PETITIONED ARTICLE FOR SPRING 2017 TOWN MEETING

PETITIONERS: Werner Lohe, Alan Christ, Kathleen Scanlon

ARTICLE 21:

A RESOLUTION REGARDING A NET ZERO ENERGY NINTH ELEMENTARY SCHOOL AND THE EXPANSION OF BROOKLINE HIGH SCHOOL

To see if the Town will vote to adopt the following resolution:

Whereas our town, the nation, and the world are increasingly aware of the need to address climate change and of the importance of better protection of the environment in general, and

Whereas Net Zero Energy LEED Platinum schools create an environment that supports student learning and health through improvements in daylighting, indoor air quality, thermal comfort, acoustics, and classroom design, all of which have an impact on a child's ability to learn and a teacher's ability to teach, while saving energy, resources, and money, and

Whereas Net Zero Energy LEED Platinum schools increase energy efficiency, thereby reducing greenhouse gas emissions, cost less to operate, utilize durable materials, reduce water and energy use, and provide other benefits; while providing an educational experience that transcends the classroom by creating opportunities for curriculum innovation and hands-on, project-based learning in which the building itself becomes an interactive teaching tool, and

Whereas decisions made now about the design of the Ninth Elementary School at Baldwin and the expansion of Brookline High School will determine each school's environmental footprint, particularly greenhouse gas emissions, for decades to come, and

Whereas the technical ability to create energy-efficient, high performing buildings has increased significantly by incorporating systems thinking into design processes, and

Whereas construction of new schools in Massachusetts and around the nation during the past five years has shown the feasibility and desirability of Net Zero Energy schools, that is, schools in which the amount of energy used on an annual basis is equal to the amount of renewable energy created on the site, and

Whereas an international standard known as LEED (Leadership in Energy and Environmental Design) allows for a building's environmental and energy performance to be accurately measured and provides a benchmark to assist in designing a Net Zero Energy building,

Whereas the most accurate measure of energy efficiency for a building is EUI (Energy Use Intensity), calculated by dividing total energy consumed annually by the gross floor area of the building,

Now therefore be it Resolved that in order for the Ninth Elementary School at Baldwin to be a Net Zero Energy school, it shall be designed to obtain LEED v4 certification at the Platinum rating level, and in addition, specifically, to achieve 16 of the possible 16 points available in the Optimize Energy Performance category and to achieve an EUI of 25 kBTU/sq.ft.,

And, be it further Resolved that while overall net zero energy consumption is unlikely to be achieved for Brookline High School and even the degree to which the as-of-yet-undefined, expanded portion of the school can approach Net Zero Energy is currently uncertain, nevertheless, Net Zero Energy principles shall be applied, to the extent feasible, during all design phases of Brookline High School,

or act upon anything relative thereto.

EXPLANATION

Summary

Brookline was one of the first communities in Massachusetts to address climate change, adopting its first Climate Action Plan in 2002. In 2012, it accepted Massachusetts' target for greenhouse gas emissions—the reduction in emissions to 80% below 1990 levels by 2050. See "2012 Climate Action Plan," p. 9 (http://www.brooklinema.gov/DocumentCenter/View/2402). In part in response to this statement of our community's environmental values, recent school construction (i.e., the Runkle School and the Devotion School) has achieved high standards of energy efficiency. Similarly, in the Educational Plan for the Ninth Elementary School at Baldwin, the School Committee has stated its strong commitment to a state-of-the-art school.[1] Nevertheless, overall town-wide progress toward reduced emissions has been slow, not yet approaching the rate needed to reach our goal. See, generally, "Selectmen's Climate Action Committee Report to Town Meeting, Spring 2015," p. 2 (http://www.brooklinema.gov/DocumentCenter/View/8158).

New construction of any sort inevitably leads to a slight increases in emissions. Therefore, communities throughout Massachusetts and New England have begun to address that reality by designing "Net Zero Energy" (NZE) schools, that is, schools that minimize on-site energy use as much as possible, and offset that energy use with renewable energy generated on site, with the goal of equalizing, on an annual basis, energy consumed and renewable energy generated on site. (Examples of such schools are the Martin Luther King School, Cambridge, MA, the King Open School, Cambridge, MA, and the Pell Elementary School,[2] Newport, RI.) Schools such as this not only address climate change, but typically save money by reducing energy costs. See below. Brookline now has an opportunity to design its own NZE school.

