep experience in all aspects of commercial rooftop solar and sustainable building design and architecture. See our backgrounds below. We have no financial interest in any outcome other than how BHS and associated ZNE investments affects us all as residents and taxpayers. Our employers have no intention on bidding on any work related to the High School project.

Based on our review of the proposed High School bond budget, we believe the geothermal and rooftop solar projects are included. We applaud your inclusion of the investment and support this decision as financially prudent. In summary:

1. The Geothermal HVAC system results in an estimated **\$4 million** in net present value energy savings relative to the next best HVAC option (30-years) according to the High School Design Team.
2. The Rooftop Solar results in an estimated additional savings of **\$1 million** (30-year cumulative cash flow), and
3. The sale of Geothermal Alternative Energy Credits results in an estimated additional savings of **\$1 million** (30-year cumulative cash flow) when combined with achieving ZNE designation.

Based on the financing of these capital investments with the BHS bond, these investments are also cash flow positive from day one on and are a major opportunity to save Belmont taxpayers money. Below are details on the analysis to support our financings: 1) the **HVAC Options LCCA** (Life Cycle Cost Analysis) performed by the high school design team, 2) the **Rooftop Solar** financial model, 3) the **Geothermal Alternative Energy Credits** (AECs) Optimization Calculation.

- 1) **Geothermal HVAC.** This finding references the mechanical system options life cycle cost and cash flow analysis (hvac\_system\_options\_lcca\_180608) performed by the high school design team available on the BHS Building Committee website.

This analysis shows that the geothermal option is the most cost effective, resulting in the lowest cost of ownership with significant annual cash flow savings, accounting for the following costs: bond payments (associated with construction cost), energy, water, maintenance, and replacement costs. The analysis indicates that the geothermal option has a net present value savings of **\$4,092,195** over 30 years, compared to the next best HVAC option. Note that this analysis does not account for the additional financial benefit of the Alternative Energy Credits (AECs) created by the geothermal system which are discussed below.

- 2) **Rooftop Solar.** The attached spreadsheet is a simple solar financial model (BHS - Solar Financial Model (06.25.18).xlsx) estimates Rooftop Solar project year one savings of \$18,130 and a cumulative savings of **\$998,298** over 30 years using conservative capital cost, performance, and operating cost assumptions. For example, the Operations and Maintenance budget includes costs to cover annual preventative maintenance and an additional \$10,000 per year for a reserve fund to cover inverter replacement and any other major maintenance. The construction and overhead savings and low-cost financing available by including solar in the school construction (rather than adding it later) will enable the solar project to be cash flow positive from day one on.
  
- 3) **Achieving ZNE Designation to Optimize Geothermal Alternative Energy Credit Revenue .** The attached spreadsheet (BHS - Geothermal Alternative Energy Credit Revenue Optimization (07.28.18).xlsx) includes formulas in this calculator have been reviewed by the MA Department of Energy Resources (DOER) and the input values have been extracted from the high school design team's most recent energy model report published on the BHS Building Committee website.

The analysis shows that the Geothermal Alternative Energy Credits if optimized in value by qualifying as Class D ZNE can provide an estimated \$32,236 in annual cash flow or cumulative cash flow of **\$967,090** over 30 years. By way of background, the value of the Geothermal AECs can be further optimized by qualifying as Class D ZNE which requires purchase Renewable Energy Credits (RECs) to offset remaining energy consumption (after energy conservation and on-site renewable energy systems have been implemented to the extent practical). Achieving Class D ZNE qualifies the new geothermal system for the 7x AEC multiplier, which increases the calculated AEC value by \$10,622 per year and only \$4,942 is spent per year to buy the Renewable Energy Credits (RECs) to achieve Class D ZNE. The \$37,178 in AEC sales, minus \$4,942 in REC purchases results in \$32,236 in annual cash flow.

We support the inclusion of Geothermal and Rooftop solar in the bond budget and high school as financially prudent. This is an opportunity to save Belmont taxpayers millions of dollars and represents perhaps the single greatest carbon footprint reduction opportunity in Belmont's history. Making these capital investments in conjunction with the bonding and the construction of the high school will result in lower transaction, financing, and construction costs as well as investments that are cash flow positive from day one on. Waiting to implement until after construction of the school will jeopardize the significant financial returns that can only be achieved by making these investments in the bonding and construction of the High School.

Thank you for your work to move the High School forward. We are available to answer any questions the Committee may have about our assumptions, analysis, and recommendations.

Best regards,

Jonathan Abe, Jacob Knowles, and David Beavers

Attachments:

BHS - Solar Financial Model (06.25.18).xlsx

MA Geothermal Alternative Energy Credit Calculator\_BHS\_20180614.xlsx

## Background of authors

### Jonathan Abe

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Jon has developed, financed, and managed over 75 commercial solar and energy efficiency projects.

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Current Applicant for membership of the Belmont Light Board Advisory Committee

### Jacob Knowles

Architect and Director of Sustainable Design

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Jacob has been involved in a dozen ZNE projects

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Belmont resident with one child in Butler Elementary School and one child in Chenery Middle School

Husband of Kate Bowen, School Committee member

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### David Beavers

Engineer and Founder of Sunesty Energy Catalysts LLC

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David has been involved in 100 solar projects. Clients include Metropolitan Area Planning Council (MAPC)

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