About ten years ago, Brookline improved its design process for municipal buildings by including consideration of "environmental and sustainability goals and objectives, includ[ing] design and construction practices that explicitly consider Green technologies." Bylaws, § 7.3.2(a). Because of the Town's sound design practices and the Massachusetts School Building Authority's (MSBA) standards, the Runkle and Devotion projects have good energy performance, though they are not NZE. The Ninth Elementary School at Baldwin, however, is not subject to MSBA requirements, and no specific standards for energy performance have been set. This resolution provides direction

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1. " "Building a new school in the early 21st century when our community and society are more conscious than ever of the delicate balance between environmental sustainability and ongoing development provides an opportunity to have the physical plant itself play a significant role in the culture, educational approach and daily lives of students and teachers. Whether it's through monitoring waste water, understanding the science behind passive and active solar power, or studying conservation measures built into the new building, the physical plant can be used to help students learn about science, sustainability, and taking care of the environment. For example, signs and working exhibitions created by students could identify design elements that demonstrate architectural, structural, mechanical, and green building strategies. Student tour guides could be trained to introduce visitors to the building's features. Back-of the-house spaces could be used as instructional spaces for students and staff, and could be used by town building and maintenance staff for hands-on training. ***Brookline's new elementary school could stand as a physical demonstration of environmental stewardship and innovation, providing a local case study for sustainable school construction***." 9th Elementary School Educational Program (11/29/16 draft), p. 13 (emphasis added). *http://www.brookline.k12.ma.us/cms/lib8/MA01907509/Centricity/Domain/722/Draft%209th%20School%20Ed%20Plan%20-%2011.29.2016.pdf*

2. "The Pell School is… considered a net-zero-ready building. With the addition of a 1,100-kW photovoltaic system in the future, the school will be an actual net-zero building." https://webspm.com/Articles/2014/08/01/Net-Zero-in-School-Design.aspx. Binghamton, NY designed a NZE school, the MacArthur Elementary School, that is not only NZE, but also "fossil-fuel-free." Building Energy, vol. 36, no. 1 (2017), p. 12,

to the design architects, under the supervision of the School Committee, the Building Commission, and the Board of Selectmen, by establishing Net Zero Energy as the community's goal for its new school. This goal encourages energy efficient building design, places a major focus on energy, and encourages building users to reduce their energy needs without compromising building programs or mission.

Mechanism for Assuring a NZE Design

The most widely used and accepted rating system in the United States and in the world for green buildings is LEED v4 (Leadership in Energy and Environmental Design, version 4). See http://www.usgbc.org/LEED. Building performance is measured by awarding up to a total of 110 checklist points in eight categories and 57 sub-categories. The single sub-category in which the most points are available—with 16 points—is Energy and Atmosphere: Optimize Energy Performance. Consultation with architects and energy efficiency consultants familiar with schools, NZE principles, and LEED indicates that the realistic goal for achieving NZE for the Ninth Elementary School at Baldwin is 16 Optimize-Energy-Performance points with certification at the Platinum rating level with Energy Use Intensity (EUI) of 25 kBTU/sq.ft.

Cost

NZE schools, in addition to addressing climate change, typically save money by reducing energy costs. See https://www.districtadministration.com/article/net-zero-schools-save-big-energy-costs. Further, the Town and its architect are committed to "integrated design," which is the most effective process for ensuring not only energy efficiency, but also cost savings. See http://www.facilitiesnet.com/facilitiesmanagement/article/When-talk-is-cheaper-Integrated-design-and-better-buildings-Facilities-Management-Facilities-Management-Feature--2138.

Integrated design relies on careful planning and goal setting early in the design process. Project costs and savings are evaluated during the schematic design phase of the project. Thus, the savings (or costs) that may be realized by designing an NZE school cannot be accurately assessed at present since schematic design has not yet been authorized by Town Meeting. But, consistent with best practices, an important provision in the Town's bylaw requires that "the consultant [(the architect) prepare] a cost estimate for the project (including life-cycle costs) [and] consider the investigation, cost-benefit analysis, and recommendation of appropriate options that address the environmental and sustainability goals and objectives…." Bylaw, § 3.7.2(b).

The bylaw does not specify the methodology to be used in the cost-benefit analysis. The Town has frequently used "simple payback period" methodology. But, because of the complexity of the design of a large project such as the Ninth Elementary School at Baldwin and the desire to achieve the goal of NZE, financial analysis of energy-related features such as geothermal HVAC, solar PV panels, triple-glazed windows, and the like should include a Discounted Cash Flow (DCF) analysis, considering Internal Rate of Return (IRR) or Net Present Value (NPV) or both, based upon the life of the features,[3] and should also consider the Social Cost of Carbon.[4]

3. Funding for the Ninth Elementary School at Baldwin will be provided by the issuance of municipal bonds. Energy-related features whose nominal rate of return, as compared to baseline conventional features, are projected to exceed the Town's cost of capital in the municipal bond market should be chosen because they are the more fiscally responsible alternative.

4. See "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866" published by the Interagency Working Group on Social Cost of Carbon, United States Government, in May 2013, and revised in November 2013 and July 2015.